

# Insecticide Treated Net (ITN) Utilization and Associated Factors among Pregnant Women's in Halaba Kulito Town, South Ethiopia, 2016: Cross-Sectional Study

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**Abstract:** Background:-Malaria remains to be a major problem causing an unacceptable toll on the health and economic welfare of world's poorest communities. Globally, it is agreed to reduce the burden of malaria by half by the year 2010 and again by half by 2015. Similarly, at the African summit on Roll Back Malaria (RBM) in Abuja, committed themselves to halving the burden of malaria by 2010, by achieving 60% coverage of all at risk population with suitable curative and preventive measures by 2005. Ethiopia, as one of the signatories of the Abuja convention, has included the above global strategies in its national malaria prevention and control approach. Therefore, the aim of this study was to assess Insecticide Treated Nets utilization and associated factors among pregnant women in Halaba kulito town, 2016. Methods: A community based cross sectional study was carried out among pregnant women in Halaba Kulito town. The study included 92 mothers who were selected by simple random sampling. Household survey using structured questionnaire was used to collect information. Logistic regression analyses were employed to identify factors associated with ITN utilization. Variables with a p-value <0.05 were identified as statistically significant factors. Results: Only 51 (70.8%) of pregnant women had self-reported as utilizing bed net during in previous night of survey. The direct observation done had shown that only 39 (42.4%) of pregnant women were directly observed while sleeping under bed net. Among this 19 (20.43%) of pregnant women's properly utilize mosquito net. Conclusion: The time taken to reach health institution, the type of bed room condition and level of education were some of significant factors which were associated with ITN Utilization. Majority of the pregnant women did not utilize ITN. Therefore, the free distribution should prioritize vulnerable groups using good opportunity of Antenatal care clinic, household education and regular district level on going survey.

**Keywords:** ITN Utilization, Pregnant, Ethiopia

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## 1. Introduction

Globally, Malaria remains to be a major problem causing an unacceptable toll on the health and economic welfare of world's poorest communities. World Health Organization report has shown that the disease is estimated to be responsible for an estimated average annual reduction of 1.3% in economic growth for those countries with the highest burden. Africa has the greatest burden of malaria cases and deaths in the world. The effects of malaria in pregnancy are enormous and include maternal anemia, intrauterine growth

restriction, low birth weight, and premature deliveries among others. Malaria is also a significant indirect cause of death; malaria related maternal anemia in pregnancy, low birth weight and premature delivery are estimated to cause 75,000-200,000 infant deaths per year in Africa South of the Sahara [1, 2]. Malaria transmission in Ethiopia is mostly seasonal and unstable in characteristics, thus, predisposing majority of the population to frequent and often large-scale epidemics. Parasite species of all the four Plasmodium species occurring in the country, the two epidemiologically important species are Plasmodium falciparum and Plasmodium vivax, 60% and

40%, respectively. *Anopheles arabinos* is the principal vector adapted to different ecological locations in Ethiopia [3].

Despite the highest magnitude of this devastating disease, most countries did not start implementing program to provide access to the tools and strategies recommended by Roll Back Malaria until 2000. Globally, it is agreed to reduce the burden of malaria by half by the year 2010 and again by half by 2015. In many countries in Africa where the burden of malaria is greatest, scaling up access to treatment and prevention began even more recently [1]. For the unborn child, maternal malaria increases the risk of spontaneous abortion, stillbirth, premature delivery, low birth weight and intrauterine growth restriction a leading cause of child mortality [4]. Malaria is a major public health problem in tropical and subtropical regions of the world. The World Health Organization (WHO) 2011 World Malaria Report demonstrates the enormity of the burden of malaria, with 216 million cases and 655,000 deaths attributable to this mosquito-transmitted parasite in 2010 alone. The burden is largely borne by Africa where 91% of deaths occurred, with pregnant women most at risk of infection and adverse outcomes. Each year, there are an estimated 25 million pregnancies in sub-Saharan Africa at risk of malaria, the consequences of which can be serious for both mother and fetus in terms of morbidity and mortality [1].

In Africa, 30 million women living in malaria-endemic areas become pregnant each year. For these women, malaria is a threat both to themselves and to their babies, with up to 200 000 newborn deaths each year because of malaria in pregnancy. Pregnant women are particularly vulnerable to malaria as pregnancy reduces a woman's immunity to malaria, making her more susceptible to malaria infection. It increases the risk of illness, severe anemia, hypoglycemia, pulmonary edema, coma and death. They are more likely to develop cerebral and other forms of severe malaria, and suffer a high mortality 2 to 10 times higher than non-pregnant patients. They are particularly also susceptible to hypoglycemia and acute pulmonary oedema. *Falciparum* malaria commonly induces uterine contractions and gives rise to premature labor [5]. Sleeping under ITNs remains an important strategy for protecting pregnant women and their newborns from malaria-carrying mosquitoes. In areas of low or unstable malaria transmission, pregnant women have low immunity to malaria and a two- to threefold higher risk of severe malarial illness than non-pregnant women. In these areas, use of ITNs and prompt case management of pregnant women with fever and malarial illness are the main strategies for malaria prevention and treatment [6].

Sub-Sahara Africa harbor's 80-90% of the world malaria burden and about 19-24 million women are at risk of malaria during pregnancy. It contributes up to 11% of maternal mortality in the region. Assessment of attaining of Abuja target of 60% ITNs coverage by African countries indicated that Eritrea is the only one that reached this target during 2003 (WHO, 2005). Malaria is one of the top ranking causes of morbidity and mortality in Ethiopia. The highest score for

outpatient visit goes for malaria. It is also one of the main causes of hospitalization. Moreover, death in all corners of the country. More than two-thirds of population lives in malarious areas [7, 8]. In 2000-2003, the disease was the primary cause of reported morbidity and mortality accounting for 16% of outpatient visit, 20% of hospital admission, and 27% of hospital deaths. During a non-epidemic years, 5-6 million clinical malaria cases and over half a million confirmed cases were reported from health facilities [8]. Ethiopia, realizing the effectiveness of ITNs for prevention of malaria transmission, scaling up distribution and utilization of ITN to cover 60% of pregnant women living at high risk area of malaria transmission is undergoing. In order to support this part of malaria prevention aspect there was much effort and resources allocated from donors. On the other hand, the proper utilization coverage of ITNs among priority and high-risk groups were found to be very low, whereas the 1<sup>st</sup> phase of the commitment has ended by 2005 [4].

## 2. Methods

### 2.1. Study Setting and Design

A community based cross-sectional study was conducted from April 15-20, 2016 at Halaba Kulito town, which is located 315 km far from Addis Ababa and 90 km southwest of Hawassa. The Town is administratively divided in to two 'kifle-ketemas' (sub-towns) and five 'kebeles' all of which were malarious. The town has an estimated total population size of 37, 689. From these, 17,845 were males and 19,844 were females and it has one health center and one primary hospital.

### 2.2. Populations

#### 2.2.1. Source Population

A pregnant woman's who were registered by health extension workers of Halaba Kulito town.

Study population

Pregnant mothers who was included in sampling size during the data collection period.

### 2.3. Inclusion and Exclusion Criteria

Pregnant women, who were selected in sample size and residents of Halaba Kulito town for greater than or equal to six months were included. Pregnant women's who were mentally and critically ill and not able to speak at the time of data collection were excluded.

### 2.4. Sample Size Determination

The study sample size was determined by statistical calculation. The estimation of population proportion,  $p$ , where  $p$  is the proportion of households that uses ITNs for pregnant women,  $p=0.147$  was used which was done in Adama woreda [9], as this value gives sample size sufficiently large to guarantee an accurate prediction, at 95%

confidence interval and 5% error of estimate. The following formula was used  $n = (Z\alpha/2)^2 \times p(1-p) / d^2$  whereas: -  $n$ =sample size  $p=0.147$  (proportion of pregnant women using ITNs)  $Z\alpha/2=1.96$  ( $Z$ =score corresponds to 95% confidence interval.  $d=0.05$  (margin of error). Total sample size was 193. Since the source population is less than determined sample size, we have used reduction formula i.e.  $n / (1+n/N)=192 / (1+192/180)=93$  pregnant women's.

## 2.5. Sampling Technique

All kebeles were included and the study participants were selected by simple random sampling method with proportion from each Kebele using the registration list, which was prepared by health extension workers of the town.

## 2.6. Operational Definition

Bed Net-is a material made of nylon, polyester, polyethylene and synthetic with cotton mixture with different shape, size and used to protect people against insect bites.

Insecticide Treated Mosquito Nets- Nets treated with insecticide to kill or irritate mosquitoes and used as physical barriers.

ITN utilization- The use of standardized properly hanged (mounted) over the bed or the sleeping area, no thorn /without defect and pregnant women sleeping under the mosquito net during the early morning of observation day.

## 2.7. Data Collection Tools and Procedures

Data were collected by using semi-structured questionnaires. Both closed ended and open-ended questions were utilized for data collection. The questionnaire initially was prepared in English and then translated to local language Amharic then back to English version to ensure consistency. The questionnaires include items informed consent of respondent and questions. Five midwifery students were collected data on daily basis from morning to evening including weekends for the period of two weeks starting from April 15-20, 2016. The questionnaire took 20-30 minutes to interview one-study participants.

## 2.8. Data Entry and Analysis

The data was cleaned, coded, entered, and analyzed using SPSS version 20. Descriptive statistics was computed to assess Utilization of Insecticide Treated Nets and association factors. Logistic regression analysis was used to obtain odds ratio and the confidence interval of statistical associations. The strength of statistical association was measured by adjusted odds ratios and 95% confidence intervals. Statistical significance was declared at  $P<0.05$ . finally finding of the result was presented by text, figure, graphs and tables.

## 2.9. Data Quality Control

Investigators were reviewed all the questionnaires, checked for errors and incompleteness at the end of each day. Five data collectors (midwifery students) were

participated in data collection. Information was given for data collectors on how to collect data, on the objectives of the study, the contents of the questionnaire, and particularly on issues related to the confidentiality of the responses and the rights of respondents. The Questionnaires were checked for completeness on daily bases and take appropriate measures. One week prior to data collection pretest was conducted on 5% of women and based on the finding necessary modification was made before conducting the actual study and those participated in the pretest was excluded from actual study.

# 3. Result

## 3.1. Socio-demographic Characteristics of Households

A total of 93 (100%) study subjects were participated in the study. Out of these participants 35 (37.6%) respondents were in 25 to 29 years age group and 90 (96.8%) were married. From total of study participants 35 (37.6%) had secondary education, 35 (37.6%) were Muslims, 35 (37.6%) were housewives and 31 (33.3%) were Kambata by ethnicity (Table 1).

**Table 1.** Socio-demographic characteristics of pregnant women's in Halaba Kulito town, 2016.

Age of respondents	Frequency	Percent (%)
20-24	33	35.5
25-29	35	37.6
30-34	12	12.9
≥35	13	14
Ethnicity of respondent		
Halaba	29	31.2
Kambata	31	33.3
Others	33	35.5
Marital status of the respondent		
Married	90	96.8
Non married	3	3.2
Religion of respondents		
Orthodox	23	24.7
Muslim	35	37.6
Protestant	32	34.4
Others	3	3.2
Occupation of respondents		
Government employer	15	16.2
Private worker	19	20.4
Merchant	24	25.8
Housewife	35	37.6
Educational status the respondents		
No education	20	21.5
Primary education	17	18.3
Secondary education	35	37.60
More than secondary education	21	22.6

## 3.2. ITN Coverage and Conditions Related to Pregnant Women's Net

A total of 79 (84.95%) of the respondents reported that they have their own at least one bed net.

But, 7 (8.86%) pregnant women's couldn't show any bed net during observation of households. Among household's bed nets which were observed, 18 (25%) were inspected with

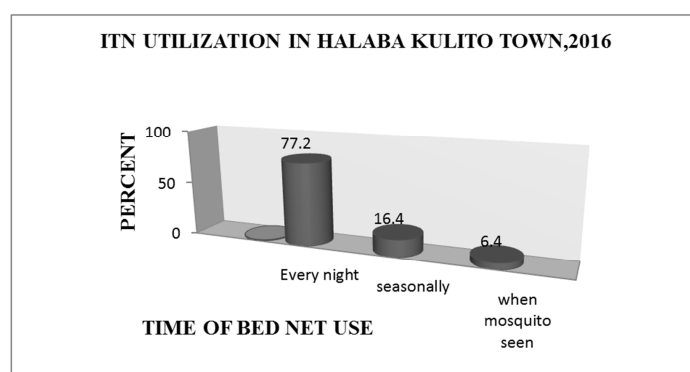
varying degree of visible defect /thorn, burn etc. / through the nets. Thirteen (18.05%) mosquito nets were re-treatable but, remaining 9 (69.23%) respondents hadn't re-treated their nets. The major reasons given for none re-treating bed nets were- absence of K-O tablet (retreating kit) was given by 7 (77.77%) respondents and 2 (22.23%) were due to lack of information about the need of re- treatment.

Among total respondents 89 (95.7%) have information about ITN and the remaining 4 (4.3%) haven't information about ITN. Among these the assessment done on where they get information about bed net for the first time has showed that 17 (19.1%) of pregnant women's get information about bed net for the first time from community, 65 (73.03%) of pregnant women's from health institution and 7 (7.86%) respondent's get from other sources and 69 (95.8%) of respondents were got ITN from health institution and 3 (4.2%) were got from sale.

#### Insecticide Treated Nets utilization among pregnant women

**Table 2.** Utilization of ITNs among pregnant women over direct observation, Halaba Kulito town, 2016.

Characteristics	Number	(%)
Have ITNs (n=93)	72	77.4
Pregnant women slept in previous night in the area (n=72)	39	54.16
Pregnant women sleeping under properly hanged net (n=39)	19	48.7
Pregnant women sleep under net with defect (n=39)	18	46.1
Pregnant women sleeping under net which were not retreated (n=39)	2	5.2



**Figure 1.** Time of ITN utilization among pregnant women, in Halaba Kulito town, 2016.

#### Reasons for not-utilizing of ITNs among pregnant women's

Among the reasons for non-utilization, 28.37% pregnant women not owning bed net and 71.63% of pregnant women not utilize due to improper utilization of bed net (Table 3).

**Table 3.** Reason for not utilization of ITN among pregnant women's, Halaba kulito town, 2016.

S. N	Variables	Reasons	Percent
1	No ITN (n=21)	Expecting for free distribution of bed net by government	14.9
		Lack of information	7
		Causes discomfort	5.4
		Others	2.7
2	Not using ITNs in the last night (n=12)	Forgot to mount	6.4
		Did not want	4
		No mosquito seen in the house	3
		Others	2
3	Slept in bed net with problem (n=20)	Using bed nets having defect	23.32
		Sleeping under non treated bed net for the last 12 months	2.7
4	Not slept under bed net (self-reported) n=21	No comfort	13.51
		Cause heat	8.1
		Air hunger	4.05

Others

2.7

### 3.4. Factors Affecting Ownership of Bed Net and Its Utilization

The utilization of ITNs was significantly associated with the educational status, bed room condition and time taken to reach health unit of the respondents. The pregnant women's who had primary education were 5.03 times more likely utilizes bed net than no education, (COR=5.03, 95%CI, 1.479, 120.165), p-value=0.021. The assessment done on bed room condition showed that those pregnant women's who have separated bed room utilizes 5.63 times than who have

shared bed room with others (COR=5.63, 95%CI, 1.61-7.265)) p-value=0.018 and pregnant women time taken to reach health unit less than 1hr utilize 4.2 times than those who take greater than 1hr to reach health center (COR=4.2, 95%CI, 1.023-19.56) p-value=0.001. However, there was no significant association demonstrated from the data between other factors (socio-demographic variables, source of information, ANC follow up and pregnant women utilization of bed net (Table 4).

**Table 4.** Associated factors affecting utilization of ITN among pregnant women, Halaba Kulito town, 2016.

Variables	Utilized ITN		OR (95% CI)	P-value
	Yes	No		
Educational status				
No education	3	17	1	
Primary education	8	9	5.03 (1.479-120.165)	0.021
Secondary education	3	32		
More than secondary	5	16		
Bed room condition				
Separated	16	36	5.63 (1.61-7.265)	0.028
Shared with others	3	38	1	
Time taken to reach health unit				
<1hr	18	60	4.2 (1.023-19.56)	0.001
≥1hr	1	14	1	

## 4. Discussion

The study showed that 72 (77.4%) pregnant women's own at least one bed net. This was higher than the study done Enugu Nigeria [10]. This could be due to high distribution ITN by Halaba woreda health office in collaboration with regional health bearuea. Among 79 pregnant women's which had self-reported as owning bed net, only 7 (8.8%) were missed during direct observation of household's bed net. This was another different finding compared to study done in Burundi, which had shown that 28% of free distributed bed nets were resold to the neighboring country [11]. The finding of this study is similar to different studies done in Eritrea, Burkina Faso and Ghana [1, 11, 12]. this could be due to lack awareness about the advantage of ITN.

Concerning the factors for non-owning of bed net, 52.38% was waiting for free distribution through village authority without any attempt to purchase from social market. This figure was higher than the study done in Nigeria. This could be because of lack of awareness on purchasing ITN from social market.

Concerning the re-treatment of bed nets, 69.23% of re-treatable bed nets were reported as none re-treated for last 12 months. This is lower than the study done in Adama woreda [9]. This could be due to close follow up of health extension workers. Another area of concern was the factors given for pregnant women not utilizing bed net the previous night of survey. Similarly to other study done in Ghana forgot to mount the bed net during the night was among the major

reasons given [12].

The assessment done on the timing of ITN utilization shows that 78% every night, which is encouraging compared to the study done in Kenya 50% [13]. This might be due to the health information dissemination on timing ITN utilization by health workers of Halaba Kulito town.

The survey done on ITN use of pregnant women who slept under ITN the previous night of the survey was (54.1%). this is 20.1% higher than the survey done on ITN use of pregnant women who slept under ITN the last night of the survey in Ghana [10]. This is might be due to the dissemination of health information on ITN utilization by the health extension workers.

Concerning the associated factors of ITN utilization, pregnant women's who had primary education were 5.03 times more likely utilizes bed net than no education, (COR=5.03, 95%CI, 1.479, 120.165), p-value=0.021. This is different with study done in Nigeria and Uganda [10, 12]. This might be due to they have more information about ITN utilization than no education.

The assessment done on bed room condition showed that those pregnant women's who have separated bed room utilizes 5.63 times than who have shared bed room with others (COR=5.63, 95%CI, 1.61-7.265)) p-value=0.018. and Time taken to reach health unit less than 1hr utilize 4.2 times than those who take greater than 1hr to reach health center (COR=4.2, 95%CI, 1.023-19.56) p-value=0.001. This is different from the study done in Uganda [12]. This could be because of social responsibility which cannot make them free and they missed out ITN and vital messages from antenatal

clinic, which could have an influence over their attitude toward ITN utilization.

The assessment done on marital status of the study participants shows no association with ITN utilization unlike the study done in Kenya which shows married pregnant women's utilize ITN than single/widowed/divorced [13]. This could be due to equal distribution of ITN for all pregnant women's. Concerning the parity of pregnant women's there is between parity ITN utilization in our study while the study done in Southern Tanzania showed that multiparous women's utilize ITN than others [15].

This could be due equal distribution of ITN for all pregnant women's regardless of their parity. Concerning the age of respondent's there is no association between the age of respondent and ITN utilization while the study done in Adama showed that age grouped 18-24 utilizes ITN than other's [9].

In our study there is no association between ANC follow up and ITN utilization while the done in Kenya showed that pregnant women who have gone for ante natal were 1.83 times utilize more likely than those who have not gone for ante natal service [13]. This might be due to health information dissemination by health extension workers of the study area by home to home visit.

## 5. Conclusion

Majority of the pregnant women in Halaba Kulito had not utilized ITN (79.57%). Only about 20.43% of the pregnant women had utilized ITN properly. Not having free insecticides treated net and lack of knowledge how to use properly was seen in this study. Expecting free distribution from government, lack of information and causes discomfort was main reason for not owning of ITN. The educational status and housing condition was poor in the study area. The utilization of ITN is significantly associated with time taken to reach health unit, type of bed room condition and level of education but there is no significant association with other factors (socio demographic characteristics, ANC follow up, parity of respondents, source of delivery, number of bed net).

## 6. Recommendation

The free distribution should prioritize vulnerable groups using good opportunity of Antenatal care clinic, household education and regular district level on going survey with great emphasis to Halaba special woreda health office. Halaba special woreda health office can potentially use the existing awareness about cause of malaria and ITNs protection in malaria control program to improve the observed utilization (none compliance) problem. Stakeholders (Ministry of Health and NGOs) should ensure adequate supply of ITN to pregnant women and also sensitize them on the benefits of ITN utilization. Also, leaders should encourage pregnant women to acquire and use ITN as a mean of reducing their vulnerability to malaria disease since they live in housing that offers little protection against mosquitoes.

## 7. Limitations of the Study

This study didn't include proper tacking of pregnant women mosquito net under the mattress or materials used similarly, as mothers go out of bed unpacking the net to open the door for the observers and it may affect proper utilization.

Although, this study has been able to examine ITNs use throughout the entire period of pregnancy, the data collected was based on ability of the women to recall events of the last nine months of pregnancy.

## Declarations

### *Ethical Approval and Consent to Participant*

Ethical clearance was obtained from Arbaminch University College of Medicine and Health Science department of Midwifery. After approval, formal official letter was written to Halaba Kulito town administrative office to get permission and cooperation. The respondent was informed about the objective, purpose of the study and verbal consent was taken from respondents, and their confidentiality was kept.

### *Availability of Data and Material*

All related data has been presented within the manuscript. The data set supporting the conclusions of this article is available from the authors on request.

### *Consent for Publication*

Not applicable.

### *Competing Interests*

The authors declare that no one have competing interests.

### *Funding*

Arbaminch University.

## Author Contribution

Both authors have read and approved the manuscript. Both supervised the study design and statistical analysis and contributed to the writing of the manuscript and both authors approved the submitted version of the manuscript.

## List of Abbreviations and Acroyms

ANC: Antenatal Care, DHS: Demographic and Health Survey, ETB: Ethiopian Birr, FMOHE: Federal Ministry of Health of Ethiopia, HH: House Hold, ITNs: Insecticide Treated Nets, MDG: Millennium Development Goal, NGO's –Non-Governmental Organization, RBM: Roll Back Malaria, UNICEF: United Nations children's fund, WHO: World Health Organization

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