

Long lasting insecticide bed net utilization and associated factors among pregnant mothers in Fogera district, North West Ethiopia, 2018.

Melese Damtie Abitew (✉ melesedamtie19@gmail.com)

Fogetra health district

Kihinetu Gelaye Wudineh

Bahir Dar University

Simachew Animen Bantie

Bahir Dar University

Destawu Fetene Teshome

University of Gondar

Desiyalew Habtamu Tamiru

Clinton Health Access Initiative

Research

Keywords: Pregnant women, LLIN utilization, knowledge

Posted Date: April 10th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-22018/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: Long lasting insecticide bed net utilization is one of the major vector control intervention to prevent malaria in Ethiopia. Effective utilization of long lasting insecticide bed net has many impacts for decreasing malaria related morbidity and mortality among pregnant mothers.

Methods : A community based cross sectional study was conducted from May 1-30, 2018 in Fogera district, North West Ethiopia. Systematic random sampling technique was used to select study participants. A pre-tested and structured questionnaire was used to collect the data. Data was entered into epi-info and analyzed with SPSS software. Bi-variable and multivariable logistic regression with 95% CI at $P \leq 0.05$ was used to assess factors associated with net utilization.

Result: The mean age of respondent was 28.26 (SD= 5.39). Over all knowledge of pregnant mothers about long lasting insecticide bed net was 68.7 % with 95% CI (64.1%-72.5%). Utilization of LLIN by interview was 88.3% and by observation was 68.3%. Pregnant mothers with secondary school (AOR = 2.449(1.125, 5.33)), had good knowledge about malaria (AOR=2.246(1.508, 3.344)), and had good knowledge about LLIN (AOR=2.1(1.417, 3.119)) were positively associated with LLIN utilization.

Conclusion: Observational utilization of LLIN by pregnant mothers was 68.8% which was lower compared with WHO guideline. Those who had good knowledge about malaria and LLIN utilization, and educated mothers were positive significant factors for long lasting insecticide bed net utilization. Continuous health education on the use of long lasting insecticide bed net should be given to pregnant women at antenatal clinic to enhance its utilization.

1. Background

Malaria remains one of the major public health problem in the globe, especially in sub-Saharan Africa(1). Globally, an estimated of 212 million cases and 429,000 deaths occurred due to malaria in 2015, of which 90% cases and 92% deaths are found in sub-Saharan Africa. In Ethiopia, 2,800,000 cases and 4900 deaths estimated in the same year which accounts 1.3% and 1.1% cases and deaths from the world respectively (2). In Ethiopia, approximately 68% of population lives in malaria area(3, 4). In Ethiopia, from 2010 to 2016 an estimated malaria cases and deaths decreased by 46.5% and 44% respectively(5). Even though, malaria prevalence decreased in Ethiopia, still it is a major public health problem and has been consistently reported as one of the three causes of morbidity and mortality(6). In most endemic area of the world pregnant women are the main risk group for malaria; they are four times more likely to suffer for attacks of malaria than non pregnant women(7, 8). Worldwide, an estimated 125 million pregnancies are at risk from malaria each year(9). In Ethiopia pregnant women accounted for 1.7% of all reported outpatients with malaria, 2.9% of reported malaria hospitalizations, and 1.7% of reported inpatient malaria deaths(10). The infection of malaria during pregnancy have many impacts like severe anemia in the mother, increase the risk of maternal mortality and morbidity and it affects the health of the fetus during pregnancy, though it causes still birth and low birth weight of the child(11–13). However, malaria

is both preventable and treatable disease, and a combination of treatment and preventive measures can be used to control it (14).

Long lasting insecticide bed net (LLIN) utilization is one of the major vector control intervention to prevent malaria in Ethiopia (15). In malaria risk areas, LLIN distributed through mass campaigns and continuous distribution to achieve and maintain LLIN utilization levels above 80%(10). Effective utilization of long lasting insecticide bed net has many impacts for pregnant mothers such as decrease morbidity and mortality due to malaria, life saving of infants and fetus, economic saving due to medical cost for malaria treatment.

In Ethiopia to improve LLIN utilization among pregnant women different strategies and policies were applied(2, 15). As a result, there is some improvement of LLIN utilization from 2011 to 2015 in pregnant mothers, despite the improvement of utilization of LLIN in pregnant mothers in malaria's areas of Ethiopia, only 44 percent of pregnant women slept under LLIN at night before 2015 survey(16). However, WHO recommends that utilization of long lasting insecticide bed net (LLIN) should be above 80%.

Regardless of this fact, assessing practical utilization of LLIN by observation during in the morning and determinant factors among pregnant mothers have been limited in the study area which is endemic for malaria. In addition to this, there is also variability of factors from one study to another study. Therefore, the purpose of this study is to assess proper long lasting insecticide bed net utilization and associated factor among pregnant mothers in Fogera district, North West Ethiopia.

2. Methods

2.1. Study design and period

A Community based cross sectional study design was carried out to determine the utilization of long lasting insecticide bed net and associated factors. The study was conducted from May1-30, 2018.

2.2. Study area and population

The study was conducted in Fogera district, North West Ethiopia; located 60 km from Bahirdar which is capital city of Amhara region and 610 km from Addis Ababa, the capital city of Ethiopia. The boundary of the district is in the north Libokemkem, in the south Dera district, in the east Farta and Estie and in the west Tana hike. Total area of the district is estimated 1028.21 km square, average annual rain fall was 1284.2 mm, altitude above sea level 1820 meter, maximum temperature of the area was 27.2 and minimum temperature of the area was 10.3 degree centigrade. The district has 35 kebeles, from which 33 are rural kebeles. The district had 9 health centers and 45 health posts with health coverage of 86% for both health post and health centers. According to 2007 census projection, total population of the district was 261,341. The district had 61,624 estimated number of reproductive women and 8807 number of pregnant women.

2.3. Source of population

All pregnant mothers living in Fogera district.

2.4. Study population

All pregnant mothers living in selected kebeles.

2.5. Study sample

Those pregnant mothers selected for this study.

2.6. Inclusion and exclusion criteria

2.6.1. Inclusion criteria

Pregnant mothers whose age was from 15–49 and living in the house during visiting time.

2.6.2. Exclusion criteria

Pregnant mother who was severely or critically ill during the study period.

2.7. Sample size determination

The single population proportion formula was used to calculate the sample size considering the following assumptions: proportion of women using long lasting insecticide bed net 44% [16], 95% confidence level, 5% margin of error (absolute level of precision).

Thus, $n = [Z_{\alpha/2} * P(1-P)] / d^2$

$$= 1.96^2 * 0.44(1-0.44) / 0.05^2$$

$$= 379$$

Since it was multistage sampling, design effect was considered. This make total sample of $379 * 1.5 = 569$, (10%) non response rate was added = $569 + 57 = 626$.

In addition we calculated the factors associated with LLIN utilization among pregnant mothers in Adama district Oromia region(37). Since our study was prevalence and factor, we took the largest number of sample size from the three factors and prevalence. So we took the number calculated using single population proportion 626.

2.8. Sampling technique/procedure

The study units were identified by two-stage sampling technique. Primarily, from the source population 8 kebeles were selected by simple random sampling. The number of pregnant mothers which was selected from each randomly selected kebeles was determined by the proportion allocation. The total number of pregnant mothers registered in 8 kebeles were 1233. Furthermore, to select the study units (pregnant mothers), systematic random sampling was used with sampling fraction k^{th} which was calculated ($k = 1233 / 626 = 1.96 = 2$) from the recent antenatal care (ANC) registration list. Out of the 2 pregnant

mothers, the initial one was determined by using the lottery method. The next pregnant women to be included in the study was identified systematically through house-to-house visit. For households with more than one eligible woman, interview was done for one of the mothers using simple random sampling technique. Revisits of two to three times were made in case where eligible respondents were not available at the time of the survey by asking the neighbors whether an eligible women in that house was present or not, after all they were considered as non-respondents.

2.9. Data Collection Tools and Procedures

A semi-structured questionnaire was administered by interview method to all pregnant women visited at home. Early in the morning, each pregnant woman was visited to observe the actual practice regarding the use of LLIN during the previous night, and each selected household was revisited on the same day to answer the remaining questions. The data was collected by 8 data collectors and supervised by two supervisors.

Both the data collectors and supervisors were given one day training about the aim of study, procedures and collection techniques going through the questionnaires question by question, art of interviewing and ways of collecting the data.

2.10. Data quality control

The questionnaire was prepared originally in English and then translated to local language Amharic then back to English to ensure reliable information. Pre-test of questionnaire was done on 5% of respondents in one neighboring kebele in fogera district for validity and reliability to identify and correct the potential problems encountering during data collection. One day training of data collectors and supervisors was conducted to ensure the quality of data. Data collectors and supervisors were reviewed every questionnaire for completeness and logical consistency, and checked by the principal investigator every day. Finally data cleaning was conducted at the end of data entry.

2.11. Data processing and analysis

Data was checked for completeness and any incomplete information was excluded from the entry. Coded data was entered by using Epi info version 7 and analyzed using SPSS (statistical package for social science) version 21 software. Proportion and percentages were used to describe the socio demographic characteristics and other variables. We used multivariable logistic regression analysis to identify factors associated with LLIN utilization. Adjusted odds ratio (AOR) with 95% confidence intervals and p-value < 0.05 was used to show the association between dependent and independent variables.

In multivariable regression, variables with p-value of < 0.05 were considered as significant.

2.12. Ethical consideration

Ethical clearance was obtained from the institutional review board of institute of public health, University of Gondar College of medicine and Health Sciences. Formal letter was written to south Gondar zone from Amhara region. Then official permission letter was obtained from South Gondar zone and Fogera district health office. Prior to interview and inspection of household survey, data collectors had been requested for the respondents' consent. Written informed consent was obtained from each study participant. Respondents were informed about the confidentiality of the information they provide. Participation in the survey was voluntary and they can choose not to participate, but was told that their views was important to strengthen the program. When the data collectors found problems with incorrect use of LLIN, they had educated the study participants about the correct use and maintenance upon completion of the survey. Clinically ill patients found during the survey were advised to consult the nearby health facility to get health service.

3. Results

3.1. Socio demographic characteristic of study participants

A total of 626 pregnant mothers were studied, ranging from 15 to 49 years. The mean age of respondents was 28.26 years with a standard deviation of 5.393. All of pregnant mothers had been interviewed and those not present in the morning were asked to demonstrate proper utilization of LLIN. Majority, 575(91.9%) of pregnant women were married and living together with their spouse 563(89.9%). About 585(93.4%) of the respondents were orthodox Christian followers (Table 2).

3.2. Knowledge of pregnant mothers about malaria

Majority, 581(92.8%) of pregnant mothers had knowledge of malaria is major health problem in the study area and 533(85.1%) of the respondents mentioned mosquito bites as the mode of transmission of malaria. More than half, 371(59.3%) of pregnant mothers knew that pregnant mother were more affected by malaria than non-pregnant mothers and 184, (29.4%) of pregnant mothers knew that malaria preventing mechanisms and 62(9.9%) of pregnant mothers had low knowledge of adverse effect of malaria on pregnancy.

3.3. Over all knowledge score of respondents about malaria

From total respondents, 410(65.5%) had good knowledge about malaria cause, transmittion, adverse effect and prevention mechanisms and 216(34.5%) of pregnant mothers had poor knowledge about malaria.

3.4. Knowledge of pregnant mother about long lasting insecticide bed net

Majority, 604(96.5%) of pregnant mothers had information about long lasting insecticide mosquito net (LLIN) and 537(85.8%) knew that LLIN is needed in especial case for pregnancy (Table 4).

Over all knowledge score about long lasting insecticide bed net

Out of 626 participants, 430(68.7%) respondents had good knowledge about long lasting insecticide bed net and other 196(31.3%) respondents had poor knowledge about LLIN.

3.5. Utilization of LLIN by pregnant mother previous night of data collection

Prior to data collection/interview, the utilization of LLIN by pregnant mothers by interview was (553) 88.3% with 95% CI (85.6%, 90.7%). Those pregnant mothers had given priority by family members in the shortage of LLIN in the house (77%) and perception of pregnant mothers more at risk for malaria than non-pregnant mothers (59.3%).

3.6. Morning observation of practical utilization of long lasting insecticide bed net

Majority of pregnant mothers, (96.3%) sleeping with only one person or she alone, 439(70.1%) hanged properly, 496(79.2%) found sleeping during observation, 328(52.4%) stretched long lasting insecticide bed net (LLIN) properly in the sleeping area and 590(94.2%) observed LLIN have not any hole or damage.

Over all observation practical utilization of long lasting insecticide bed net (LLIN)

By observational out of five practical long lasting insecticide bed net utilization points, those fulfilled four and above were (68.8%) which was recorded as good utilization practice, which is above the mean score value. The mean and standard deviation of LLIN utilization was 3.92 and 1.192 respectively.

3.7. Factors associated with LLIN utilization

In order to determine what factors influence the utilization of LLINs, several socio demographic and LLIN related factors were entered in stepwise regression. The findings revealed that, there was a significant association between educational statuses, knowledge about malaria and knowledge about LLIN utilization.

Pregnant mothers with secondary school (AOR = 2.449(1.125, 5.33)), pregnant mothers who had good knowledge about malaria (AOR = 2.246(1.508, 3.344)) and had good knowledge about LLIN utilization (AOR = 2.1(1.417, 3.119)) were positively associated with LLIN utilization among pregnant women.

4. Discussion

In our study self-reported utilization of long lasting insecticide bed net was 88.3%. However, by observation, proper LLIN utilization by pregnant mother was 68.8% with 95% CI (65.1%- 72.5%) which is low as compared with the WHO recommendation and the study conducted in Nigeria [20, 21]. This might be due to pregnant mothers might not have been provided with appropriate health information regarding the appropriate utilization of LLIN during the provision of the nets and antenatal care (ANC) follow-up

time. This suggests that pregnant mother need to know how to hang LLIN properly. Demonstration and assistant with hanging should also be provided. In addition to verbal communication during distribution, posters with a key message should be available as back up reference. This study was high as compared with the study conducted in Adama Woreda, Oromia Regional State, Ethiopia 18.1% [19]. This difference may be due to the difference in time period; our study is after 10 years of this study, so there might be a knowledge, attitude and behavioral difference in between this time period.

Educational status, knowledge about malaria, knowledge about LLIN was variables significantly associated with LLIN utilization among pregnant mothers. In our study finding more than half (80.5%) of pregnant mothers get information from health institution which is consistent with the previous study in southern Ethiopia [4]. Study conducted in Limmu Seka district showed that participants who had information from health facility was 2 times more likely utilized LLIN than those who had no information from health facility[22].

The odds of LLIN utilization was 2.449 times more among secondary school education pregnant mothers than mothers who didn't attended any formal education(AOR = 2.449(1.125, 5.33)). This finding was consistent with studies conducted in Damot Pulasa district, Southern Ethiopia, Kenya and Zambia respectively [4, 18, 23]. This could be attributed to the fact that people who attended formal education were better aware of importance of malaria prevention methods including LLIN through reading, mass media and attending different training at community level [17].

In our study, the odds of LLIN utilization among pregnant mothers who had good knowledge about malaria (AOR = 2.246(1.508, 3.344)) was 2.246 times more than those who had poor knowledge about malaria. This finding was consistent with study conducted in Damot Pulasa district, Southern Ethiopia [17]. Our study finding showed that study participants who had good knowledge about malaria had good practice of long lasting insecticide bed net (LLIN) utilization. Pregnant mothers who had knowledge about malaria transmission; side effect on pregnancy, preventive methods gave more emphasis to utilize LLIN effectively to prevent themselves as well as their infants from malaria infection.

In this study, the odds of LLIN utilization among pregnant mothers who had good knowledge about LLIN (AOR = 2.1(1.417, 3.119)) was 2.1 times more than those pregnant mothers who had poor knowledge about LLIN. This might be due to lack of follow up by the health authority to the households of pregnant mothers after mass community health education regarding proper and safe utilization of LLIN. This study finding was also consistent with the study conducted in Nigeria (AOR = 1.8; 95% CI 1.4–2.5) [24] and Mirab Abaya district, southern Ethiopia (AOR = 2.51 (1.17, 5.37) [25].

4.1. Limitations of the Study

There could be social desirability bias during observation of LLIN utilization. Secondly, since the design is quantitative, it doesn't address cultural issues of the respondents.

5. Conclusion

This study concludes that although self-report utilization of long lasting insecticide bed net was high, practical utilization of LLIN by pregnant mothers was still low. Pregnant mothers who had good knowledge about malaria and LLIN and educated mothers were a positive significant factor for long lasting insecticide bed net utilization.

Abbreviations

ANC:Ante Natal Care,AOR:Adjusted Odd Ratio,APHI:Amhara Public Health Institute, CI:Confidence Interval, COR:Crude Odd Ratio, ITN:Insecticide Treated Net, LLIN:Long Lasting Insecticide Net, SPSS:Statistical Package For Social Science, WHO: World Health Organization

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the institutional review board of institute of public health, University of Gondar College of medicine and Health Sciences. Formal letter was written to south Gondar zone from Amhara region. Then official permission letter was obtained from South Gondar zone and Fogera district health office. Written informed consent was obtained from each study participant. Confidentiality of information and privacy was maintained.

Consent for publication: Not applicable

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests.

Funding: University of Gondar. This study was done by the fund obtained from University of Gondar for the design and collection, analysis and interpretation of data. However, the funder has no specific role in the preparation of the manuscript.

Authors' Contribution

MDA, KGW, and DHT conceived and designed the protocol, performed the data collection, contributed for data analysis, wrote the paper and revised the manuscript.

SAB and DFT participate on the editorial and data entry and analysis. All authors read and approved the final paper.

Acknowledgments

The authors would like to pass their gratitude to University of Gondar for the approval of ethical clearance. We would like to extend our thanks to Amhara Regional health Bureau, Fogera health office and respected kebeles for permitting to conduct the study and providing the necessary preliminary information. The authors are also very grateful for data collectors and mothers who participated in this study.

References

1. Okoye IOaH. Factors Influencing Utilization of Intermittent Preventive Treatment and Long Lasting Insecticide Treated Bed Nets by Pregnant Women in Anambra State, Nigeria. 2016;1(7).
2. WHO. world malaria report 2016; world health organization206.
3. MACEPA. Ethiopia stakeholder analysis: The path Malaria Control and Elimination Partnership in Africa (MACEPA) June 2015.
4. Fuge TG, Ayanto SY, Gurmamo FL. Assessment of knowledge, attitude and practice about malaria and ITNs utilization among pregnant women in Shashogo District, Southern Ethiopia. *Malar J.* 2015;14(1):235.
5. WHO. World malaria report. 2017.
6. Federal democratic Republic of Ethiopia MoH. National malaria guidelines,third Edition2012.
7. malaria R. Evidences for advocacy: key statistics on the fight against malaria. 2015.
8. Ololade Ogunsanmi M, Arit Essang BPH, Titilayo Olaoye M, Andrew Solademi M, Bose Makinde M. Insecticide Treated Nets Usage and Barriers Among Pregnant Women Attending Ante-Natal Clinic in Ogun State, Nigeria. *European Scientific Journal* 2016;12.
9. Hill J, Hoyt J, van Eijk AM, ter Kuile FO, Webster J, Steketee RW. Prioritizing pregnant women for long-lasting insecticide treated nets through antenatal care clinics. *PLoS Med.* 2014;11(9):e1001717.
10. USPMI. President's malaria initiative ethiopia: Malaria operational plan fy 2017. 2017.
11. GFMER. Malaria in pregnancy, The Geneva Foundation for Medical Education and Research.
12. Ikeako LCAE, Njelita IA, et al. Insecticide Treated Nets: Perception and Practice among Pregnant Women Accessing Antenatal Services at a Tertiary Hospital in Awka, Nigeria. 2017;5(4).
13. Singh N, Shukla M, Sharma V. Epidemiology of malaria in pregnancy in central India. *Bulletin of the World health Organization.* 1999;77(7):567.
14. Malaria RB. Continuous long lasting insecticidal net distributions: a guide to concepts and planning. Geneva: World Health Organization; 2011.
15. WHO. world health stastics: monitoring health for the sustainable development goal. 2016.
16. EPHI. Ethiopian national malaria indicator survey 2015 technical summery; Ethiopian public health institute Addis Abeba Ethiopia. 2015.

17. Amanuel Ayza Shonga MTB, Tesfaye Falaha Boltana. Insecticide Treated Bed Nets Utilization among Pregnant Mothers and Associated Factors in Damot Pulasa District, Southern Ethiopia. 2018;16.
18. Choonara S. Factors affecting the use of malaria prevention methods among pregnant women in Kenya 2012.
19. FELEMA B. Assessment of Insecticide Treated Nets (ITNs) Utilization among Children under five years of age and Pregnant women of Adama Woreda, Oromia Regional State, Ethiopia. 2007.
20. WHO. Vector Control Technical Expert Group Report to MPAC Methods for maintaining coverage with long-lasting insecticidal nets (LLINs), world health organization. September 2013.
21. Ikeako LCAE, Njelita IA, et al. Insecticide Treated Nets: Perception and Practice among Pregnant Women Accessing Antenatal Services at a Tertiary Hospital in Awka, Nigeria. MOJ Public Health. 2017;5:4–2017.
22. Mitiku Teshome Hambisa¹ TD, Yadeta Dessie¹ and Tesfaye Gobena. Long lasting insecticidal net use and its associated factors in Limmu Seka District, South West Ethiopia. BMC Public health. 2012.
23. Rutagwera M-RI. Assessment of factors associated with utilization of insecticide treated bed nets among women of reproductive age: Observations from the Zambia national malaria indicator survey 2010.
24. Israel OK, Fawole OI, Adebowale AS, Ajayi IO, Yusuf OB, Oladimeji A, et al. Caregivers' knowledge and utilization of long-lasting insecticidal nets among under-five children in Osun State, Southwest, Nigeria. Malar J. 2018;17(1):231.
25. Tassew A, Hopkins R, Deressa W. Factors influencing the ownership and utilization of long-lasting insecticidal nets for malaria prevention in Ethiopia. Malar J. 2017;16(1):262.

Tables

Table 1: Sample size determination for factors of LLIN utilization by pregnant mothers in Fogera district, south Gondar zone, Amhara region, 2018.

Characteristics	Responses	Pregnant women utilized		Total	Proportion unexposed	among	COR=95%CI	Sample size
		LLINS						
		Yes	No					
Educational status	Illiterate	6	20	26	0.23		0.52	583
	Literate	15	26	41				
Occupational income	Farming	15	39	54	0.28		0.45	364
	Others	6	7	13				
LLIN use information	Yes	15	22	37	0.41		2.73	174
	No	6	24	30				

Table 2: Socio-demographic characteristics of pregnant mothers in Fogera district, south Gondar zone, Amhara, North West Ethiopia, 2018(n=626).

Variables	Frequency	Percent (%)
Age group(years)		
15-25	204	32.6
26-35	347	55.4
36-45	75	12
Religion		
Orthodox	585	93.4
Muslim	21	3.4
Others	20	3.2
Mrital status		
Single	32	5.1
Married	594	91.9
Occupational status		
Farmer	563	89.9
Merchant and others	63	10.1
Educational status		
unable to read and write	363	58
only read and write	138	22
primary school	60	9.6
secondary school	67	10.4
Main source of income		
Farming	607	97
Trading and others	19	3

Table3: Over all knowledge score of pregnant mothers about malaria in Fogera district, south Gondar zone, Amhara, 2018.

Level	Number	Percentage
good(4-6)	410	65.5
poor(<4)	216	34.5
Minimum=0	Mean=3.67	
Maximum=6	Standard deviation=1.019	

Table 4: Knowledge of pregnant mothers about LLIN in Fogera district, south Gondar zone, Amhara, 2018.

No	Variables(n=626)	Frequency	%
1	Having information about mosquito bed net	604	96.5
2	knowing what type of bed net they used	608	97.1
3	Knowing LLIN is given in especial case for pregnancy	537	85.8
4	Knowing how LLIN prevents malaria transmission	606	96.8
5	Knowledge on benefit of sleeping under the bed net(3.5/5)	185	29.6
6	Knowledge on using LLIN in all the year	450	71.9

Table 5: Over all knowledge score of pregnant mothers about long lasting insecticide bed net in Fogera district, south Gondar zone, Amhara, Ethiopia, 2018.

Level	Number	Percentage
good(5-6)	430	68.7
poor(<5)	196	31.3
Minimum=1	Mean=4.78	
Maximum=6	Standard deviations=0.891	

Table 6: over all utilization levels of LLIN by pregnant mothers in Fogera district, south Gondar zone, Amhara, Ethiopia, 2018

utilization of LLIN by pregnant mothers		
Level	Frequency	Percent
Poor(<4)	195	31.2
Good(4-5)	431	68.8
Mean=3.92	Std. deviation=1.192	

Table 7: Bivariate and multivariable logistic regression to identify factors associated with LLIN utilization of pregnant mother in Fogera district, south Gondar zone, Ethiopia, 2018.

Variables	LLIN utilization by pregnant mothers			
	Yes (%)	No (%)	COR (95% CI)	AOR(95%CI)
Occupational status				
Farmer	383(68)	180(32)	1.0	
Merchant and others	48(76)	15(24)	1.132(0.605, 2.116)	1.192(0.562, 2.528)
Educational status				
Unable to read and write	242(66.7)	121(33.3)	1.0	1.0
Can read and write only	97(70)	41(30)	1.183(0.77, 1.8)	1.08(0.68, 1.715)
El/ school	36(60)	24(40)	0.75 (0.423, 1.31)	0.733(0.397, 1.35)
Sec/school and above	56(86)	9(14)	3.11(1.489, 6.501)	2.449(1.125, 5.33)
Source of income				
Farming	415(68)	192(32)	1.0	1.0
Trading and others	16(84)	3(16)	2.467(0.711, 8.569)	1.557(0.415, 5.843)
Health worker as source of information about LLIN				
No	69	53	1.0	1.0
Yes	362	142	1.96 ^c (1.3, 2.9)	1.147(0.707, 1.859)
Use of chemical				
No	401(70)	175(30)	1.0	1.0
Yes	30(60)	20(40)	0.66(0.36, 1.18)	0.7(0.36, 1.359)
Access to LLIN				
No	418(70)	183(30)	1.0	1.0
Yes	13(52)	12(48)	0.47(0.21, 1.06)	0.565(0.229, 1.397)
Perceived quality of LLIN				
No	413(69)	182(31)	1.0	1.0
Yes	18(58)	13(42)	0.6(0.29, 1.27)	0.777(0.33, 1.832)
Maternal knowledge about malaria				
Poor	115(53)	101(47)	1.0	1.0
Good	316(77)	94(23)	2.683 (1.88, 3.828)	2.246(1.508, 3.344)
Maternal knowledge about LLIN				
Poor	105(53.6)	91(46.4)	1.0	1.0
Good	326(75.8)	104(24.2)	1.8 (1.273, 2.553)	2.1(1.417, 3.119)

X^c = significant at crude but not significant at adjusted odd ratio