ADDIS ABABA UNIVERSITY
FACULITY OF MEDICINE
DEPARTMENT OF COMMUNITY HEALTH

ASSESSMENT OF INSECTICIDE-TREATED MOSQUITO NET POSSESSION, UTILIZATION AND THE ASSOCIATED DETERMINANTS AMONG PREGNANT WOMEN IN RAYA-AZEBO DISTRICT, TIGRAY REGIONAL STATE, NORTHERN ETHIOPIA

BY: MEBRAHTOM BELAY, BSC

"A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSTY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN PUBLIC HEALTH".

APRIL, 2007

ADDISS ABABA

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

ASSESSMENT OF INSECTICIDE-TREATED MOSQUITO NET POSSESSION, UTILIZATION AND THE ASSOCIATED DETERMINANTS AMONG PREGNANT WOMEN IN RAYA-AZEBO DISTRICT, TIGRAY REGIONAL STATE, NORTHERN ETHIOPIA

BY: MEBRAHTOM BELAY, BSC.

DEPARTMENT OF COMMUNITY HEALTH, FACULTY OF MEDICINE, ADDISS ABABA UNIVERSITY

APPROVED BY THE EXAMINING BOARD

MR. WAKGARI DERESSA _____

Advisor

_____ _____

Advisor

_____ _____

Examiner

DECLARATION

I, who under signed below , declare that this is my original work and has never been presented in any university and that all the source material which were used for the thesis have been properly acknowledged.

Name: Mebrahtom Belay

Signiture_____

Place _____

Date of submission_____

This thesis has been submitted for examination with my approval as a university advisor.

Name Mr. Wakgari Deressa

Signiture_____

Date _____

ACKNOWLEDGEMENTS

I am strongly indebted to my advisor Mr. Wakgari Deressa from the Department of Community Health, Faculty of Medicine, for his unreserved advice, and continuous comments through out my thesis work. Without his advice, the accomplishment of this thesis would have been difficult. I am also extending my special thanks to Department of Community Health Addis Ababa University, Faculty Medicine for the financial support of this study. I am also grateful to the Tigray Regional State Health Bureau, particularly to Raya-Azebo District Administration, District Health Office, staff member of health institution, data collectors, Community Health Workers in the District and the pregnant women of the District involved in this studies.

It is also my pleasure to thank FMOH, malaria control unit, for they provision of relevant literature needed for this project. I am also thankful to the Department of Community Health and WHO library for allowing me to access relevant literature.

I would like to thank all my friends for their tireless effort, valuable support in all aspects including moral and material support and sustainable encouragement to complete this thesis.

Lastly, my special thanks and appreciation goes to my wife Sr. Abeba Mehari, my brother Zenebe Belay and my sister Tirhas Kidane for their valuable encouragement and support through out the study.

Table of content

Acronyms/ Abbreviation

ANC	Antenatal care
CBRHA	Community Base Reproductive Health Agent
CHA	Community Health Agent
DHS	Demographic Health Survey
FGD	Focus Group Discussion
FMOH	Federal Ministry Of Health
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
HMIS	Health Management Information System
IEC	Information, Education and Communication
ITNs	Insecticides Treated Net (Mosquitoes net)
IRS	Indoor Residual Spraying
Kms	Kilometers
NGO	Non-Governmental Organization
OR	Odds Ratio
RBM	Roll Back Malaria
SD	Standard Deviation
SNNPR	Southern Nations Nationalities and Peoples Region
SRS	Systematic Random Sampling
TTBAs	Trained Traditional Birth attendants
UN	United Nation
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
USD	United States Dollar
VAT	Value Added Tax
WHO	World Health Organization
WHO-AFRO	World Health Organization Regional Office for Africa

Abstract

Background: Malaria is one of the major health problems of the community in the world, mainly to children and pregnant women. The use of insecticide treated nets (ITNs) for protection against malarial is one of the major strategies currently applied in most developing countries. Raya-Azebo is one of the target Districts in Ethiopia for ITNs intervention, but with limited evidences pertaining to its possession and utilization in the most vulnerable group like pregnant women.

Objective: To assess the status of ITNs possession, utilization and determinant factors among pregnant women for malaria control.

Methodology: A cross-sectional study was conducted in both urban and rural areas of Raya-Azebo District in Tigray Regional State. Using multistage stratified sampling method, 815 households with at least one pregnant woman were interviewed from randomly selected 21 Kushets from rural areas (90.6% pregnant women) and three Kushets from urban (9.4% pregnant women).The interview were regarding to possession and utilization of ITNs by the pregnant women. Four Focus Group Discussions (FGDs) were also held to generate important ideas for the study. In addition to this, direct observation about the proper utilization of ITNs by the pregnant women and children under-five was carried out during early morning. Data entry and analysis were done using SPSS version 10 soft ware.

Result: ITNs possession and utilization of during the preceding night by pregnant women of the study area was 59% and 34.5%, respectively. Net re-impregnation rate in the areas was 96%. Educational status of the pregnant women, lack of radio at household level, gravidity, family size and number of living rooms were the most important factors that influenced possession and utilization of ITNs.

Conclusions: Possession and utilization of ITNs by the study households were low. Educational level, radio possession, gravidity, family size, lack of access to ITNs, and way of distribution were the main determinants for possession and utilizations of ITNs. Improving the availability, sustainable integrating of the supply of ITNs to ant natal care (ANC) services and also to other sectors can be assured. Effective Information, Education and Communication (IEC) should be needed to enhance continuous uses of ITNs for protection of malaria in the highly risk group of the community.

Introduction

Malaria, the most important parasitic infection of human, affects many people in the world. It is estimated that the incidence of malaria in the world is between 300-500 million clinical cases per year (1). Of the estimated 1.5 million to 2.7 million annual deaths from the disease worldwide, about one million occur among children under 5 years of age in sub-Saharan Africa (1). About 90% of the malaria burden occurs in sub- Saharan Africa, most of which is due to *Plasmodium falciparum*. During first and second pregnancies, malaria is associated particularly with low birth weight, anemia and both prenatal and maternal mortality (2).

Beyond the individual ailments, the disease results in increased burden to health institutions, and poor growth of economy (3). An analysis of economic growth over 25 years found that countries with intense malaria had rates of GDP growth that were 1.3% lower than those in comparable countries with less intense malaria (4). Nine percent of the disease burden in Africa is due to malaria (1). The estimated annual direct and indirect cost in Africa alone is more than USD 2000 million (1).

In Ethiopia, malaria is a major public health problem. In a non-malaria epidemic year, 5-6 million clinical cases and over 600,000 confirmed cases are reported from public health facilities (5). Malaria has been reported as the major cause of morbidity and mortality, accounting for 16.6% of outpatient consultations, 15 % of admissions and 28.9% of inpatient deaths (6). About 75% of the landmass of Ethiopia is potentially malarious and about two thirds of (68%) of the population being at risk of infection (5, 7, 8 and 9).

Well-documented studies from the 1930s to the present have shown that infection with only two of the four-*Plasmodium* species is of epidemiological importance in Ethiopia (9). *P. falciparum* accounts for about 60% of infections and *P. vivax* for the rest of the burden (10).

In Tigray region, 258 420 cases of malaria were microscopically or clinically diagnosed and treated at different health institutions in 2002/03 and accounted for 16% of all admissions and 14% of all deaths in hospitals and health centers (11). In Raya Azebo Wereda (District) the proportion of the malaria to other diseases showed 24.5%, 29% and 63% in 2002/03, 2003/04 and 2004/05, respectively, of all clinically and laboratory investigated cases (12).

Insecticide-treated nets (ITNs) are now a major intervention for malaria in Ethiopia, with particular emphasis on children and pregnant women (13). A study conducted in 2004 at five sites in Ethiopia revealed that households who owned any net and ITNs were found to be 25% and 11%, respectively (14). Among the respondents in non-net owning households who had heard of nets, reasons for not having a net were cost, lack of availability and the belief that nets are not necessary (14). Studies on ITNs possession, utilization in pregnant women and factors related to these issues were rare in the country and thus, this study described the status of possession, utilization and factors affecting these situations among pregnant women in Raya Azebo, Tigray region.

2. Literature review

2.1 Malaria burden among pregnant women

Malaria infection during pregnancy is a major public health problem in tropical regions throughout the world (15). In most endemic areas of Africa, pregnant women are the main adult risk group for malaria. The main burden of malaria infection during pregnancy results from infection with *Plasmodium falciparum*. Every year at least 30 million women in malarious areas of Africa become pregnant; most of these women live in areas of relatively stable malaria transmission (15, 16).

In unstable area, a pregnant woman is at risk of developing severe malaria about 2 to 3 times higher than that for non-pregnant women living in the same area for *Plasmodium falciparium* (17, 18). Maternal death may result either directly from severe malaria or indirectly from malaria-related severe anemia (17). *Plasmodium falciparum* infection during pregnancy is estimated to cause 75-200 thousand infant deaths each year (19).

Malaria has been estimated to contribute to 8% to 14% of all low birth weight (LBW) and 3% to 8% of all infant deaths in areas of Africa with stable malaria (19). In terms of its effect on mothers, malaria is estimated to cause 2% to 15% of maternal anemia, which is estimated to cause 7% to 18% of LBW. Severe anemia increases the risk for maternal mortality and malaria anemia is estimated to cause as many as 10,000 maternal deaths each year in Africa (19).

A mortality survey of rural under-five children conducted in Tigray revealed that 12% of deaths reported by families were due to

fever or malaria (20). This probably could be related to not taking febrile children to CHWs or heath institutions in time for treatments.

2.2 ITN as a malaria control Strategy

The national malaria prevention and control approach in Ethiopia employs early case detection and treatment, selective and sustainable vector control measures (including the use of ITNs, IRS, environmental management for vector control), prevention and control of malaria epidemics and giving more attentions on this to prevention of malaria during pregnancy (21). The main strategic framework for malaria control during pregnancy in WHO African Region includes intermittent presumptive treatment (IPT), ITNs and effective case management of malaria (16).

Taking in to account the disease burden and its consequences, the Roll Back Malaria (RBM) partnership was launched in 1998 by the WHO, UNDP, UNICEF and the World Bank to enhance global support, mobilize resources and build partnership to halve the malaria burden by 2010(22). Based up on the Abuja Malaria Summit, at least 60% of those at risk of malaria particularly young children and pregnant women were targeted to benefit from the best use of ITNs (17). Although there are prospects to such a goal, like the Global Fund to Fight AIDS, Tuberculosis and Malaria, what had been achieved in years was not encouraging (2, 15). WHO estimates that fewer than 10% of at-risk children and pregnant women in Africa regularly sleep under ITNs. Even where a larger proportion of households report owning a net, regular treatment with insecticides is rare (23)

In Ethiopia, distribution of ITNs through the health care delivery system was first introduced in returnee and resettlement sites in the Western part of the Tigray Region in 1997 through a cost recovery

scheme (24). In 1997-1998, ITNs were also distributed in Oromia, Amhara and Southern Nations, Nationalities, Peoples (SNNP) regional states with support of the WHO and Italian Co-operation (13). In 1999, 5.3% of households had at least one mosquito net although they had highly interested in using mosquito net, based on the baseline survey for the implementation of ITNs for malaria control in Ethiopia (25).

Unfortunately full cost of ITNs delivered through the commercial sector will be unaffordable to the vast majority of Ethiopian population at the current prices. It would cost USD 33 million to supply at least one ITN per household in target populations and employing a market segmentation approach targeting the most vulnerable group for free ITNs is important (13). ITNs are among the most effective tools at our disposal for reducing malaria transmission and mortality. The promotion of ITN use has become the central element of national and international efforts against malaria control (26). ITNs are a low cost, easily produced and practically weapon in the fight against malaria, if properly used and maintained they can reduce all causes of mortality in children by an average of 17% and the incidence of sever and mild malaria episodes by 45-48%(27).

Nets have been in use since very early times to protect people against different insects, including mosquitoes (28). Insecticide treated nets either kill or irritate the mosquitoes beyond being physical barriers (28). They serve as human baited traps when somebody is sleeping inside by attracting and killing mosquitoes and other biting insects (29). ITNs have to be treated regularly for maximal benefit. The commonest chemicals used are second and third generation synthetic pyrethroids (permethrine, flumethrine etc.) (28).

A trial in Kenya concluded that efficacy of nets is reduced if re-treatment with permethrine is delayed beyond six months (30). But other studies in Kenya showed that if untreated nets are used in a relatively good condition, they could still protect against malaria (31, 32).

ITN programme performance, more than other vector control methods, depends to a large extent on the acceptance and active involvement of individuals and communities (33). Communities should also be involved as much as possible in re-treatment issues, but there must be a lead organization to ensure that re-treatment is accessible to the communities and families most at risk, is done at the right time and achieves high coverage dosage (33).

2.3 Opportunities

The Government of Ethiopia is highly committed to strengthen the prevention and control activities of malaria in the country. The continued commitment and interest of RBM partners, the community and stakeholders is expected to bring in more resources and concerted efforts for the large-scale distribution of ITNs (13).The Millennium Development Goal (MDG) target 8 indicates to have halted by 2015 and begun to reverse the incidence of malaria and other major diseases and RBM partnership to halve malaria associated mortality by 2010 (34). Therefore, this global partnership gives due attention for high-risk groups to be supported with the necessary supplies in order to achieve the targeted goal.

2.4 Policies, tariffs and taxes regarding ITNs

The Heads of States or Representatives of 44 African countries assembled on 25 April 2000 in Abuja, Nigeria to approve a plan of action for controlling malaria. One of the specific steps was called for the removal of tariffs and taxes on ITNs and untreated nets packed with a single insecticide treatment and materials they are made from (35).

One way to encourage the use of ITNs, at least in the short run, is to reduce or remove tariffs and taxes on treated and untreated nets, netting materials, and insecticides (36). In the Abuja Declaration, African governments committed themselves to reduce or eliminate the tariffs and taxes imposed on mosquito nets, netting materials and insecticides, in order to help lower retails prices (37). Accordingly, Ethiopia has reduced two costume duties on ITNs from 10% to 5% as of January 2003 and exempted from value added Tax (VAT). Customs duty imposed on insecticide has been reduced from 15% to 10% since December 1997 and insecticide products are free of VAT (38).

According to the national stand on ITNs, Ethiopia will achieve at least 60% of pregnant mother and children less than 5 years of age to be covered 2 ITNs per household by the end of 2007 (13). Based on the policy of ITNs use in Ethiopia, it has been fully agreed and endorsed for free distribution and re-treatment of ITNs to children under five years of age and pregnant women living in targeted areas (13).

2.5 Possession, utilization and benefits of ITNs

ITNs reduce the overall risk of morbidity and mortality among pregnant women and their infants. A trial in the Gambia found that during the rainy season in villages where ITNs were used, the prevalence of malaria infections among pregnant women was lower and fewer babies were classified as premature (39). Further evidence from Kenya indicates during the first four pregnancies, women who were protected by ITNs at night gave birth to 25% fewer premature or small-for-gestation-age babies than women who did not sleep under ITNs (30).

A study conducted to assess the efficacy of ITNs in the prevention of mortality in young children in an area of high perennial malaria transmission in western Kenya indicated that the overall reduction in all causes of child mortality was 16% (40). Large-scale trials of ITNs conducted over two years period in various epidemiological settings across Africa reported a 15-33% reduction in all causes of child mortality (41). Properly used ITNs can cut malaria transmission by at least 50% (5, 42). During pregnancy ITN use provides significant protection against maternal anemia and low birth weight, major contributors of neonatal morbidity (42).

According to the study done in west Kenya, the impact of ITN on maternal and newborn health reveals that among gravidae of women 1 to 4 during pregnancy 38% of reduction in peripheral parasitemia, 21% of reduction in all cause of anemia (Hb <11 g/dl), 47% reduction in sever malaria anemia were seen. In addition to these at the time of delivery 35% of reduction in placenta malaria, 28% reduction in Low

birth weight (LBW) and 25% reduction in adverse birth out come were observed (43).

Regular use of ITNs can reduce malaria mortality by 20% and malaria incidence by 50% in children less than five years of age. When combined with early diagnosis and treatment, use of ITNs can reduce malaria mortality by over 50% (44). UNICEF's recent multiple indicator cluster surveys (MICL) revealed very low overall coverage of ITNs in Africa (20%), and of greatest concern, <1% coverage for young children (44). Among pregnant women, coverage with any net (treated or untreated) was less than 10% in three of the four countries for which recent data were available. Coverage with ITNs in the three countries (Malawi, Rwanda and Uganda) was even lower, at 3% or less. As countries accelerate efforts to control malaria during pregnancy, ITN coverage is expected to increase (44). Recently treated nets were most effective at preventing malaria and anaemia (prevalence of mild anemia was 68% compared with 82% for those with out nets (p=0.02); prevalence of malaria was 22% compared with 33% for those with out nets (p=0.02). The conclusion of this study was development of programmers for malarias control should include pregnant women as a specific target group in any countries with burden of malaria disease (45).

The protective efficacy of ITNs plus SP (sulfadoxine-pyrimethamine) on anemia was 55.8% (95% CI 30.6 - 71.8), of ITNs alone can prevent 41.6% (95% CI 9.8 - 62.3) (45). The study done in southern Tanzania reveals that the protective efficacy of ITNs in pregnancy for parasitaemia was 23 % (CI 2 - 41). Multiparous ITN users had a twofold decrease in parasite density compared with multiparious non-ITN users (626 parasites/micr. L vs. 1173

parasited/micr. L: p=0.01) (41). ITN had a protective efficacy of 12% against mild anemia and of 38% against sever anemia (<8g/dl) (45).

It was shown that a baby is twice as likely to be borne of low birth weight if the mother has an infected placenta at the time of delivery (all parities: 23% vs. 11%, primigravidae only: 32% vs. 16%), and that the probability of premature mortality of Africa new born in the first year of life is 3 times higher in babies of low birth weight than in those of normal birth weight (16% vs. 4.6%) (47). 5.7% of infant deaths in malarious areas could be an indirect cause of malaria in pregnancy (47). According to the Ethiopian Household Survey by Net Mark Ethiopia, 11% of households owned an ITN and 9% of the pregnant women slept under a net the day prior night (14).

ITNs coverage for Tigray Region based on the assumption of at least one ITN per household was about 33% in 2004/05 (48). In Serbo Town in Jimma, 23% of the nets available in the households were only used for malaria prevention and only 17% of the young children slept under a net (49). In the same study 69% of the nets were treated before six months of the survey time (41). Different donors like WHO, UNICEF, the GFATM and others delivered large amount of ITNs to prevent malaria. Thus, this study tried to elucidate the ITNs possession, utilization and identified the gaps that affect the possession and utilization of ITNs for malaria prevention in order to achieve the goals.

3. OBJECTIVES OF THE STUDY

General objective

Assess the level of ITNs utilization by pregnant women and identifying factors that affect its utilization, in Raya-Azebo District in Tigray Region.

Specific objectives

1. Assess coverage of ITNs in terms of possession among pregnant women.
2. Determine the proportion of pregnant women properly utilizing ITNs.
3. Examine the socio-demographic factors that influence the practice of ITNs use among pregnant women.

4. METHODOLOGY

4.1. Study area

The study was conducted in Raya-Azebo District in southern Zone of Tigray Region. The District is located at 120 kms south of Mekelle Town at an altitude of 1,459 to 1,888m above sea level, with a lowland (*Kolla*) climatic condition. The District is bordered by Alamata District in the south, Endamohoni and Ofla Districts in the west, Hintalo–Wajirat District in the North, Alaje District in the Northwest and the Afar National Regional state in the East (Figure 3).

The annual temperature ranges between 18 and 28^{o}C and the average annual rainfall is about 850 ml (50). The area of the District is estimated at 1767 Sq.Km with a total population of 122,573 (51% females) in 2005 (51). Of the total population of the District, 110,215 (89.9%) are living in rural areas and the rest reside in the towns (urban) located in the District. The District is administratively divided into 15 Kebeles (Tabias) with an average population of 8,172 in each Kebele. In this administrative District, there are 14 rural and 1 urban kebeles, and each kebele is further divided into 4 Kushets. Kushet is the lowest local administrative unit with an average population of 2043.

There was one health center, three nucleus health centers, four health stations and nine health posts in the District at the time of the survey. There were two private clinics in the District, 207 community health workers (CHWs), which includes community health agents (CHAs) 57, trained traditional birth attendants(TTBAs) 87 and community base reproductive health agents (CBRHAs) 63 have been

functionally deep in the community at the time of the survey. In addition to these, there were also 28 health extension workers and 95 different health professionals in the District. Some of the health extension health workers are performed their work in the Kebeles, though health posts in each kebeles are not yet constructed.

The type of health professionals in the District includes health officers, nurses, sanitarians, pharmacy technicians, laboratory technicians, midwife and health assistants. There was no malaria control laboratory technician separately at this moment; it was already integrated into the health system. There were three personnel responsible for malaria prevention and control in the District Health Office, but at health institution level malaria prevention and control has been integrated into the general health system. About 19,000 non-permanent treated nets were distributed to the communities in 2002/03 and 27,300 long lasting treated net were also distributed by the Regional Health Bureau in collaboration with other NGOs in 2005/06 (51). But based on the District Health Office assessment for ITNs coverage during house-to-house vaccination campaign in 2006, it revealed that 72% of the households had at least one ITN at home (51).

The District Health Office estimated that more than 44,500 ITNs were distributed to the community with in the last four to five years; though the average estimation of ITN at household level was one or above, it was not achieved due to different reasons.

According to the District Health Office, the major malaria control strategies in the District included vector control strategies by environmental management, ITNs utilization, and some times destruction of larvae were practiced by

application of burned oils ponds and by making ongoing surveillance and early and prompt treatment of case. In addition, health education has been also used as a tool for creating awareness to the community about malaria prevention.

Almost all kebeles of the District are malarious. The 2005/06 annual report of the Raya-Azebo District Health Office indicated that most important health problem were malaria, acute respiratory infection, intestinal parasitosis, diarrheal diseases, eye diseases, and gastritis (51). Malaria was responsible for 52.4%, 84.6%, and 90% for OPD, admission and deaths in the District, respectively and accounted to be one of the leading causes of morbidity and mortality (51).

It was also revealed that there were both endemic and epidemic situations in the District at different times. This could be associated with the availability of mosquito breeding sites and suitable climatic conditions favoring malaria transmission. There were about 6,356 ponds constructed in the last three years (2003/04 -2005/06) in the District (50) and these could be by far increased the risk for the occurrence of malaria in the areas. Coverage and utilization of ITNs by pregnant women for malaria control were assessed in Raya-Azebo District from 20 May through 3 June 2006. The study was carried out during the "Belgi" transmission season that follows a minor rainfall during February to April.bbbbb

4.2 Study design

A community-based cross-sectional household survey was conducted during in May and June 2006. The study used both quantitative and qualitative research methods.

4.3 Source population

The source (eligible) population included all households with at least one pregnant women residing in the District.

4.4 Study population

Quantitative study:

Randomly selected households with pregnant women in the District at the time of the study were the study population. Quantitative data was collected using a pre-tested interviewer-administered questionnaire.

Qualitative Study:

A total of four focus group discussions (FGDs) were held among men household heads, CHAs, community leaders and pregnant women to complement the quantitative data.

4.5 Sample size determine

The required sample size was calculated using a formula for a single population proportion. It was calculated considering the coverage of pregnant women using the net in three of the four countries (Benin, Malawi & Uganda) of Africa based on malaria report of 2003(45). Assuming that 10% of the pregnant women in the study area were using ITNs for malaria prevention, using 3% marginal error at 95 % confidence level ($Z\alpha/2=1.96$) generated a minimum sample size of 384 pregnant women for the study. Since the study was based on multistage stratified sampling method, adjusting the design effect by a factor of 2 and a 10% non-response rate, the minimum desired sample size for the study was 845 pregnant women.

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

$$n = \frac{(1.96 \times 1.96) \times 0.1(1-0.1)}{(0.03 \times 0.03)} = 384$$

Where: n = the number of pregnant women to be interviewed,

d = degree of marginal error

$z^2\alpha/2$ = standard normal distribution curve for 95% CI which is 1.96.

p = the possible assumptions of ITN uses in pregnant women

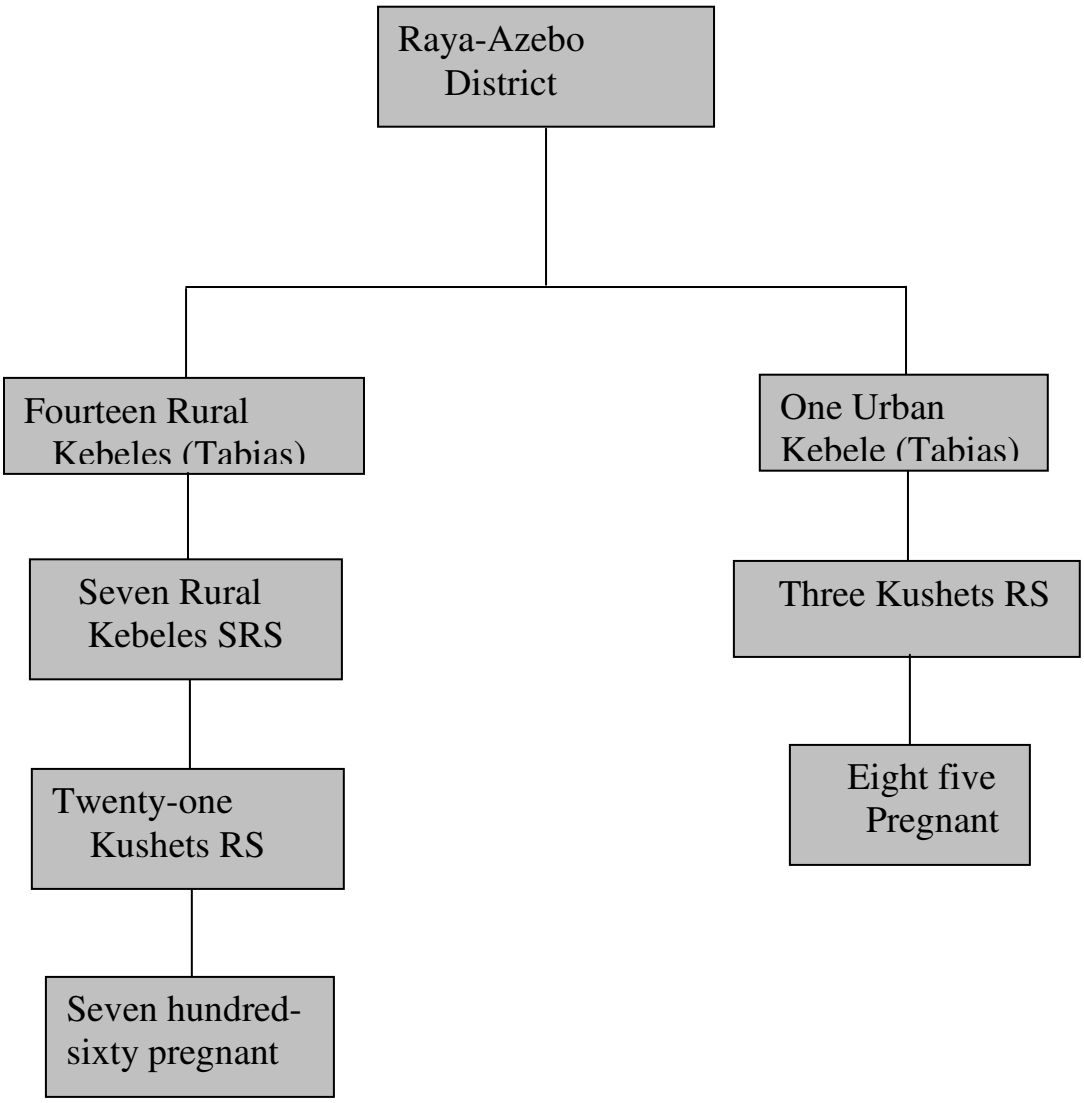
Therefore, [(384 x 10%) + 384)] x 2 = 845

4.6. Sampling procedures

Among 15 Kebeles in Raya-Azebo District, one urban and seven rural kebeles were included in the study.Since the town has only one kebele, it was decided to be included in the study and three Kushets were randomly selected for the study. The 14 rural kebeles were first grouped into seven pairs depending on their geographical proximity and each pair was given a number. From each pair, one kebele was selected using random sampling to make a total of seven rural kebeles to be included in the study.

There were 32 total Kushets in both rural and urban selected kebeles. From each of the selected kebeles, three Kushets were randomly selected (Figure 1). Kushet is a subdivision of kebeles, which consisted 2-4 villages. CHAs, mainly the TTBAs were given training on how to identify the pregnant women using obvious clinical symptoms what they knew before. Checklist which consisted, date, kebele, kushet, and village where the pregnant residing, name of the pregnant woman, the name of the data collector were also used during a census. Before data collection, censuses for pregnant women were done by CHAs in each household of the selected Kushets, to identify the pregnant women. Identification the households with pregnant women were carried out by making a Census of all households in the selected Kushets. This was done in the selected Kushets. Consequently, the total sample size determined for the study was distributed to all the selected Kushets proportionate to the number of pregnant women identified in each Kushet, and study participants were finally selected using simple random sampling method.

Figure 1: Sampling frame of households



Key note: SRS - means simple random sampling.

RS – means random sampling

Inclusion criteria:

- Randomly selected households, with pregnant women who lived more than a year in the area, after making the censuses households in the randomly selected villages were involved in the study. The reason for selection of women living more than a year for the study was due to an assumption of expressing by the women about the actual perception and utilization the ITNs.

Exclusion criteria:

- Pregnant woman who came from other places due to migration or temporarily residing in the area in search of jobs or labor works were excluded from the study.

4.7. Data Collection

The variables that were explored by both the FGDs and the questionnaire focused on socio-demographic factors like educational level, marital status, income, availability of radio, etc that determining the possession and utilization of ITNs, the cause and symptoms, methods of prevention malaria. The participants were also asked their preference for distribution, re-impregnation and their desire to the use of ITNs in the future.

4.7.1. Quantitative Study

A pre-tested structured Tigrigna (local language) questionnaire comprising 64 items was developed for the study. The questionnaire was originally prepared in English and then translated into Tigrigna and then back to English to ensure its consistency. The questionnaire included information on socio-demographic characteristics of the women, malaria, ITNs possession, use and awareness about the re-impregnation issues. Pre-test was done in a Kebele that was not selected for the study. Minor modifications were made on some questions depending on the findings of the pilot testing.

Twenty-eight CHAs (especially trained traditional birth attendants) in the selected areas and the data collectors including the supervisors were trained for one and two days on how to use the questionnaire, and administered it to the women using Tigrigna version, respectively. In addition, the principal investigator and two health workers from the District Health Office supervised the data collection. The data collectors were familiar with the study area, the language and the culture.

Malaria is locally called "*Holeta*", and people describe the disease as "*Holeta*" when symptoms such as fever, headache, joint pain and general body discomfort are manifested on a person. Data collectors were exposed to fill at least two questionnaires for making pretest before starting of the actual data collection. Early in the morning, each pregnant woman and her children under-five were visited to observe the actual practice with regard to the utilization of ITNs, and during the daytime revisiting each pregnant woman collected the remaining data. The two supervisors daily supervised the data collection process.

Every day completed questionnaires were checked for clarity, consistency and completeness both by the supervisors and principal investigator.

4.7.2 Qualitative Study

Qualitative data were collected from four FGDs. The number of participants per FGD ranged from six to twelve people and the participants were purposively selected with the help of the local community leaders. A FGD guide was used to direct the discussants during the FGDs, which were moderated by the supervisors in Tigrigna language, note was taking by the principal investigator and Tape recording also carried out by one of the supervisors.

The purpose of this assessment was to explore and understand perceptions and practices related to malaria among pregnant women. The discussion focused on the extent of malaria burden, method of prevention, beliefs and practices of ITNs, identification of malaria risk group, priorities given to pregnant women by the community in the use of ITNs and preference for the mechanisms of distributing ITNs.

4.8 Data quality assurances

Data collectors were trained properly, a pre-test the questionnaire before the actual collection in one kebeles out of the study areas and questionnaires were also checked for consistency and completeness on a daily basis by the supervisors and principal investigator. Any incorrectly filled or missed ones were sent back to the respective data collectors for correction in time.

4.9 Operational definitions

Insecticide treated net_ Mosquito nets treated with into insecticides in order to prevent and/or kill mosquitoes (avoiding of bites human).

Utilization _ Individual practiced the ITNs, it means a pregnant women who has used the night before the survey day and assured by direct observing of the bed net hanging over the sleeping areas of the pregnant woman can be considered as utilization.

Knowledge _ Assessment of what the individual pregnant women knows about malaria and its prevention.

Attitude _ Assessment of the predisposition to respond in favor or unfavorable towards ITN utilization.

Practice _ Assessment of respondents by direct observation what they actual ITN practice during this study period.

Prevalence_ Number of malaria cases identified by verbal autopsy during the study period.

Pregnancy _ *A* woman who has obvious clinically identified as pregnancy by the trained traditional birth attendants.

Possession _ *the* pregnant women who owned at least one ITN during the survey of households.

District or Woreda _ Administrative unit with a population of about 122,000.

Kebeles or Tabias – The administrative unit just below the District with an average population of about 8,000.

Kushet – The local name for the lowest administrative unit with an average 2000 of population.

4.10 Data analysis

Quantitative data were entered, cleaned and analyzed using SPSS version 10.0. Analysis was done using 95% confidence interval, P-value and presented in frequencies tables, and proportions. Multiple logistic regressions were used in order to identify the association between variables. The FGD was carried out in Tigrigna and supported by note taking and tape recording during the discussion from each FGD. The qualitative data was transcribed manually from audio taped records and field notes and then translated in to English. Data were aggregately presented for each FGD in order to generalize their perception and behavior towards the use of ITNs. Results were analyzed manually and written summarizing the ideas forwarded by all focus group discussants.

5. Ethical consideration

Ethical clearance and approval was obtained from the Department of Community Health at the Faculty of Medicine (Addis Ababa University). Both written and verbal permissions to undertake the study were also obtained from Tigray Regional State Health Bureau, Raya-Azebo District Administration and District Health Office. Informed verbal consent was obtained from the study households and the study participants prior to the interview after explaining the purpose of the study. Data collectors informed the respondents about the confidentiality of any information provided by them. The participants were interviewed on a voluntary basis and also well oriented by data collectors to the extent of not accepting to give responses, and were encouraged them to be honest as much as possible during the course of the survey.

6 RESULTS

6.1) General information

Out of 12,576 total visited households during the census, 871 (6.9%) households with pregnant women were identified. Eight hundred forty-five households were visited during the survey; of these women 815(96.4%) of visited households had been responded during data collection. Of the remained 26 pregnant women, 5 of them were delivered, 19 of them were not at home due to some social events, and 2 of them were gone to health institutions due to sickness. About 480(59%) visited households possess ITNs.

6.2) Socio-demographic characteristics of the study population

A total of 815 (96.4%) of the expected respondents were interviewed, of which 738 (90.6%) and 77(9.4%) from rural and urban areas, respectively. The highest proportion (50.4%) was within the age group of 20-29 years and the least proportion (12.9%) being 15-19 years old. The median age was 26 years, ranging from 15 to 48 years and the mean age of the respondents was 26.8 $\pm$ 6.3(SD). About 92% (n=749) of the respondents were married and 66(8.1%) were single (Table 1). The majority, 530 (65%), of the respondents were followers of Orthodox Christian religion, followed by Muslim (34.7%) and others (0.2%). Regarding the educational status of the pregnant women and the husbands, 521(63.9%) and 472 (64.7%) were illiterate respectively, and the remaining of both sexes were literates. The literates group were slightly higher in both sexes in urban than the rural one. Only 22(2.7 %) of the pregnant and 32 (4.4%) of the husbands were grade nine or above.

Assessment of the occupation of the pregnant women and the head of the household revealed that 716(87.9%) and 600(82.2%) of them were housewives and farmers, respectively (Table 1). About 49 % (n=399) and 39% (n=321) of the respondents were estimated their monthly income of 100-500 and less than 100 ETB (Ethiopian Birr) respectively and only 95(11.7%) said that their monthly income on average was greater than 500 ETB.

Table 1: Socio-demographic characteristics of pregnant women's in Raya-Azebo District, Tigray, 2006

Variable		Rural, n(%)	Urban, n(%)	Total, n(%)
Residence		738 (90.6)	77(9.4)	815(100)
Age of the pregnant women				
15 - 19 years		93(12.6)	12(15.60)	105(12.9)
20 - 29 years		369(50)	42(54.5)	411(50.4)
≥ 30 years		276 (37.4)	23(29.9)	299(36.7)
Educational status of the pregnant women	Illiterate	486(65.9)	35(45.5)	521(63.9)
	Literate	252(34.1)	42(54.5)	294(36.1)
Marital status of the pregnant women				
Married		683(92.5)	66(85.7)	749(9.9)
Not married		55(7.5)	11(14.3)	66(8.1)
Religion of the pregnant women				
Orthodox		459(62.2)	71(92.2)	530(65
Muslim		277(37.5)	6(7.8)	283(34.7)
Occupation of the pregnant women				
Housewife		659(89.3)	57(74)	716(87.9)
Other		79(10.7)	20(26)	99(12.1)
Educational status of spouse				
Illiterate		436(65.8)	36(53.7)	472(64.7)
Literate		227(34.2)	31(46.3)	258(35.3)
Occupation of head of house holds				
Farmer		593(89.4)	7(10.4)	600(73.6)
Other		70(10.6)	60(89.6)	130(17.8)
Monthly income of household in Birr				
≤ 100		284(38.5)	37(48.1)	321(39.4)
100 – 500		367(49.7)	32(41.6)	399(49)
> 500		87(11.8)	8(10.4)	95(11.7)
Living rooms	Single	626(84.8)	52(67.%)	678(83.2)
	≥ 2	112(15.2	25(32.5)	137(16.8)

Sixty percent (489) and 37.7% (307) of the pregnant women were in their third and second trimester of gestational age, respectively. Six-hundred-eighty seven (84.3%) of them were multigravdae and 467(57%) of the pregnant women were attended at least once for ANCs in health institutions in the current pregnancy (Table 2).

The average (±SD) family size of the studied households was 4.45 (±1.89). The mean number of rooms and beds or sleeping places for the households was 1.2 (±0.45) and 1.7 (± 0.65) per households, respectively.

The mean number of children under five years of age per the interviewed woman was 1.3± (0.51). The mean (±SD) number of nets per household was 1.17 (±0.38) (Table 2). The male household participants age and educational level of the focus group discussants, were in the range of 26 to 40 years and grade one to six respectively; while the community leaders were also 24 to 38 years and able to read & write up to grade five, but the pregnant women age and educational level that participating in this discussion were 17 to 35 years and illiterate to grade two. The majority of the participants were come from rural areas.

Table 2: Reproductive history of pregnant women's in Raya-Azebo District, Tigray, 2006

Variable		Rural, n(%)	Urban, n(%)	Total, n(%)
Gestational age				
1st trimester		18(2.4)	1(1.3)	19(2.3)
2nd trimester		279(37.7)	28(36.4)	307(37.7)
3rd trimester		441(59.8)	48(62.3)	489(60)
Gravidae				
Primigravida		108(14.6)	20(26)	128(15.7)
Multigravida		630(85.4)	57(74)	687(84.3)
Take ANC at least once for the current pregnancy				
Yes		415(56.2)	50(64.9)	465(57)
No		323(43.8)	27(35.1)	350(43)
Family size (n =815)	≤ 4 Families	386(52.3)	54(70.1)	440(54)
	> 4 Families	352(47.7)	23(29.9)	375(46)
Children <5 years (n=643)				
1		424(71.1)	40(85.1)	464(72.2)
2		164(27.5)	7(14.9)	171(26.6)
3		8(1.4)	0	8(1.3)

6.3) Knowledge, attitude and practice about malaria and mosquitoes

All residents in the study area commonly used the local term "*Holeta*" for malaria. Almost all respondents had ever heard of malaria and about 92% of them recognized that malaria was one of the major heath problems of the community. Of the total 815 respondents, 778 (95.5%) knew that malaria could be transmitted from one person to another; only 37(4.5 %) didn't believe the transmissibility of the disease. Concerning the mode of transmission for malaria, 735(94.5 %), 409(52.6 %), 278(35.7 %) and 199(25.6 %) respondents believed that malaria is transmitted by the bite of mosquitoes, through physical contact with malaria patient, by eating stalk of maize or sorghum and exposure to cold, respectively. Most respondents 768(94.5%) recognized that mosquitoes bred in the stagnant water and swampy areas. However, 511(62.9 %) and 114(14 %) said that mosquitoes bred in running water or on the soil, respectively.

Pertaining to the knowledge of the respondents about the methods of malaria prevention, 528(64%) reported that using ITNs in combination with other vector control measures could be applied to prevent malaria and 120 (14.7 %) were believed that malaria is only one prevented by indoor residual spraying of the houses (Table 3). The pregnant women involvement in environment management for the prevention and control of malaria was found to 76.4%.

Table 3: Knowledge of the respondents on malaria transmission, mosquito breeding sites and prevention methods in Raya-Azebo District, Tigray, 2006

Variable	Rural, n(%)	Urban, n(%)	Total, n(%)
Malaria transmissible (n=815)			
Yes	704(95.4)	74(96.1)	778(95.5)
No	34(4.6)	3(3.9)	37(4.5)
Mode of malaria transmission by (n=778)			
Eating of stalk of Maize/Sorghum	246(34.9)	32(43.2)	278(34.1)
Working in the sun day	68(9.7)	6(8.1)	74(9.1)
Exposing to cold	186(26.4)	13(17.6)	199(24.4)
Drinking dirty water	135(19.2)	7(9.5)	142(17.4)
Physical contact with malaria patient	382(54.3)	27(36.5)	409(50.2)
Bite of infective mosquitoes	663(94.2)	72(97.3)	735(90.2)
Living near ponds	696(94.7)	72(93.5)	768(94.2)
Mosquitoes breeding site *(n=815)*			
On the soil	105(14.3)	9(11.7)	114(14)
In running water	439(59.7)	72(93.5)	511(62.7)
Stagnant water	696(94.7)	72(93.5)	768(94.2)
Method of prevention			
ITN and one or more of the following	485(65.7)	43(55.8)	528(64.8)
IRS(Indoor residual spraying)	107(14.5)	13(16.9)	120(14.8)
Cleaning the surroundings	37(5)	5(6.5)	42(5.2)
Clothing windows & doors at night	32(4.3)	5(6.5)	37(4.5)
Uses of ITNs	34(4.6)	0	34(4.2)
Use of curtains	18(2.4)	7(9.1)	25(3.1)
Draining of collected water	20(2.7)	3.(3.9)	23(2.8)
Take tablets	5(0.7)	1(1.3)	6(0.7)

*Total percent may exceed 100% due to multiple responses

The most frequently mentioned malaria symptoms were fever 788 (96.7%), rigor 761(93.4 %), headache 707(86.7 %), chillness 687(84.3 %), loss of appetite 540(66.3 %), general body weakness 497(61 %), and vomiting 493(60.5 %). Regarding to the knowledge of the women about antimalaria drugs, 661(83%), 488 (61.3%) and 297(37.3%) mentioned Fansidar, Chloroquine and Coartem, respectively. Locally for Fansidar and Chloroquine they directly mentioned these names properly, but for Coartem they described as "*Cortem*". Fansidar was known slightly more in rural than urban women, while the Coartem was better known by the urban women than the rural once. As to their attitude on treatment seeking behaviour, 525(64.4%) preferred to go to CHAs, followed by public health facilities 266(32.6 %) and private pharmacy or clinics 19(2.3 %) (Table 4). But, their preference differed from rural to urban, the rural women were more preferred to go to CHAs, while the urban preferred from health institution.

About 200(24.5 %) of the pregnant women reported that they had had a history of malaria attack after the conception of the current pregnancy; of whom, 10% reported that they had an attack of malaria within the past two weeks before the survey. Of these, 48 (56.5%), 32 (37.7%) and 5.8% sought treatment from public heath institutions, from CHAs and used traditional remedies, respectively (Table 4). But all women who lived in urban and were sick due to malaria with in the past two weeks of the survey were treated at health services. The treatment given by the CHAs was the first level of treatment and provided Fansidar till the patient reaches to the health institution. Actually nowadays the drug recommended for pregnant women and children less than five kg body weight, the first line treatment, is oral quinine.

Table 4: Knowledge about the symptom of malaria, anti-malaria drugs and immediate preference of health services for malaria treatment by pregnant of Raya-Azebo District May 2006.

Variable		Rural, n(%)	Urban, n(%)	Total, n(%)
Knowledge of Signs & Symptoms of malaria				
Fever		712(96.5)	76(98.7)	788(96.7)
Chillness		620(84)	67(87)	687(84.3)
Rigor		691(93.6)	70(90.9)	761(93.4)
Headache		637(86.3)	70(90.9)	707(86.7)
Vomiting		439(59.5)	54(70)	493(60.5)
Body weakness		441(59.5)	56(72.7)	497(61)
Loss of appetites		484(65.6)	56(72.7)	540(66.3)
Knowing anti- malaria drugs				
Chloroquine		427(59.4)	61(79.2)	488(59.9)
Fansidar		601(83.6)	60(77.9)	661(81)
Coartem		254(35.2)	44(57.1)	298(36.6)
Preferences of first treatments				
CHAs		520(70.5)	5(6.5)	525(64.4)
Health Institutions		196(26.6)	70(90.6)	266(32.6)
Private pharmacy		17(2.3)	2(2.6)	19(2.3)
Traditional healers		5(0.7)	--	5(0.6)
Number of family members sick from malaria during the preceding two weeks period (n = 815)	None	614(83.2)	56(72.7)	670(82.2)
	1	81(11)	16(20.8)	97(11.9)
	2-5	43(5.8)	5(6.5)	48(5.8)
History of malaria illness during the current pregnancy at any time				
Yes		177(24)	23(29.9)	200(24.5)
No		561(76)	54(70.1)	615(75.5)
Malaria sickness of pregnant women in the past two weeks	Yes	68(9.2)	17(22)	85(10.4)
	No	670(90.8)	60(78)	730(89.6)
Sources of treatment for malaria illness in the past two weeks				
Drug taken from Public HI		31(45.6)	17(100)	48(56.5)
Drug taken from CHAs		32(47)	---	32(37.6)
Traditional healers and others		5(7.4)	---	5(5.9)

6.4) Knowledge, attitude and practice about ITNs possession

As shown in Table 5, the majority of the respondents 757(92.9%), had ever heard about mosquito net. Concerning the sources of information, about mosquito net, 707(93.4%), 220(29%), 155(20.5%) were from health workers, governmental officials (local administrations), and radio, respectively. Four hundred and eighty-one (59%) households had ITNs. The possession of ITNs was relatively more in rural (59.5%) than urban (54.5%).

Regarding the number of ITNs possession per household, 398(48.8 %) had only one and 82(10.2%) households had two nets at the time of survey. One hundred-sixty one (33.5%) of those who had ITN was having long lasting treated net and the remaining 320(66.5%) were having treated net but not long lasting treated. Table 5 shows that, of those who possess the ITNs, 374(77.8 %) had got their net freely and the rest 21.2% had bought it with minimum cost recovery, from the government through health stations or health posts.

Ninety percent of the households who owned ITNs for the first time acquired their nets within the past three years. Only 42(8.7%) of the pregnant who owned ITNs were also acquired their nets more than three years ago. Since 2002/03, ITNs were initially supplied through collaboration of the Regional Health Bureau and the District local government with a cost-sharing scheme (15 Birr per ITNs) through social mobilization, but latter on the government in collaboration with other NGOs supplied it freely.

There were 835 under five children identified through the survey. Based on the observation about the actual utilization of ITNs during the survey, the proportion of the pregnant women and children under-

five who slept under ITNs during the night preceding the survey was generally 281(34.5%) and 302(36.2%), respectively. But out of those who possessed ITNs, about 58.4% of the pregnant were utilized (Table 5). Among those who possess ITNs, Women in the urban were by 19% more utilized it than the rural residence. The main reasoned out by the pregnant women for not using the ITNs, were due to their believing of not main malaria transmission period and giving priority to their husband. The average number of months that women slept under mosquito nets through out her life was almost 12 months.

Table 5: Knowledge about ITNs, its possession, and utilization by pregnant Women in Raya-Azebo District, Tigray My 2006.

Variable	Rural, n(%)	Urban, n(%)	Total, n(%)
Ever heard about ITNs (n = 815)			
Yes	690(93.%	67(87)	757(92.3)
No	48(6.5)	10(13)	58(7.1)
Source of information about ITNs (n = 757)			
Health worker	646(93.5)	62(92.5)	707(93.4)
Governmental officials	169(24.5)	51(76.1)	220(29.1)
Radio	145(21)	10(14.9)	155(20.5)
Newspaper	84(12.2)	12(17.9)	96(12.7)
Poster	77(11.2)	9(13.4)	86(11.4)
ITNs possession status (n = 815)			
Yes	439(59.5)	42(54.5)	481(59)
No	299(40.5)	35(45.5)	334(41)
Number of nets owned per household (n = 481)			
1	366(83.4)	32(76.2)	398(82.7)
2	73(16.6)	10(23.8)	83(10.2)
Is your net long lasting net? (n=481)			
Yes	149(33.9)	12(28.6)	161(33.5)
No	290(66.1)	30(71.4)	320(66.5)
Duration of the previous ITN owned			
< 12 months	249(56.7)	19(45.2)	268(55.7)
12 – 24 months	57(13)	16(38.1)	73(15.2)
25 – 36 months	90(20.5)	2(4.8)	9219.1)
≥ 37 months	43(9.8)	5(11.9)	48(9.9)
Payment of ITNs			
Free supplied	343(78.1)	31(73.8)	374(77.8)
Paid /Bought	92(21)	10(23.8)	102(21.2)
Didn't recall	4(0.9)	1(2.40	5(1)
Ever slept under ITN(n = 815) Yes	428(58)	42(54.4)	470(57.5)
No	310(42)	35(45.6)	345(42.5)
Pregnant women slept under ITN in the previous night(n=481)			
Yes	249(56.7)	32(76.2)	281(58.4)
No	190(43,3)	10(23.8)	200(41.6)
< 5 years children slept under ITNs in the previous night (n=835)			
Yes	273(35.3)	29(46.8)	302(36.2)
N o	500(64.7)	33(53.2)	533(63.8)
Utilization rate as calculated from total (n = 815)	249(34)	32(41.6)	281(34.5)

About 73% of the respondents were having the knowledge about the re-impregnation of nets. With regard to the nets re-impregnation and washing pattern, 306(95.6%) and 217 (38.5%) reported that their nets were re-impregnated and washed their nets at different times before the survey, respectively. Regarding to the time of using the ITNs by the family, 313(65 %) them was recognized that they used every day through out the night. This related to knowledge of proper utilization by them (Table 6).

Those who didn't have ITNs during the survey were asked the main reasons why they didn't possess it, and 228(68.3 %) of them reported lack of access to ITNs. Ninety (26.9%) of the non-users were also believed that ITNs couldn't prevent malaria (Table 6). Lack of access to ITNs were more in urban than in rural women's.

Of those households who didn't have ITNs at the time of survey, about 77.8% of them had a desire to have and use it in the future. The rest 22.2% of the women still didn't have desired to have and use ITNs in the future.

Table 6: Knowledge, practice about re-impregnation nets and reasons for not owning of ITNs by household in Raya-Azebo District, Tigray My 2006

Variable	Rural, n(%)	Urban, n(%)	Total, n(%)
Ever heard about re-impregnation of nets			
Yes	528(71.5)	65(84.8)	593(72.8)
No	210(28.5)	12(15.6)	222(27.2)
Ever re-impregnated the net (n = 320)			
Yes	276(95.2)	30(100)	306(95.6)
No	14(4.8)	0(0)	14(4.4)
Time of using ITNs			
Every day through out the night	286(65.1)	27(64.3)	313(65.1)
Every day only half of the night	8(1.8)	5(11.9)	13(2.7)
Some times	145(33)	10(23.8)	155(32.2)
Reasons for not owning ITNs (n = 334)			
Lack of access to the net	196(65.50)	32(91.4)	228(68.3)
Nets didn't prevent malaria	89(29.8)	1(2.9)	90(26.9)
Didn't know the reason	14(4.7)	2(5.7)	16(4.8)
Duration after the last re-impregnation of the net(n = 306)			
3 – 6 months	43(15.6)	5(16.7)	48(15.7)
6 – 11 months	230(83.3)	25(83.3)	255(83.3)
$\geq$ One year	3(1.1)	--	3(1)
Nets ever washed			
Yes	186(36.3)	31(59.6)	217(38.5)
No	326(63.7)	21(40.4)	347(61.5)
Need to use ITNs in the future (n = 334)			
Yes	209(69.9)	34(97.1)	243(77.8)
No	90(30.1)	1(2.9)	91(27.2)

6.5 Findings from the FGDs

6.5.1 Perception about the magnitude of malaria and its impacts

Malaria was identified by all the participants of the FGDs as one of the major health problems affecting the community. The peak occurrence of the disease highly coincided with the harvesting season of the year during September to December, and caused great loss on the household income according to the majority of the discussants. The participants further elaborated that the impact of the disease was disastrous and led to stay-on bed with out active participation in the routine activities such as farming or harvesting, resulting in incapacitation and death if effective treatment was not sought.

Although the participants perceived malaria as the most common health problem particularly during September to December, they also expressed that its prevalence could also be high following the short rainy season (i. e., *Belgi*) during April to June. One of the male households whose age of 40 years came from Mechare kebele expressed as follows:

"*May through July, 2005 a major malaria epidemic was seen; even the District health workers were unable to control it in time. After the community observed those who used ITNs well and were not affected by malaria, majority of the community were developed a desire to have ITNs to overcome that problem".*

He added that despite all these problems, "*the mortality was very low, because the health workers provided the new drug to the community and health education to eradicate the mosquitoes breeding sites and disturbed the growth larvae in the ponds.*"

The discussants were put their speculations that the cause of the epidemic was due to the collection of rainwater in the recently constructed ponds that favored mosquito breeding.

6.5.2 Major methods of prevention and control of malaria

Almost both sexes involved in the FGDs mentioned that draining, filling and clearing of the breeding places for mosquitoes could prevent malaria. It could also be prevented by indoor residual spraying of houses by insecticides and this method was cited as the best of all methods for prevention and control of malaria to their beliefs, besides to these methods, currently introduced a new method of prevention the so called using ITNs or sleeping under treated nets. But majority of the community as well as our belief is to spray of residential houses by insecticides, they rationalized in the way that "*the spray was not only preventing malaria, but also it kills many insects like fleas, flies, bedbug and even snakes*", said by 36 years of community leader.

Almost all the discussants also mentioned that developing (constructing) ponds within the proximity of the residence of the community increased the number of mosquito breeding sites, and hence increased malaria incidence too. Though the majority of the discussants appreciated the benefits of using ITNs to prevent malaria, the number of the participants who resisted or opposed the use of ITNs for malaria prevention and control was high. One of the women FGD participants expressed her views as follows:

"*A single ITN could be used only by few members of the family, but not serve the whole family, because some family members might pass the night out of home to protect the crops from wild animals*". She added, "*That is why part of the community still resist using ITN and requested the local government to continue indoor residual spraying*".

Other male participant expressed or described strongly "*Indoor insecticide spraying could protect the whole members of the family if they slept in the sprayed house. But a bed net could only prevent mosquito bite for those who slept under it and yet the nets were not enough in number to cover the whole family*". He added that, "*the government should either continue to spray the house as usual or distribute adequate number of ITNs for family members to prevent malaria*".

6.5.3 Practice towards ITNs possession, use and re-impregnation

The District Health Office distributed ITNs to the community for the first time as a cost-sharing scheme three or four years back in small scale and the majority of the community were not willing to buy and use it.

The discussants reported that though the health workers, CHAs and community leaders had given health education to the community about the benefits and advantages of ITNs, strong resistance from the community was frequently encountered. The main reasons were being the cost of the nets at initial time. Almost the majority of the community believed that if ITNs were not used, the government might reconsider to do the indoor spraying.

The discussants added that, latter on after the community faced to the epidemic of malaria and observing that those households possessing and proper utilized ITNs were safe from malaria attacks, majority of the community can trust on ITNs utilization for prevention of malaria. Although the number of ITNs were not enough to cover the whole community, free distribution of nets could further increased the desire to possess and use nets. According to the discussants expression though ITNs were distributed to the community, it was not

enough in number to cover the whole community. There was only one ITN even in those who had got the net at household; therefore it couldn't cover the whole family to protect them from the bite of mosquitoes.

There was also another problem related to the proper utilization and handling of the ITNs at household level. One male discussant explained about the use of the nets as follows:

"I have five people in my family and have three ITNs for the last four years by re-impregnating and proper handing it, I had never observed any harm from it and therefore didn't spend any cents for malaria treatment with in the last four years. In addition to this I didn't loss-working time due to malaria illness. But before that time I lost a lot even in one season due to malaria though there was frequently spraying of houses." He added his view that, "*When I took the net from the health center, not only my neighbors but also my wife was considered me as abnormal for the money I spent on it."*

The four groups were also asked about the identification of risk groups from the communities to malaria disease. All of the participants except two individual were agreed that women and children were considered to be risk to malaria illness and its severity.

One female discussant explained that "*The supplies of ITNs to the community from the Government were not adequate and equity to all Kebeles of the District, therefore it should not be continued in such way for the future".* She extended her suggestions *"Some community leaders distributed the ITNs to their family members and to their intimate individuals rather than providing in the fair way to all".*

The participants were asked whether the community give special focus for the pregnant and children to prevent from malaria or not.

The discussants pointed out that, even though women and children were considered as a risk, practically they concluded that pregnant women were not given particular emphasis to use ITNs. One discussant from the CHWs, reported that as "*To talk reality we as a community health agents didn't give especial focus in giving health education to the community to make attentions on ITNs utilization for pregnant women, even giving priority for our wife to use ITNs in a continuous pattern was low.*"

6.5.4 Major challenges in ITNs possession and utilization in the community, particularly to pregnant women

In the study sites, ITNs have better acceptance than before, but inadequate in supply of it. The method of distribution was not well convenient, the distribution was mainly based on the health institution, Kebeles, community leaders and on a fixed day, one pregnant discussant reported," *Some of the community leaders and health workers make discrimination during mosquito ITNs distribution, it was up to their personal relation to supply the net, but it doesn't mean to all of them".*

Shortage of insecticide to re-impregnate in time, all of the discussant appreciates the re-impregnation process. They have also mentioned that before the day of re-impregnation, the local administration and CHAs making announcements to the societies to wash and make ready the available nets that should need to re-impregnates. But the major challenges that have been faced for possession and utilization of ITNs to the community according to them were the health education was not given in sustainable way, inadequate integration of health system with associations as well as with other sectors like agriculture and educations in this issues, in adequate Kebeles political administration

support to CHAs in allocating time for health education, tendency of the community to give priority for indoor spraying rather than to ITNs and less attention to pregnant women for possessing and utilizing ITNs by majority of the community.

Suggestions to improve continuous possession, uses and re-impregnation ITNs

According to the discussants view, the possession and utilization of ITNs in the community in general and in pregnant women in particular needs to improve in the area of three categories with respect to their rolls. These are:

1. The Government: -

· Supplies like the ITNs and KOTabs used for re-impregnation should increase as much as possible.

· When an epidemic a raised, the government should also take an appropriate action like indoor spraying by insecticides and so on.

· Should do continuous assessment of the distribution of ITNs and proper utilization by the communities.

· The District Administration should enforce to the Kebeles political leaders to create suitable ground for CHAs to give health education.

2. District health office and CHAs: -

They should create integrated activities with the social associations like women, youth, farmers associations and Agricultural office up to the local village level.

Net distribution should be carried out through community health agents in a continuous manner rather than in a fixed place and period.

Health education should be mainly focused on giving priority of the community to pregnant women and children to use ITNs for prevention of malaria.

CHAs as whole TTBAs in particular give adequate advices to the pregnant, since they have better chance of communication with them.

3. Community: - the community has to accept the education given by the health professional, CHAs and community leader concerning to ITNs possession and proper utilizations. In addition to this the male householder should need to increase their role of participation on ITNs possession and utilization to the pregnant women.

Determinants of possession and utilization of ITN

Among the crucial determinants explored regarding ITNs possession, education of the pregnant women and the head of the households, marital status of the women, average monthly income of the household, having functional radio, gravidity of the pregnant women , number of living rooms, and/or family size were found to be significantly associated with net possession (Table 7). Literate rate of the pregnant were 2.7 times (95% CI 1.9, 3.9) more likely to possess the ITNs compared to the illiterate one. After adjusting these variables, the pregnant women without functional radio at household were 0.6 times (95% CI 0.4, 0.8) less likely to possess than those who had radio at the time of the survey. Mulitgravidea women were 2.2 times (95% CI 1.2, 3.9) more likely to possess the nets than the primgravidea.

Those households in which they had greater than or equal to two rooms were about 1.6 times (95% CI, 1.03, 2.6) more likely to possess ITN than those who had less rooms (Table 7). In addition to this household with more than four family size were also had 1.5 times(95% CI 1.05, 2.3) more likely to possess than those who had less or equal to four families.

Table 7: Association between Socio-demographic factors with ITNs possession in Households, in Raya-Azebo District, Tigray, May/June 2006

Variables		Possessed ITNs		Odds Ratio (95 % CI)	
		Yes	No	Uni variant	Multi variant
Age	15 -19 years	56	49	1.00	1.00
	20 – 29 years	241	170	1.4(0.9, 2.2)	0.56(0.3, 1.1)
	≥30	184	115	1.13(0.8, 1.5)	
Education of pregnant	Illiterate	271	250	1.00	1.00
	Literate	210	84	2.3(1.7, 3.1)*	2.7(1.9, 3.9)*
Marital status of the pregnant	Married	451	298	1.00	1.00
	Not married	30	36	0.55(0.3, 0.9)*	0.7(0.2, 2.3)
Occupation of the Pregnant	Housewife	423	292	1.000	1.00
	Others	57	43	94(0.6, 1.4)	0.6(0.3, 1.4)
Education Of Head HH	Illiterate	264	208	1.00	1.00
	Literate	169	89	1.49(1.1, 2.1)*	1.1(0.7, 1.5)
Occupation of the HH	Farmer	349	251	1.00	1.00
	Other	84	46	1.3(0.9, 1.9)	1.1(0.6, 2)
Average monthly income of HH	≤ 500 Birr	414	306	1.00	1.00
	> 500 Birr	67	28	1.77(1.1, 2.8)*	1.45(0.9, 2.4)
Radio of HH	Possesses	173	85	1.00	1.00
	Lack of possess	308	249	0.6(0.5, 0.8)*	0.55(0.4, 0.8)*
Gravidity	Primigravida	58	70	1.00	1.00
	Multigravida	423	264	1.9(1.3, 2.8)*	2.2(1.2, 3.9)*
Residence	Urban	42	35	1.00	1.00
	Rural	439	299	1.2(0.8, 1.96)	1.7(0.9,3.5)
Living room	Single	385	293	1.00	1.00
	≥ 2 room	96	41	1.8(1.2, 2.6)*	1.6(1.03, 2.6)*
Family size	≤ 4	237	203	1.00	1.00
	> 4	244	131	1.59(1.2, 2.1)	1.5(1.05, 2.3)*

* Statistically significant at $p<0.05$

Among the potential determinants explored concerning ITN utilization by the pregnant women, educational status of the pregnant, possession of radio, and residence were found to have significant. When controlling for confounders educational status maintained its significance. The literate pregnant women were 3.2 times (95% CI 1.9, 3.9) more likely to utilized ITN compare to the illiterate once (Table 8).

Table 8: Association between Socio-demographic factors with ITNs Utilization in the previous night in Households, in Raya-Azebo District, Tigray, May/June 2006. R-First

Variables		ITNs utilization		Odds Ratio (95 %, CI)	
		Yes	No	Uni variant	Multi variants
Age	15–19 yrs	30	26	1.00	1.00
	20-24 yrs	140	101	1.3(0.7, 2.4)	2(0.8, 5.5)
	≥30	111	73	1.1(0.7, 1.6)	1.2(0.7, 1.9)
Educational	Illiterate	127	144	1.00	1.00
Of pregnant	Literate	154	56	3.1(2.1, 4.6)*	3.2(2, 5)*
Marital status	Married	263	188	1.00	1.00
	Not married	18	12	1.1(0.5, 2.3)	0.3(0.04, 2)
Occupation of the	Housewife	242	182	1.00	1.00
Pregnant	Others	39	18	1.6(0.9, 2.9)	3.5(0.8, 14.7)
Education	Illiterate	145	63	1.00	1.00
Of Head HH	Literate	106	119	1.4(0.9,2)	0.9(0.6, 1.5)
Occupation of the	Farmer	195	154	1.00	1.00
HH	Other	56	28	1.6(0.9, 2.1)	0.7(0.3, 1.3)
Average Income	<500 Birr	237	177	1.00	1.00
	≥500 Birr	44	23	1.4(0.8, 2.5)	1.2(0.7, 2.3)
Radio	Possesses	114	59	1.00	1.00
	Lack of possess	167	141	0.6(0.4,0.9)*	0.7(0.5, 1.2)
Gravidity	Primigravida	33	25	1.00	1.00
	Multigravida	248	175	1.07(0.6,1.9)	0.7(0.3, 1.7)
Residence	Urban	32	10	1.00	1.00
	Rural	249	190	0.4(0.2, 0.8)*	0.4(0.2, 1.08)
Living room	Single	220	165	1.00	1.00
	≥2 room	61	35	1.3(0.8, 2.1)	1.3(0.7,2.2)
Family size	≤4	144	93	1.00	1.00
	>4	137	107	0.8(0.6,1.2)	0.8(0.5, 1.3)

7. DISSCUSION

The findings of this study suggest that awareness about malaria, its mode of transmission, and mosquito as a cause for malaria among pregnant women was high. All respondents heard about malaria. This is similar to the study that revealed 99% in Uganda (37)**.** About 92% of the respondents noticed that malaria is one of the major health problems of the community; the participants of the FGDs who expressed the impact of malaria on the community to performing their agricultural activities also confirmed this. The knowledge of the respondents about the transmission of malaria by mosquito bites in this study almost does not have any more difference with baseline survey for the implementation of insecticide treated mosquito nets in malaria control in Ethiopia which was 93% (25)**;** but higher than in Bungoma District Kenya, which was 63% (52).

The knowledge of symptoms of the respondents was very high, no significant differences in urban and rural settings were observed. Almost 97% identified fever as a major symptom for malaria. The community health agents treating malaria clinically in the area also taking fever as a proxy for the disease, especially during the transmission seasons. They knew it from their own experiences and as well as from health education given by the health professionals. Studies in Uganda also show that, 71% the study participants mentioned fever as a main symptom of malaria (53).

Knowledge about the stagnant water as a major breeding site of mosquitoes is higher by about 11% compared to the baseline survey of January to February 1999 (25). Majority of the respondents were also identified children and pregnant women as the most vulnerable

group to malarial infection, this is also substantiated by the focus group discussants.

About 65% of the study participants knew the use of ITNs and one or more of other measures to prevent from malaria attack; this is by far higher than the baseline survey, which was 15.4 % (25). The gap between the present finding and the baseline studies might be due to the period of studies, in which the baseline was carried out just before seven years and different social mobilizations and health education have been carried out by the government after it and this could be increased the awareness of the community about ITNs.

Of all anti-malarial drugs, sulfadoxine-pyrimethamine (Fansidar) was well known by the respondents (83%). This could be due to the provision of the drug by CHAs for a long period within the community. About 64% of the pregnant women were preferred to be first visit or treated by the CHAs when the member of family was sick due to malaria and this is also very much higher than the baseline survey which was only 0.1%. The possible reason for this could be due to the availability of anti-malaria drug just near to their residence for a long period and could also be in access to the health institutions.

Net possessions by households with pregnant women were fifty-nine percent (59%), but the over all ITNs possession of households of the District Health Office profile shows 72% (51). There is a discrepancy between the finding of the survey and the District profiles, possibly the community might transfer or sold the ITNs to other third persons. But this study is higher than the household baseline survey, which revealed 12.9% possessed the mosquito net (25). The ITNs coverage in Tigray Region for at least one per household (38.2%) (54), which was almost similar to this study; but the possession of

ITNs in this study is lower than the same study done in Kafta-Humera District, which was 85.5% (55). The possible reason for the difference between these two studies could be due to the awareness of the community and duration of net distribution in respect to each District. IN Kafta-Humera District net distribution were started since 1997 and the experiences of the refugee returnees from Sudan who resided in the areas after the Dergi regimes fallen down; but in Raya-Azebo distribution was started 2002/03.

The ITNs possessions in Raya-Azebo District are more than the study on Net and ITNs conducted in 2004 by Net Mark, Ethiopia in 1000 households from five urban sites: Bahr-Dar, Adama, Dessie, Dire-Dawa and Awasa which revealed that 11% of households owned at least one ITN, (14)**.** Possible rationally for increment of ITNs possession in the present study area might be due to attention given by the Regional Health Bureau to scale up the ITNs coverage in the District in collaboration with GFATM, the District Health Office and District Administration to over come the occurrence of malaria epidemic in the area, and also the time of the study.

In this study, ANC attendance was not associated with possession and utilization of ITNs for the pregnant women. This implies that the health workers who were working in MCH might not give more attention for the pregnant women to use ITNs or might not particularly integrated the malaria prevention strategies to MCH activities.

Educational status of the respondents has significant association with possession of ITNs; the literate group was 2.7 times (95% CI 1.9, 3.9) more likely to possess the ITNs compared to the illiterate one. This is also similar to the study done in Serbo town that revealed those who were educated mothers had more nets than those who didn't

have any education (49). This means those women who were educated could have a better information or understanding about the ITNs. In addition to this, pregnant women with multigravida were twofold more likely to possess ITNs than the primigravida. Possible reason for increased in gravidity to possess the ITNs could be their repeated exposures to health institutions for medical care as well as for MCH services, and might access to health education or information about the advantage of ITNs.

But the pregnant women not having functional radio were 45% less likely to possess the ITNs than those who have functional radio. This study is similar to studies done in Kafta-Humera which revealed that those respondents who have radios had possessed nets (2.6 times more likely) (55). This means that the pregnant women who have a functional radio at home have better chance to possess ITNs than those who didn't have it; this could be due to getting information about the ITNs that passes through this media. Therefore the community needs to encourage having radio at household level for gaining more information about their own health.

Those households who have more than or equal to two rooms were about 1.6 times more likely to possess ITNs than those who have only one room. This could be more related to their wealth that means for having more rooms might be due to having better resources at household level and made them to posses ITNs than the poor households. In addition to this those household with more than four families had about 1.5 times more likely to possess than those having a family size of less than or equal to four families, this could be the households with lower families might be the new established married

family with low knowledge and experienced to ITNs than those with more families who might had a better chance to information about it.

ITNs possession in the study areas for at least two at household level was only 10.2%. This indicates that the majority of the communities don't have adequate ITNs at household level for prevention of malaria, and usually from observations the farmers also pass their night time in farming site to keep their crops from wild animals and thus one ITN might not enough to prevent the families from malaria. According to the Ethiopian FMOH, Malaria control unit current profile about the actual ITNs distributed, it revealed that country coverage in terms of two per household is 40.7% (56), and thus this study shows by much lower than the National coverage of distribution, but more than the Ethiopia DHS survey of 2005 data which was only 10.1%(57). It also lowers than the survey in Kafta-Humera that had at least two ITNs (71.1%) per household (55).

Sixty-eight percent (68.3%) and twenty-seven percent (26.7%) of reasons for not having ITNs at household level for those who didn't have at the time of survey was in-access of the ITN and lack of trust on ITNs respectively. Comparing to the reasons for not had the net in the base line survey, lack of trust to net was 19.6 % (25), and this study shows slightly higher. This may indicate that more than a quarter of those who didn't have ITNs at the time of survey were due to misconceptions about the benefits of ITNs**.** The FGD were also revealed that the lack of adequate ITNs in the District and the strong desire of the community to the indoor residual spraying contributed to become low ITNs possession. Since the indoor residual spraying had been used for a long period in the areas and believed that it also used not only kills mosquitoes but could also to all other insects like louse,

flea, and bedbug in their houses, the community has desired to continue it. Therefore, this by itself might have its own contribution to have low ITNs in their house.

The mean ITNs and room possession per households in the District during the study period was (1.17 $\pm$ 0.36) and (1.2 $\pm$ 0.45), respectively. Numbers of ITNs were lower than the number of children under five years of age (1.17 $\pm$ 0.36 versus to 1.3 $\pm$ 0.51) in the District. This could indicate that including all other member of the family with respect to the availability of ITNs in each household is not enough to protect from mosquito bite.

The average ratio of high-risk groups (children < 5 years and pregnant women) to ITNs was 3.6:1, and the ratio of household member to ITNs was 7.9:1. This suggests that the average number of ITNs in the household would typically not sufficient to cover all residents, and the high-risk groups. However; the assumptions couldn't allow for sharing of beds and ITNs between adult and children as a whole. The reason may be inadequate distribution of ITNs in the areas.

According to the data collected by direct observations during the survey, some ITNs were simply stored at home without any use. Of the nets that should need to re-impregnate, ninety-six percent (95.6%) were re-impregnated with necessary insecticides and could be enough to bring adequate killing effect on the targeted vectors. The re-impregnated coverage of nets for the Tigray Region for the same year was eighty-five percents (85.4%) (54), this shows that the re-impregnation rate in the District was about 10% higher than the average Regional performance. This could be due to the occurrence of malaria epidemics in the District just a year back of the survey; which

makes people to give more attention for re-impregnation. Pyrethroid-impregnated bed nets reduce man –vector contact by acting as a physical barrier and by repelling mosquitoes, driving them out of house, also offers some protection for others sleeping for the same room, even if they are not sleeping under the ITNs (53,58).

Of the treated nets, almost all of the nets were treated within the last 12 months, so this corresponds with the Roll Back Malaria definition of an ITN. The coverage of re-impregnation of nets may also decrease mosquito density and contributes against clinical attack of malaria in the study area. Households who do not possess a radio are not fortunate group to own ITN in the area; this could be due to poverty of the family or could be due to negligence's. Therefore, in the future, distribution of the ITNs will be mainly focus to those who are unprivileged portion of the families. In the FGD, particularly the participants of the pregnant of focus group discussants were expressed that not only the shortage of the ITNs but also the distribution of the ITNs were not fair, some Kebele leaders were provided the ITNs mainly to their family and to those who have better intimate with them. Continuous evaluations about the distribution pattern of ITNs for target groups can effectively reduce this inequality.

At the time of the study, only 36.2 of the under five children slept under ITNs the night before the date of survey. The proportion of pregnant women who slept under ITN during the night preceding a survey was only about 35%. This finding is higher than the study done on Net and ITN conducted by Net Mark that revealed 6% of pregnant slept under an ITN the prior night (14). The possible reason for the increases of ITNs utilization in the study area could be the distribution of ITNs to the community following the epidemic of malaria that was

seen in May to July in 2005 in the District**.** But lower than the study done in southern Tanzania, which revealed that ITN use in pregnant women was 53% (45). In addition to this, it is also lower than the Abuja target.

In the Abuja Declaration African heads of states had agreed to achieve at least 60% coverage of pregnant women and children under five years of age, insecticide treated mosquito nets and other materials to prevent infection and suffering by 2005(17). The possible reasons for the declined use of ITNs in the District compared to the above two reference could be due to late introduction of the strategies in the areas, resistance by the families to the new initiatives, desired to create a pressure on the Government to continue the already adopted indoor insecticide spraying, lack of sufficient knowledge on ITNs and in adequate supplies of the net to the community.

This was strengthening by the participants of FGD of the four groups. According to the malaria section head of the District, the cost recovery scheme of bed net supply initiative established in the District since 2003/2004 by Regional Health Bureau and District Health Office may contribute that people could have a negative attitude on ITNs due to the price of it. His suggestions extended, at that time, the local government as well as the Regional Health Bureau had an intention to enforced not to make any spray in the areas, instead making intensive and sustainable health education on utilization of the new initiatives to community, so that ITNs could be available by purchasing from the community cost subsidizing collected money of the District Health.

Educational status of the pregnant women was significantly associated to utilization of ITNs. The literate pregnant women were threefold more likely to utilize ITN compare to the illiterate once. The

FG discussants were also mentioned that one of the strategies, which can be improved for the possession, and utilization of ITNs by the pregnant women is continuous health education through different means. Generally, the studies showed that economical, social and behavioral factors such as, educational status, poor access to ITN, lack of radios at household level is the barriers for possessing and utilizing ITNs.

This study gives some clues or issues to understand the status of ITNs possession and utilization by pregnant women for the control of malaria in the study areas. Even though, the proportion of pregnant women who had not heard about ITNs was not considerable (7%), the proportion of pregnant women who owned ITNs among who had heard about it was only 59%. This shows there is a large gap, which exists between those who have heard about ITNs (93%) and those who owned it and between those who possessed and used ITNs appropriately.

8. STRENGTH AND LIMITATION OF THE STUDY

Strength of the study

- The study mainly focused on one of the most voluntary portion of the population.
- Direct observation was carried out to check the actual behavior of the study population with regard to ITNs coverage and utilization.
- The study was carried out during one of the transmissions seasons.
- It includes both the rural and urban areas for making internal comparison of the ITNs possession and utilization.
- The study was carried out after few months of the long lasting treated net distribution to the community and so it can give us important information.

Limitation

• The pregnant women, who were not clinically perceived by the TTBAs, were no directly included during the study period.

• It is difficult to clearly know whether the determinant or the outcome occurred first.

• It didn't include the direct blood smear and other hematological investigations for identifying the level of maternal risk association to malaria.

- In adequate of in-depth interview

9. CONCLUSION

The awareness of the pregnant women about malaria and ITNs in the study areas showed a promising result. But there is a gap between the awareness and possession, between the knowledge and utilization of ITNs in both rural and urban areas. More than 58% of the study population in the District possesses ITNs, but the proportion of the pregnant women who slept under ITN during the night preceding the study period was found to be low. Almost all of the pregnant women who had not long lasting treated net in the District were re-impregnated their net once within a fiscal year to have adequate killing effect on the targeted vectors.

Educational level, gravidity, radio possession, number of living rooms, and family size had direct effect in possession of ITNs in the study population. The important factors that influence for the utilization of ITN in the study areas were educational level of the pregnant women. There was inadequate ITN distribution in the areas, besides to that the distribution way made some dissatisfaction for a portion of the community. It didn't achieve to the core indicator of the Roll back malaria set in Abuja framework. The study also showed that there was no any association in both possession and utilization of ITNs between those pregnant women who attended or not the antenatal care.

RECOMMENDATION

In order to improve or increase the coverage of ITNs possession and utilization, the following important actions should be carrying out in the future.

• The educational level of the community, particularly the pregnant women should be improved through strengthening of girl's enrolment to education and through enhancement of the illiteracy campaign by making sustainable communication to all sectors, especially to Ministry of Education.

• Continuous mobilization/health education about the use of ITNs to the community leaders, the community as a whole and the pregnant women in particular is required.

• The health professional assigned to work in MCH should be needed to train about the risk of malaria illness during pregnancy and also will need to set a strategy to integrate the ITNs distribution with other ANC services.

• Attention should be given during ITNs distribution through the community leaders.

• Adequate availability of ITNs in the community should be assured by the government in cooperation with other NGOs and its distribution should be carry out in a sustainable way by the community health workers and health extension workers.

• The effectiveness of the insecticide within the treated net should be monitored to identify resistance status and the vector behavior in general

• Attention should be given to the risk groups, means to pregnant women and children by the community, and this can be achieved through sustainable education to all portions of the societies.

In conclusion, the possession and proper utilization of ITNs of pregnant women at the time of survey was very low compared to the Abuja target and the risk of malaria burden in the area. By improving the awareness, attitude and practice of the community on ITNs, the problem of malaria in pregnant women will be alleviated. In addition to this, supplies of both the ITNs and insecticides for re-impregnation can be strengthening. This may contribute to the success of malaria control strategies in the country.

References

1) World Health Organization Expert Committee on Malaria, Twentieth Report, WHO, Geneva, 2000.

2) Garner, Brabin.B, A review of randomized controlled trials of routine antimalarial drug prophylaxis during pregnancy in endemic malarious areas. Bulletin of the WHO 1994,72(1): 89-99.

3) UNICEF, Malaria, a major cause of child death and poverty in Africa, 2004. www.unicef.org/publication/index-19019.html (Accessed Oct. 20, 2006)

4) WHO/Malaria control: the power of integrated action. www.who.int/heli/risks/vectors/malariacontrol/en/index8.html (Accessed on Nov 4. 2006)

5) Federal Democratic Republic of Ethiopia Ministry of Health: Malaria Diagnosis and Treatment Guidelines for Health Workers, 2nd edition 2004; 1- 2.

6) Planning and Programming Department, FMOH, Health and Health related Indicators, MOH, 2004/05; PP 41-42.

7) Assefa Nega, (1993): Malarious areas determination in Ethiopia, www.uhcr.org/horne/RSDCOI/4657a184.pdf (Accessed Nov 2006)

8) Tulu AN. Malaria:In Kloos H and Zein AZ(ed).The Ecology of Health and Disease in Ethiopia.Boulder, Westeview Press. 1993:341-352

9) Gebremariam N. Malaria: In Zein ZA, Kloos H(eds). The Ecology of Health and Disease in Ethiopia. Addis Ababa 1988; 136-150.

10) Ministry of Health. Malaria control profile, Addis Ababa. , March 2002.

11) Health Management Information System Division, Planning and Programming Department, Tigray Health Bureau, Tigray Health profile, 2004/2005

12) Raya Azebo District Health Office, Malaria annual Report,Tigray,2004/05.

13) FMOH, Ministry of Health: Insecticide-Treated Nets (ITNs) National Strategic plan for going to scale up with coverage and utilization in Ethiopia, 2004-2007, Aug, 2004.

14) Net mark: Summary of Ethiopia House holds survey, 2004

15) Roll Back Malaria, (2000): Malaria in pregnancy

htt://Www.rbm.int/cmc upload/0/000/015/RBMInfosheet 4.htm (Accessed on Oct. 28 2006).

16) Strategic frame work in malaria during pregnancy in the WHO Africa Region, Geneva, World Health Organization, (Initial draft; in press) 2003.

17) The African summit on Roll Back Malaria, Abuja, Nigeria 25 April, 2000 (document WHO/CDS/RBM/2000.17.

18) Drs Paola Marchesini and Jane Crawley, Reducing the burden of malaria in pregnancy, Roll Back Malaria Department,World Health Organization,Genevahttp://www.who.int/malaria/rbm/Attachment/20040713/MeraJan2003.pdf (Accessed on Oct. 2006).

19) Steketee RW, Nahlen BL, Parise ME, Menendez C,. The burden of malaria in pregnancy in malaria-endemic areas. Am J Trop Med Hyg , 2001, *64:* 28–35

20) Alemayehu T., Ghebreyosus T.A., Witten KH., Bosman Andrea, Teklehaimanot A.,Community-based malaria control programme in Tigray Regional State, North Ethiopia: Results of a mortality survey of rural under-five children. Ethiop.J.Health Dev. 1998; 12(3):203-211

21) FMOH, (2004): Insecticide-Treated Nets (ITNs): National Strategic plan for going to scale up with coverage and utilization in Ethiopia, 2004-2007.

22) The Roll Back Malaria Partnership: Lunched 1998 by WHO, UNICEF and World Bank. http://www.rbm.who.int (Accessed Nov. 2, 2006).

23) Mukelabai K. RBM technical resource on ITNs. RBM Technical Resource Network News 2000;2:1. http://www.who.int/bulletin/archives/en/80(11)892.pdf (Accessed Nov, 2006)

24) WHO A Review of Program Setup, Activities, Outcomes and Impact: The community-Based malaria control program in Tigray, northern Ethiopia:, 1999,WHO/CDS/RBM/99.12

25) Jima D, Tesfaye G, Deressa W, Woyessa A, Kebede D, Alamirew D., Base line survey for implementation of insecticide treated mosquito nets in Ethiopia, Ethiop J.Health Dev. 2005; 19(1): 17-23

26) Frederick M. &Jacqueline A. Sleeping arrangements and mosquito net use among under-fives: results from the Uganda Demographic and Health Survey, 2003; 2(4)

27) Roll Back Malaria, (2000): Malaria in pregnancy accessed on Oct. 28 2006. htt://Www.rbm.int/cmc upload/0/000/015/RBMInfosheet 4.htm (Accessed Oct 28, 2006).

28) Roozendaal A. Vector control methods for use by individuals and communities, WHO, 1997.

29) Curtis C, Mnzava A. Comparison of house spraying and insecticide-treated nets for malaria control. Bulletin of the WHO .2000; 78(12): 1389-1399.

30) Kulle i et al perimetrine treated bed nets reduce malaria in pregnancy in an area of intense perennials malaria transmission in Western Kenya. American Journal tropical Medicine and Hygiene 2003; 68(4): 50 - 58

31) Clarke S, Bogh C ,Brown R, Pinder M, Walraven G, Lindsay S. Do untreated bed nets protect against malaria? Transactions of the Royal Society of Tropical Medicine and Hygiene. 2001; 95:457-62.

32) Mwani T, Ross A, Marsh K, Snow W. The effects of untreated mosquito nets on malaria infection and morbidity on the Kenyan coast. Transaction of The Royal Society of Tropical Medicine and Hygiene. 2003;97:369-72.

33) Tony Stewart &Merchand P,(2000): Factors that affect the success and failure of Insecticde-Treated Net Programs for malaria control in SE Asia and the western Pacific.http://www.who.int/malaria/cmc upload/0/000/016/301/itn.r62.pdf (Accessed on July 25,2006)

34) WHO & UNICEF, World Malaria Report, 2005

35) The Abuja Declaration and the Plan of Action An Extract from The African Summit on Roll Back Malaria, Abuja, 25 April 2000 (WHO/CDS/RBM/2000.17)http://www.afro.who.int/malaria/publications/section6.pdf (Accessed Oct,2006)

36) Jonathan L. Simon, Bruce A. Larson, Alexandar Zusman & Sydney Rosen : How will the reduction of tariffs and taxes on insecticide-treated bed nets of affected household purchase? Bulletin of the WHO, 2002; 80(11): 891-899

37) Roll Back Malaria: Insecticide-Treated Mosquito Nets, 2002 htt://www.rbm.who.int (Accessed on Aug. 4,2005)

38) FMOH, Ministry of Health, Malaria Control profil on ITNs status in Ethiopia, Nov, 2006

39) Alessandro v et al. The impact of a rational impregnated bed net program on the out come of pregnancy in primigravdae in the Gambia Transaction of the Royal Society of Tropical Medicine and Hygiene, 1996,90(5): 487-492

40) Philips-Howard P, Nahlen B, Kolczac M, Hightower A ,Ter Kuile F, Alaii J. Efficacy of permethrin treated mosquito nets in the prevention of mortality in young children in an area of high perennial malaria transmission in western Kenya. American Journal of Tropical Medicine and Hygiene. 2003;68 (4 suppl): 23-29

41) Dallo D, Cousens S, Cuzin-Ouattara N, Nebie I, Ilboudo-sanogo E, Esposito F. Child mortality in a West African population protected with insecticide treated curtains for a period of up to 6 years. Bulletin of the World Health Organization .2004; 82(2): 85-91.

42) Nahlen B, Clarc J, Alnwick D. Insecticide treated mosquito nets. American Journal of Tropical Medicine and Hygiene, 2003; 68(4): 1-5.

43) Alaii J, Hawley W, Kolczac M , Ter Kuile F, Gimnig J, Vulule J. Factors affecting use of permethrin–treated mosquito nets during a randomized controlled trial western Kenya. American Journal of Tropical Medicine and Hygiene.2003;68(4 suppl): 149-60.

44) The Africa Malaria report-2003, Malaria during pregnancy, 2003., htt://www.afro.who.int/amd-2003/main repor.pdf. Microsoft (Accessed Oct. 2006)

45) Marchant T.,.Schellenberg J.A,: Socially marketd insecticide-treated nets improve malaria and anaemia in pregnancy in southern Tanzania. Tropical Medicine & International Health, Feb. 2002; 7(2): 149-158

46) Njagi,J.K., Magnussen, P. ,Estambale, B. ,Ouma,J. and Mugo, B. prevention of anemia in pregnancy using insecticide-treated bednet and sulfadoxine –perimethamine in a highly malarious area opf Kenya: a randomized control trial . Transaction of the Royal Society of Tropical Medicine and Hygiene, 2003;97(3): 277-282

47) Guyatt,H.L. and Snow,R.W: Malaria in pregnancy as an indirect cause of infant mortality in sub –Sahara Africa . Kenya Medical Research Institution/Welcome Trust Collaborative Programme, Nairobi, Kenya, and the Center for Tropical Medicine, University of Oxford, John Radcliffe Hospital. Transaction of the Royal Society of Tropical Medicine and Hygiene,2001;95(5):569-712

48) Tigray Regional Health Bureau Annual Report of, 2004/05

49) Getachew S., Assessment of use of insecticide treated mosquito net and factors affecting it in Serbo Town, Jimma, MPH Thesis A.A.U, (unpublished), 2005.

50)Raya-Azebo District, Agriculture Office Annual report and Metrological Profile, 2006.

51) Malaria Section of Raya-Azebo District Health Office profile and Annual repot of 2005/06

52) Mary J. Homel, Amos Odhacha, Jacqucline M. Roberts & Michael S. Deming : Malaria control in Bungoma District, Kenya: a survey of home treatment of children with fewer, bed nets use and attendances clinic, Bulletin of WHO the international Journal of public Health 79 (11) 2001, 1005-1092

53) Net Mark: Baseline Survey on Insecticide-Treated Materials (ITMs) in Uganda May, 2001.
http://www.netmarkafrica.org/Research/quantitative/UgandaQuan2001.PDF

54) Tigray Regional Health Bureau: Annual activity report, 2005/06

55) Haileslassie B., Assessment of Insecticide Treated Nets Coverage for Malaria control in Kafta-Humera District, Tigray, MPH Thesis, A.A.U, (unpublished) April, 2006

56) FMOH, Malaria Department: Need and gap analysis of ITNS by sources in Ethiopia, Nov, 2006

57) Central Statistical Agency, Ethiopia Demographic and Health survey, preliminary report, Addis Ababa, Ethiopia MEASURE DHS, 2005

58) Bermejo A. and Vecken H.: Insecticide –impregnated bed nets for malaria control, a review of the trial: WHO, Bulletins OHS 70(3), pp 292-296.

Appendix I SPSS OUTPUT

Multiple logistic regressions for total ITNs possession

Variables in the Equation								
Variables	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**95.0% C.I.for EXP(B)**	
							Lower	**Upper**
AGGRP			3.469	2	.177			
AGGRP(1)	-.587	.364	2.603	1	.107	.556	.273	1.134
AGGRP(2)	-.300	.192	2.443	1	.118	.741	.509	1.079
GRPEDCPR(1)	.999	.188	28.311	1	.000	2.716	1.880	3.925
GPDMARIT(1)	-.322	.594	.294	1	.588	.724	.226	2.323
GRPOCPHW(1)	-.537	.439	1.502	1	.220	.584	.247	1.380
GRPEDCHH(1)	.070	.184	.142	1	.706	1.072	.747	1.538
GRPOCPHH(1)	.142	.301	.224	1	.636	1.153	.640	2.078
AVIGRP(1)	.370	.253	2.132	1	.144	1.447	.881	2.377
FUNRAD(1)	-.600	.188	10.170	1	.001	.549	.379	.793
NPRGRP(1)	.774	.304	6.481	1	.011	2.168	1.195	3.935
RESIDEN(1)	.560	.358	2.439	1	.118	1.750	.867	3.533
GRPDLIVR(1)	.497	.237	4.397	1	.036	1.643	1.033	2.614
FMSGR(1)	.432	.193	4.980	1	.026	1.540	1.054	2.250
Constant	-1.123	.734	2.339	1	.126	.325		

a Variable(s) entered on step 1: AGGRP, GRPEDCPR, GPDMARIT, GRPOCPHW, GRPEDCHH, GRPOCPHH, AVIGRP, FUNRAD, NPRGRP, RESIDEN, GRPDLIVR, FMSGR

Multiple logistic regressions for total ITNs utilization

Variables in the Equation								
	B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**95.0% C.I. for EXP(B)**	
							Lower	Upper
AGGRP			2.282	2	.320			
AGGRP(1)	.741	.490	2.282	1	.131	2.097	.802	5.482
AGGRP(2)	.160	.248	.420	1	.517	1.174	.723	1.908
GRPEDCPR(1)	1.177	.227	26.765	1	.000	3.244	2.077	5.065
GPDMARIT(1)	-1.297	1.013	1.640	1	.200	.273	.038	1.990
GRPOCPHW(1)	1.251	.733	2.910	1	.088	3.493	.830	14.702
GRPEDCHH(1)	-.070	.235	.089	1	.766	.932	.588	1.479
GRPOCPHH(1)	-.416	.367	1.288	1	.256	.660	.322	1.353
AVIGRP(1)	.241	.307	.615	1	.433	1.272	.697	2.323
FUNRAD(1)	-.295	.228	1.682	1	.195	.744	.476	1.163
NPRGRP(1)	-.368	.444	.688	1	.407	.692	.290	1.652
RESIDEN(1)	-.926	.496	3.484	1	.062	.396	.150	1.047
GRPDLIVR(1)	.236	.280	.707	1	.400	1.266	.731	2.192
FMSGR(1)	-.200	.254	.621	1	.431	.819	.498	1.346
Constant	-.806	1.147	.494	1	.482	.447		

a Variable(s) entered on step 1: AGGRP, GRPEDCPR, GPDMARIT, GRPOCPHW, GRPEDCHH, GRPOCPHH, AVIGRP, FUNRAD, NPRGRP, RESIDEN, GRPDLIVR, FMSGR.

Appendix II

QUESTIONNAIRE

Assessment Of Determinants and the level of Impregnated Treated Net (ITN) Utilization On Pregnant Women, at Raya-Azebo Wored

Questionnaire Number.....

House Number.....

These questionnaires are used to collect necessary information's about the ITNs utilization of pregnant women's and Factors Affecting it in Raya Azebo Woreda. Hello, my name is..... . I am one of the data collectors on the study with the above topic. I would like you to cooperate in answering the questions that follow. The information you will provide contributes to measures that are taken to prevent & control malaria, particularly in pregnancy. Any information you provide will be confidential. You have the right not to participate inthe study.

Response of the pregnant woman to the interviewer advises for the involvement of the interviewing process: a) volunteer b) refusal c) unavailable

Kebele(Tabia)_____ Kushet(Vilage)_____

(1) Socio- demographic characteristics of the household.

No	Questions (characteristics)	Responses	
1	Residence	1 – Urban 2 – Rural	[__]
2	Age in years	_____	[__]
3	Marital status	1. Married 2. Single 3. Divorced 4. Widow 5. Separated	[__]
4	Are you the head of the household? (If yes, skip to Question No 7)	1. Yes 2. No	[__]
5	Occupation of head of the household	1. Farmer 2. Government employee 3. Craftsman 4. Merchant 5. Retired 6. Private work 99. Other specify _____	[__]
6	Educational status of head of the household	1. Illiterate 2. Read and write 3. 1 to 4^{th} grade 4. 5 to 8^{th} grade 5. Above 9^{th} – 12^{th} grade 6. Above 12^{th} grade	[__]
7	Occupation of the pregnant woman	1. House work/house wife 2. Government employee 3. Private gain 4. Seeking a job 5. Student 99. Other specify _____	[__]
8	Educational status of the pregnant woman	1. Illiterate 2. Read and write 3. 1 to 4^{th} grade 4. 5 to 8^{th} grade 5.9^{th} – 12^{th} grade 6. Above 12^{th} grade	[__]
9	Religion of respondent	1 –Orthodox 2 – Muslim 3 – Catholic 4 – Protestant 99 – Other (Specify)___	[__]
10	Do you have or any one in your household owns a functioning radio?	1 – YES 2 – NO	[__]
11	What is your average monthly income in the household?	1. less than or equal to Birr 2.One hundred to five hundred Birr 3. Greater than five	[__]

		hundred Birr.	
12	Family size	M _____ F_____	[__]
13	Number of living rooms in the house	_____	[__]
14	Number of sleeping beds/places in the house	_____	[__]
15	Number of family members sleep on the bed in the previous night	_____	[__]

(2) Reproductive Related questions

16	Have you been seen in antenatal care after perceiving this pregnancy?	1. Yes 2. No	[__]
17	If yes, how many times?	_____	
18	How many times have you become pregnant of including the present one?	_____	[__]
19	What is the gestational age of this pregnancy in month?	_____	[__]
20	Have you got a tetanus antitoxin vaccine during this pregnancy?	1. Yes 2. No	[__]
21	How many children less than 5 years of old do you have?	_____	[__]
22	How many living children's do you have?	_____	
23	Is the current pregnancy wanted?	1. Yes 2. No	[__]

(3) Knowledge, attitude & practices related to malaria

24	Have you ever heard malaria?	1-yes 2-no	[__]
25	Is malaria a health problem of this community?	1-yes 2 –no	[__]
26	Which groups of people is most risk group to malaria? (only one answer)	1- Adults 2-young people 3- Children 4- Pregnant women 5- both children& pregnant 88- I don't know 99-Other (please specify)	[__]
27	Have you ever malaria attack during this pregnancy?	1-yes 2-no	
28	What symptom of malaria are you aware of? (Multiple response possible) (do not read options)		[__]
		yes no	
	22.1 -Fever	1 2	[__]
	22.2 -Chills	1 2	[__]

	22.3- Rigor 22.4 -Headache 22.5 - Vomiting 22.6 -body weakness 22.7 -Loss of appetite 22.88- Don't know 22.99- Other (specify)	1 2 1 2 1 2 1 2 1 2 1 2 1 2	[__] [__] [__] [__] [__] [__] [__]
29	Where do you regularly obtained drugs for the treatment of malaria?	1- CHAs 2- private pharmacy 3- Governmental H/I 4- traditional healers 99- Others (specified)--	[__]
30	What are the names of the currently used antimalaria drugs you know?	Yes no 1. Chloroquine 1 2 2. Fansidar 1 2 3. Coartem 1 2 4. Quinine 1 2 88. I don't 1 2 99. Others (sp) 1 2	[__] [__] [__] [__] [__] [__]
31	Is there a family member who has been sick due to malaria during the past two weeks? (If no skip to Q 35)	Yes No	[__]
32	If yes, how many?	_____	[__]
33	Have you been sick due to malaria during the past two weeks?	Yes No	[__]
34	If yes, what did you take to treat the malaria?	1. Traditionally treated at home 2. Drugs taken from CHAs 3. Drugs taken from health institution 4. Relieve with out treatment 99. Others (specify)____	[__]
35	Can malaria be transmitted from one person to another? (If no skip to Q 37)	1-yes 2- no	[__]
36	If yes, how is malaria transmitted or what causes malaria?	Yes no 1. Chewing maize/sorghum Cane 1 2 2. Working in the sun day 1 2 3. Getting cold 1 2 4. Drinking dirty water 1 2 5. Living near collected water 1 2 6. Contact with person of malaria 1 2	[__] [__] [__] [__] [__] [__]

		7. Being bitten by mosquitoes 1 2 88. I don't know 1 2	[__] [__]
37	Methods of malaria prevention	1. Uses of bed net (ITNs) 2. Take tablet 3. IRS(Spraying houses) 4. Closing windows and doors at night 5. Use of curtains 6. Cleaning surroundings 7.Drainage of collected water 8.ITNs and one or more of the above	[__]
38	Where does a mosquitoes breed?	yes no 1- on the soil 1 2 2-in the running water 1 2 3- in the stagnant water 1 2 88 - I don't 1 2 99- others (specify) 1 2	 [__] [__] [__] [__] [__]
39	Is there Mosquito breeding site available nearby your home?	1-yes 2-no	[__]
40	Have you ever participating in environmental management for mosquito control?	1-yes 2-no	[__]

4) Mosquito nets (ITNs) Knowledge, possession and utilization related questions

41	Have you ever heard any education messages about bed nets/mosquito nets from any source? (If no skip to Q 44)	1. Yes 2. No	[__]
42	If yes, where did you see or hear these education messages from? (Multiple responses possible)	Yes no 1- News paper/magazine 1 2 2- Radio 1 2 3- Health workers 1 2 4-Posters/notices 1 2 5-Parents [---] 1 2 6- Government officials 1 2 7-Church/mosque 1 2 99-Other (please specify) 1 2	 [__] [__] [__] [__] [__] [__] [__] [__]
43	Do you have insecticide treated bed net in the household currently? (If no skip to Q 47)	1. Yes 2. No	[__]
44	If yes, how many of them are currently functional?	_____	[__]
45	How did you obtain it?	1.I bought it from private or government	[__]

		2.Freely supplied from NGO /Government 3.I didn't remember 4.one of them bought & one get free 99- others (specify----)	
46	Is your net permanently treated net?	1. Yes 2. No	[__]
47	Have you ever sleep of under a treated net? (If no skip to Q 49)	1-yes, 2-no	[__]
48	Did you Sleep under a treated net during the previous night?	1-yes, 2-no	[__]
49	How many of the <5 children slept under mosquito net during the previous night?	_____	[__]
50	Either the net hanging over the sleeping area? (Check it)	1-yes 2- no	[__]
51	At what time do you use mosquito nets?	1. Every day through out the night 2. Every day only part of the night 3. Some times 4. During day time	[__]
52	How long do you use the ITN in month	---------	
53	Is there any net at home that was not used in the past two months by you? (If no skip to Q 54)	Yes 2. No	[__]
54	If yes, what was the reason?	yes no 1. Nets do not prevent against malaria 1 2 2. The bed net was not treated with chemicals 1 2 3. It was too hot sleeping in a net 1 2 4.Don't get bothered by mosquitoes 1 2 5.It was not a malaria transmission season 1 2 6.Given priority to husband 1 2 88. Don't know 1 2 99. Other (please specify) 1 2	[__] [__] [__] [__] [__] [__] [__] [__]
55	Have you ever heard about bed nets to be retreated with insecticide? (If no skip to Q 57)	1. Yes 2. No	[__]
56	Did you have ever impregnated the net with insecticide? (If no skip to Q --)	1-yes 2-no	[__]
57	How long has it been since your bed net/s have last been treated? (If there is more than one net mention about the recently treated one.)	1.3 months ago 2. 3-6 months ago 3. 6 - 11 months ago 4. > A year ago 5. I don't know	[__]

58	If the answer is no, why?	1. Shortage of insecticides 2. Lak of knowledge to do so 3. Doesn't have any use 99-other (specify--)	[__]
59	If you have no treated bed net what is the reason?	1-Bed nets (ITN) are too expensive 2-Bed nets (ITN) do not protect against malaria 3-Bed nets (ITN) are not available (access to get) 88- don't know the reason 99-Other (please specify)_____	[__]
60	Have any of your bed nets ever been washed?	1.Yes 2. No	[__]
61	Do you need to use ITN if a available?	1. Yes 2. No	[__]
62	What do you think the reason to be treating bed nets?	1.To make the net stronger 2. To repel mosquitoes 3. To kill mosquitoes 88. I don't know 99. Other (specify)	[__]
63	Is there opening on the wall to allow Mosquitoes?	1-yes 2-no	[__]

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.'

Name of Interviewer: _____ Date:____/___/____

Start time:_____ End time: _____

Signed_____ Date_____

Appendix III

Observation Check List for ITN utilization

1. Name of pregnant_____. 2. Either any net at home? Yes__ No__, if the answer is "No" stop to ask the next questions.

3. If the answer of the above is "yes" number of nets_____

Ask the respondents to show you the net, and observe them. Then check the net where the pregnant women sleep.

4. Is the ITN hanged over the sleeping place Yes___ No__

5. Is the pregnant sleep under the ITN? Yes____ No__

6. Number of children under 5 sleep under the net____

7. Either the net tucked under the mattress or mats? Yes__ No__

Appendix IV

QUALITATIVE QUESTIONNAIRE FOR FOCUS GROUP DISCUSSION

Interview guide, for FGD with, male's households, community health workers, and women in the reproductive age group and Kebele community leaders.

THEME I. INTRODUCTION

Thank you for coming to this session, your presence is very important. (Description; what a focus group what it like an opinion survey, but very general, broad questions).

PURPOSE: - We will be discussing your reaction/perception and experience about the importance, impact and challenges of insecticide treated mosquito net.

All your ideas, comments and suggestions are of great importance for us. There is no right or wrong answer; all comments both positive and negative are welcome.

Please disagree to one another when necessary. We would like to have many points of view. Ask each participant to introduce him/her self.

Name

Some thing about one's self, position, work or residential experience and others as desired.

Question for Male house holds FGDs

A) To begin with, how do you see the magnitude, the control and prevention strategies of malaria?

B) What is the role of ITNs, the source and method of distribution of ITNs, the appropriateness, affordability, & accessibility of the ITNs in this area?

C) What is the attitude of the community towards insecticide treated net utilization at household level?

D) What is the community perception of the ITNs utilization in pregnant women for prevention of malaria?

E) What are your suggestions to be designed for sustainability of the utilization of ITNs in pregnant women?

F) What are the major challenges of the ITNs utilization in pregnant women for prevention of malaria?

2) Question for Women FGDs

A) To begin with, how do you see the ITNs utilization started in your area?

B) How are your relations with the community health workers and community leaders, in getting and using the ITNs?

C) What is the community perception towards the use of ITNs in pregnant women for prevention of malaria?

D) What are the major challenges to pregnant women in utilization of ITNs?

E) What are the attitudes of the health worker to encouraging the community towards ITNs mobilization to the community particularly to pregnant women?

F) What do think to have the mechanisms (assumptions) designed for improvement/ sustainability of the ITNs utilization in pregnant women?

3) Question for Tabias (Kebeles) community leaders FGDs

A) To begin with, how do you see the magnitude, the control and prevention strategies of malaria?

B) How do you see the ITNs distributions utilization started in your areas?

C) What are your expectations from the health workers, Woreda administrators and the government as a whole with regards to ITNs utilization?

D) What is the community perception towards the use of ITNs for pregnant women to prevent malaria?

E) What are the attitudes of the health worker to encouraging the community towards ITNs mobilization to the community particularly to pregnant women?

F) What do think to have the mechanisms (assumptions) designed for improvement/ sustainability of the ITNs utilization in pregnant women?

G) What are the major challenges to pregnant women in utilization of ITNs?

4) Question for Community health workers FGDs

A) To begin with, how do you see the magnitude, the control and prevention strategies of malaria?

B) What is the role of community health workers in the ITNs utilization in pregnant women?

C) What is the community participation in the ITNS utilization for pregnant women?

D) What are the attitudes of the health worker to encouraging the community towards ITNs mobilization to the community particularly to pregnant women?

E) What are your mechanisms designed for sustainability utilization ITNs for pregnant women?

F) What are the major challenges of the pregnant women to uses the ITNs?

Checklist for observational study

A – Guidelines

B – Reporting formats

C – Baseline data

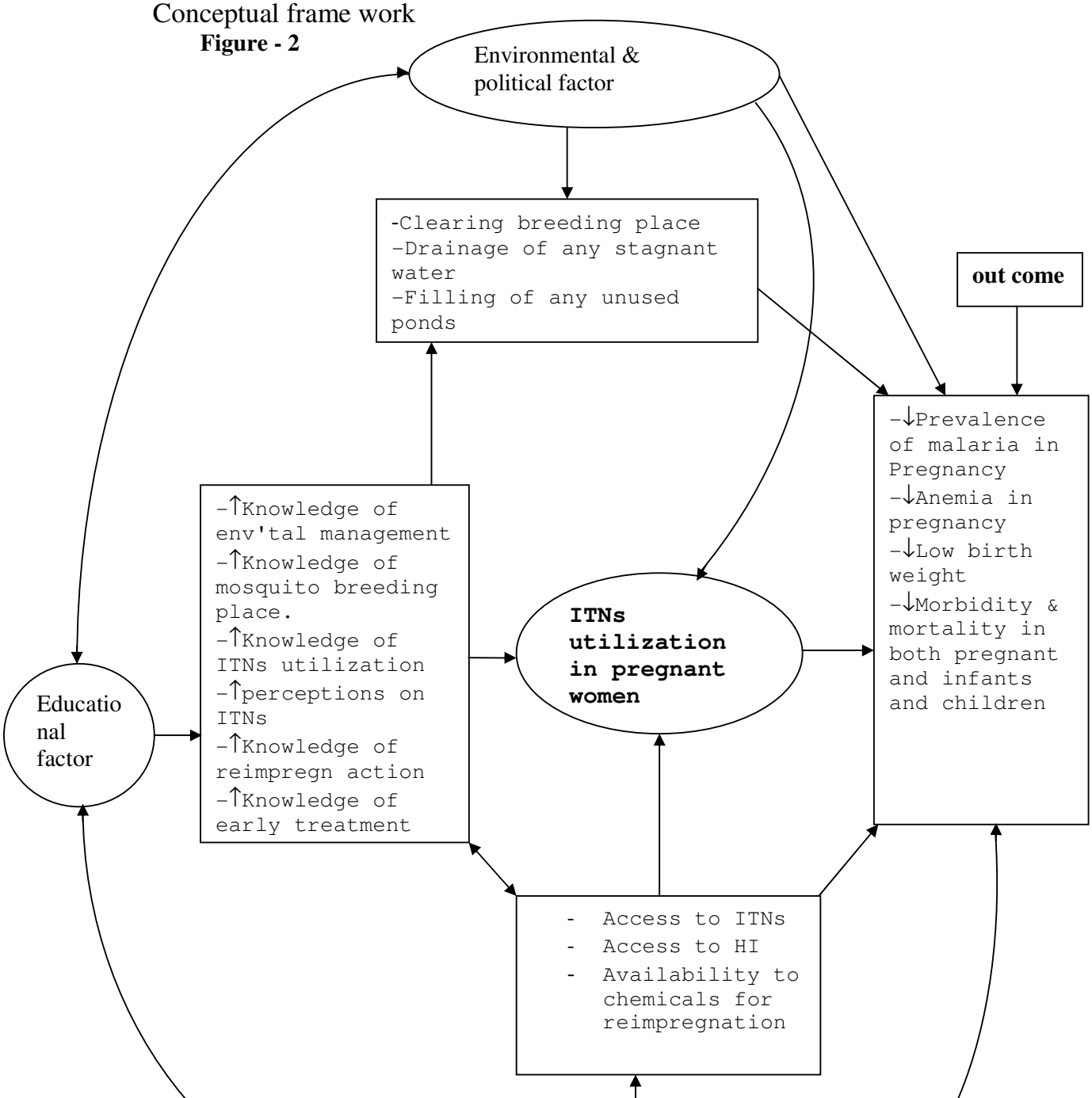
D – Criteria and List for identifying sub villages/"Kushets" to be covered by ITNS distribution.

Thank you for your provision of necessary explanation and patience during the discussion to.

Appendix V

Conceptual frame work

Figure - 2



Appendix V

Map of the study area

Figure 3