Original Research Article

Factors associated with use of long lasting insecticidal net in Kailali District, Nepal

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ABSTRACT

Background: Malaria is the protozoan disease caused by the parasite of genus plasmodium. As per the World Health Organization Global Malaria Program, the primary intervention for effective malaria control is distribution of insecticide-treated nets, more specifically long-lasting insecticidal net, to achieve full coverage of populations at risk of malaria. The aim of the study was to identify associated factors with use of long-lasting insecticidal net in Kailali district.

Methods: A community based quantitative cross-sectional study was carried out in 5 village development committees of Kailali district. Altogether 450 households which were determined based on probability proportional to household size. Analysis of association was made by bivariate logistic regression and multivariate logistic regression. Ethical approval was taken from Institutional Review Board, Institute of Medicine and written informed consent from each participant.

Results: The study showed the proportion of use of long-lasting insecticidal net was 60% and net retention rate was about 96%. About 53% of households had net density of less than 0.5. Almost one-third of respondents had good knowledge about malaria. There were bad practices regarding to handling of nets. The study found strong significant association between long lasting insecticidal net use and factors such as wealth status, education, net density and knowledge about malaria.

Conclusions: There were some bad practices in regards to handling nets. It needs to be focused on net utilization behaviours change activities. Further extensive study particularly qualitative one on behaviours related to use of bed nets should be carried out.

Keywords: Long lasting insecticidal net, Net retention rate, Village development committees

INTRODUCTION

Malaria is the protozoan disease caused by the parasite of genus plasmodium. In context of Nepal only two species are known to cause malaria. It is the vector borne disease, transmitted by the bite of infected female anopheles mosquito.[1,2] In SEAR, ten out of eleven countries are endemic. There were 27 million cases and 42,000 deaths due to malaria in 2012 in the region, where around 1.4 billion people are at risk. Countries in the Asia Pacific region are making substantial progress towards eliminating malaria. Nepal is the one from where malaria

cases have been reported continuously.[3,4] The World Health Organization/Global Malaria Program (WHO/GMP) recommends the following three primary interventions for effective malaria control to move towards achieving the MDG by 2015.[5] 1) Diagnosis of malaria cases and treatment with effective medicines, 2) distribution of insecticide-treated nets (ITNs), more specifically long-lasting insecticidal net (LLIN), to achieve full coverage of populations at risk of malaria and, 3) indoor residual spraying (IRS) to reduce and eliminate malaria transmission.

Vector control is one strategy that Nepal is employing to eliminate Malaria. Long lasting insecticidal treated nets are an integral component of the recommendation for vector control. Nepal aims to eliminate or achieve near zero transmission of malaria by 2015. LLIN distribution is one of the major strategic interventions being implemented to achieve national goal. Activities are being focused in order to fulfil gaps between control and pre-elimination with a vision of malaria free Nepal by 2026.[4]

It is clear that, net ownership is a necessary prerequisite for net utilization. However, whether or not a net owner will use a net every night, some nights or not at all depends on complex multi-level interactions between individual characteristics, household characteristics, social and cultural factors, community level factors, aspect of the physical environment and the characteristics of net itself.[6-8] The aim of the study was to identify associated factors with use of long-lasting insecticidal net in Kailali district.

METHODS

Study design, study population, and sample size

The paradigm of the study was quantitative. The study was community based cross-sectional study. Five VDCs of 16 VDCs in which government of Nepal distributed LLIN in the year 2013 were selected as study area. Total households across the study VDCs were taken as sampling frame. Each household was considered as sampling unit. Kailali district was selected purposively. Ward of each VDC was considered as cluster. There were altogether 45 clusters across 5 VDCs and 15 clusters were selected based on probability proportional to HH size and 30 HHs were taken from each cluster by spin-the-pen method. Households that hadn't received LLIN were not included in the study. Respondent less than 18 years of age was excluded from the study.

Sample size determination

The sample size was 446 calculating by using Epi info version 7 with estimation of the values; expected frequency- 50%, confidence limits- 7%, confidence interval- 95%, design effect- 2, clusters- 15, calculated sample size- 405.

Assuming non response rate of 10%, final sample size was 446 (30 were taken from each cluster).

Data collection procedures

Data were collected by researcher himself and trained enumerator. One enumerator was selected for data collection. In net owning households, interviewer asked permission to enter and observe LLINs and observe whether the net was hanging correctly over sleeping places. The respondents were asked about: presence, number, use, duration of acquisition, practice regarding washing. Face-to-face interview with the head of household was used as data collection techniques. Semi-structured questionnaire and observation checklist were used as tools. Interview was conducted with the head of household, or another adult was taken as respondent if the head of household absent or unable to respond for any reason.

Data management and statistical analysis

The data obtained in manual form were checked for consistency and completeness. Then the data were subjected to electronic form through data entry process in Epi Data version 3.1. Further data were exported to SPSS version 20. Descriptive analysis of all indicators regarding LLIN usage with respect to predictor variables was done through calculating frequency, proportions and appropriate with 95% confidence intervals. Firstly, a bivariate analysis was performed to test the existence of significant association between utilization of LLIN and selected factors.

Secondly, the significant variables (p value <0.05) observed in bivariate analysis were subsequently included in multivariate analysis. Logistic regression model was applied to examine independent associations between independent variables and binary dependent variable (LLIN use).

Validity and reliability

Questionnaire was developed based on study objectives and variables, using related articles. Using the standard questionnaire used by malaria indicator survey, roll back malaria with necessary modification in the local context, maintained validity of the study. For ensuring validity of the information, observation of the net was made along with interview.

The language of the study technique and tool was Nepali. Translation of the tool into Nepali and back translation into English was done.

Ethical consideration

Approval letter and certificate of consent was taken from Institutional Review Board (IRB) of Institute of Medicine (IOM), University (TU). The purpose of the study was

shared and informed written consent was obtained from each respondent. Permission was obtained from Department of Community Medicine and Public Health (DCMPH), IOM and DPHO Kailali.

RESULTS

As information depicted in Table 1, about 48% populations was in the group 20 to 39 years, 42% and the mean age of the study population was 41.1 years with the standard deviation 11.7 years.

Table 1: Socio-demographic and wealth status of the respondents.

Characteristics	Number (n=445)	%
Age (years)		
20-39	214	48.1
40-59	187	42.0
≥60	44	9.9
Mean age; Mean±SD	41.1±11.7	
Sex		
Male	270	60.7
Female	175	39.3
Education		
Illiterate	156	35.0
Non formal education	71	16.0
Primary	113	25.4
Secondary	68	15.3
SLC or above	37	8.3
Marital status		
Married	426	95.7
Widow or divorced	19	4.3
Occupation		
Agriculture	348	78.2
Daily labour	24	5.4
House maker	24	5.4
Business	16	3.6
Private employee	14	3.1
Public servant	11	2.5
Others	8	1.8
Religion		
Hindu	411	92.4
Buddhist	23	5.2
Christian	6	1.3
Others (Kirat, Muslim, Nirankar)	5	1.1
Ethnicity		
Disadvantaged janajati	221	49.7
Upper caste	135	30.3
Dalit	84	18.9
Religious minorities	3	0.7
Advantaged janajatis	2	0.4
Wealth quintile		
Lowest quintile	86	19.3
Second quintile	90	20.2
Middle quintile	89	20.0
Fourth quintile	90	20.2
Highest quintile	90	20.2

In regards to sex of the study population, 60.7% were male and 39.3% were female. More than one-third (35%) of the study populations were illiterate. In regards to marital status, 95.7% of study populations were married and 4.3% were widow or divorced. Majority of the study population were involved in agriculture which was 78.2%, followed by daily labour and house maker. Majority (92.4%) of the study populations were from Hindu religion and regarding ethnicity almost half (49.7%) of study populations were from disadvantaged janajati. About 19% of respondents were from lowest quintile, 20.2% from second quintile, 20% from middle quintile, 20.2% from fourth quintile and 20.2% from highest wealth quintile.

Status of bed nets and household characteristics

As per information shown in Table 2, there were altogether 1256 usable nets. Among those 1184 were LLIN and 72 were other than LLIN.

Table 2: Status of bed nets and household characteristics.

Characteristics	Number	Percentage
Usable bed net	1256	
LLIN (among usable bed net)	1184	
Other than LLIN	72	
Number of LLIN when got	1234	
Number of LLIN at present	1184	
Number of LLIN Lost	50	
Reason for loss(n=50)		
Destroyed	50	100
Net retention		
Net retention rate	1184/1234 *100	95.95
Average number of nets per household	2.7±0.9	
Household size		
Two to four	94	21.1
Five to seven	247	55.5
Eight and above	104	23.4
Average household size	6.1±2.2	
Net density		
zero to 0.499	237	53.3
0.5	131	29.4
0.51	77	17.3
Wall material		
Mud	372	83.6
Cement	68	15.3
Wood planks	3	0.7
Sticks	1	0.2
Others	1	0.2
Roof material		
Mud sheet	159	35.7
Cement sheet	138	31.0
Galvanized sheet	97	21.8
Thatch	28	6.3
Cement	23	5.2

At the time of receiving, there were 1234 LLIN and within one year of time period, the LLIN were 1184 remained. Fifty bed nets were lost. The main reason for losing net was destroyed. The average number of nets per household was 2.7 with the standard deviation of 0.9. About 21% of the households had household size of two to four people, 55.5% HHs had five to seven people and 23.4% had eight and above. The average household size was 6.1 with standard deviation of 2.2. In regards to net density, 53.3% households had net density of 0 to 0.499, 29.4% households had 0.5 and 17.3% household had greater than 0.51. Eighty four percent of households had wall made up of mud, 15.3% of HHs had wall made up of cement and regarding the roof material, 35.7% had mud sheet, 31% cement sheet, 21.8% had galvanized sheet, 6.3% had thatch and 5.2% had cement.

Knowledge about malaria

As information depicted in Table 3, about 82% of the respondents had known that malaria was transmissible disease. However, only about 20% of respondents had known about the route of transmission of malaria. About 27% of respondents had known about the signs and symptoms of malaria. Similarly, 27.2% of respondents had known about the ways of prevention of malaria. In regards to overall knowledge, about 52% of the respondents had average knowledge on malaria, 32% had good knowledge, and 16% had no knowledge on malaria.

Table 3: Knowledge about malaria.

Characteristics	Number	%
Does malaria transmit? (n=445)		
Yes	363	81.6
No	82	18.4
Know about ways of transmission (n=363)		
Yes	71	19.6
No	292	80.4
Know about cause of malaria (n=445)		
Yes	7	1.6
No	438	98.4
Know about signs and symptoms of malaria (n=445)		
Yes	120	27
No	325	73
Know about way of prevention (n=445)		
Yes	121	27.2
No	324	72.8
Overall knowledge about malaria (n=445)		
Good knowledge	142	31.9
Average knowledge	232	52.1
No knowledge	71	16.0

Long lasting insecticidal net use and handling

As per the information shown in Table 4, the proportion of use of LLIN was found 60%. Among the users of last night, 98.9% had tucked the net while sleeping.

Table 4: Long lasting insecticidal net use and handling.

Characteristics	Number	%
Slept under LLIN last night (n=445)		
Yes	265	59.6
No	180	40.4
Proportion of use of LLIN	59.6 (95% CI 55.1-64.1)	
Reason for not using net (n=180)		
Not enough Net	109	60.5
No mosquito now	83	46.0
Torn net	24	13.3
Any other reason	4	2.2
Tuck a net among users (n=265)		
Yes	262	98.9
No	3	1.1
Period of the year net use (n=445)		
All year	50	11.2
Only the rainy season	395	88.8
LLIN taken outside the house for use (n=445)		
No	440	98.9
Yes	5	1.1
Where does these nets used(n=5)		
Field	4	80
Farm hut	1	20
Period of taking LLIN outside the house (n=5)		
Rainy season	5	100
LLIN use over material		
Reed mattress	81	18.2
Wooden bed	422	94.8
Washing net ever had (n=445)		
Yes	379	85.2
No	66	14.8
Washing material (n=379)		
Soap and detergent powder	198	52.2
Plane water	101	26.6
Detergent powder	80	21.2
Net soaked during washing (n=379)		
Soaked	200	52.8
Not soaked	179	47.2
Scrub net during washing (n=379)		
No	378	99.7
Yes	1	0.3
Drying net after washing (n=379)		
Other than shade	195	51.5
Shade	184	48.5
Keeping net over the bed (n=445)		
Tightly hanging over bet	424	95.3
Folded on the bed	11	2.5
Softly hanging over bed	10	2.2

In regards to the net use of the year, 88.8% of the population used LLIN during the rainy season only and 11.2% used throughout the year. It was found that 94.8% of LLIN used over wooden bed and 18.2% over reed mattress. About 85% of the respondents reported they had washed their net at least once before. Among those who washed the net, 52.2% used soap and detergent powder

while washing, 26.6% washed with plane water and 21.2% used detergent power only. About 53% of the population reported that they soaked net during washing.

After washing net, nearly half of the study population dried net under sun. In regards to net hanging over the bed, 95.3% of respondents hung net tightly over the bed.

Table 5: Bi-variate analysis showing association between different independent variables and LLIN use.

Characteristics	LLIN use (n=445)		COR	95% CI	P value
	No (n=180) number (%)	Yes (265) number (%)			
Age					
20 to 39 years	83 (46.1)	131 (49.4)	1		
40 to 59 years	77 (42.8)	110 (41.5)	0.91	0.61-1.35	0.626
≥60 years	20 (11.1)	24 (9.1)	0.76	0.4-1.46	0.412
Sex					
Male	92 (51.1)	178 (67.2)	1.96	1.33-2.89	0.001
Female	88 (48.9)	87 (32.8)	1		
Education					
Illiterate	133 (73.9)	94 (35.5)	1		
Literate	47 (26.1)	171 (64.5)	5.13	3.39-7.81	<0.001
Marital status					
Widow or divorced	10 (5.6)	9 (3.4)	1		
Married	170 (94.4)	256 (96.6)	1.67	0.67-4.20	0.273
Ethnic group					
Dalit(Ref)	62 (34.4)	22 (8.3)	1		
Others	118 (65.6)	243 (91.7)	5.8	3.40-9.9	<0.001
Occupation					
Agriculture	140 (77.8)	208 (78.5)	1		
Others	40 (22.2)	57 (21.5)	0.959	.607-1.52	0.858
Wealth status					
Lowest	114 (63.3)	32 (12.1)	1		
Middle	50 (27.8)	99 (37.4)	7.05	4.2-11.85	<0.001
Highest	16 (8.9)	134 (50.5)	29.84	15.58-57.15	<0.001
Household size					
Zero to 5	90 (50)	116 (43.8)	0.78	0.53-1.14	0.196
Six and above	90 (50)	149 (56.2)	1		
Net density					
0-0.499	115 (63.9)	122 (46.0)	1		
0.5	47 (26.1)	84 (31.7)	1.63	1.09-8.61	0.020
0.51 and above	18 (10)	59 (22.3)	3.09	1.72-5.55	<0.001
Knowledge about malaria					
Good knowledge	42 (23.4)	100 (37.7)	9.24	3.96-21.54	<0.001
Average knowledge	89 (49.4)	143 (54.0)	6.24	2.86-13.61	<0.001
No knowledge	49 (27.2)	22 (8.3)	1		

COR= Crude odds ratio, CI= Confidence interval, Significant= p value<0.05.

Bivariate association between different independent variables and LLIN use is shown in Table 5. The association between age as independent variable and LLIN use as dependent variable was not found significant. Regarding the sex of the heads of household, the LLIN use among male is 1.96 times higher than households of having female as household head (95% CI 1.33-2.89).

The association between LLIN use and independent variables such as occupation, marital status were not found significant. In regards to educational level of heads of household, the LLIN use among literate was found

5.13 times higher than households of having heads were illiterate (95% CI 3.39-7.81). In regards to ethnic group, the use of LLIN was found 5.8 times higher among other ethnic groups than Dalit (95% CI 3.4-9.9). In this bivariate analysis, the use of LLIN was found 29.84 and 7.05 times higher among highest wealth status (95% CI 15.58-57.15) and middle wealth status (95% CI 4.2-11.85) than that of respondents from lowest wealth status.

The study showed no any significant association between household size and LLIN use. The use of LLIN was found 3.09 times higher among the households of net density over 0.51 (95% CI 1.72-5.55) and 1.63 times

higher among the households of net density of 0.5 (95% CI 1.09-8.61) than households of net density less than 0.5.

As information shown in the table, the association between LLIN use and knowledge about malaria was found highly significant. Population having good knowledge about malaria had 9.24 times higher use of LLIN (95% CI 3.96-21.54) and of having average knowledge about malaria had 6.24 times higher use of LLIN (95% CI 2.86-13.61) than population having no knowledge about malaria.

Table 6: Multi-variate binary logistic regression analysis.

Characteristics	Unadjusted OR	AOR	95% CI	P value
Wealth status				
Lowest	1			
Middle	7.05	7.46	3.3-16.89	<0.001
Highest	29.84	18.96	7.02-51.21	<0.001
Knowledge about malaria				
No knowledge	1			
Average knowledge	6.24	6.17	2.13-17.85	0.001
Good knowledge	9.24	5.40	2.05-14.26	0.001
Education				
Illiterate	1			
Literate	5.15	2.91	1.41-6.01	0.004
Net density				
0-0.499	1			
0.5	1.63	2.41	1.03-5.65	0.043

AOR = Adjusted odds ratio, CI = Confidence interval, Significant= p<0.05

Multi-variate associations between LLIN use and explanatory factors are shown in Table 6. The variables which were significant at 95% confidence interval (p<0.05) in bivariate analysis were put into multivariate analysis.

Among the variables showed significant association in bivariate analysis, independent variables such as; sex, religion, ethnic group, household size were not found significant. However, the association between LLIN use and independent variables such as, wealth status, education, net density and knowledge about malaria were found highly significant. In regards to wealth status, the use of LLIN was found 18.96 times higher among population from highest wealth status (95% CI 7.02-51.21) and 7.46 times higher among population form middle wealth status (95% CI 3.3-16.89) than the population from lowest wealth status. The study showed the significant association between LLIN use and level of knowledge about malaria. The use of LLIN was found 5.4

times higher among population who had good knowledge (95% CI 2.05-14.26) and 6.17 times higher among population who had average knowledge (95% CI 2.13-17.85) than population who had no knowledge about malaria. Net density has also significant role in using LLIN. Households having net density of 0.5 had 2.41 times higher use of LLIN (95% CI 1.03-5.65) than HHs of having net density of 0.499 and less. The study showed that education was the independent factor of using LLIN. The LLIN use was found 5.15 times higher among literate (95% CI 1.41-6.01) than among illiterate.

Table 1: The knowledge about the disease caused by dog bite (n=111).

Disease	Frequency (%)
Rabies	52 (46.8)
Don't know	59 (53.2)
Total	111 (100)

DISCUSSION

Kailali is one of the high malaria risk districts of Nepal. Therefore, government has adopted free distribution of net in the district as a major preventive measure for malaria. This study has tried to assess utilization of LLIN in household of Kailali district. The study also tried to find out the status and proportion of use of LLIN along with practices of handling of it. In each household, the practice of LLIN use was observed among head of households.

The proportion of use of LLIN was fairly low in Kailali district where as many as 60% of respondents were reported to have used LLIN the previous night. It was below the WHO target of 80% after free distribution of net.[9] Study carried out in Ethiopia showed that the proportion of net use was 50.9%.[7] However, study carried out in Benin showed the use of LLIN was 84.8%.[10] Similarly several studies found the use of LLIN was in between 50% and 84.8%.[11-13] One of the reasons for low use of LLIN as compared to WHO target could be the lack of strong educational campaigns accompanying LLIN distribution. Another reason for low uses could be seasonality, the study carried out during late rainy season.

The study found that the reasons for not using net were; not having enough net, no mosquitoes at present and torn nets. As per Pulford et al low mosquito density is the most widely identified reason for LLIN nonuse.[14] The study found good practice of using net, almost all net users tuck the net under the bed. The study carried out in Kenya, showed this practice is quite low. In regards to use of net round the year, only 11.2% of users used net throughout the year. Study carried out in Kenya found 93.9 % used all round the year.[15] The retention among those who received the LLIN found 95.95% was found higher than that found in similar studies.[16,17]

The study found 85% of the respondents washed their net before, which was higher than the finding of study carried out in Ethiopia.[17] Majority of respondents used some washing materials (soap, detergent or both) while washing, similar findings were observed in Kenya. However, the proportion of washing net with plain water was higher than the study carried out in Kenya. This bad practice of washing might be due to very dirtiness of net and it was because of nearby kitchen of sleeping room. The practice of scrubbing net while washing was quite low, which was consistent with the findings from Kenya. The practice of drying net under other than shade was 51.5% which was as high as found in Kenya study. This study found that good practice of handling bed net over the bed as compared to the finding of the study carried out in Kenya.[15] The study found about one third of the population had good knowledge about malaria and half of the population had average knowledge while in other studies showed it was less than this finding.[10]

The study tried to find out the associated factors with use of LLIN through bivariate analysis and multi-variate binary logistic regression analysis. In bivariate analysis, the association is analyzed with different categories of variables like demographic characteristics, socioeconomic characteristics, household characteristics and individual characteristics. The study found no statistical association between LLIN use and age group of the study population which was in contrast to other several studies. The study of Tokponnon et al in Benin and study carried out in Africa showed statistical significance association with age group.[11,18] Therefore, it is recommended for the further study. The study found gender of heads of household significantly associated with use of LLIN. In household having male as head of HHs had 1.96 times higher use of LLIN than the HHs of having female as head. This could be due to behavioral nature of female giving net to other member of household in case of net scarcity. However, the study carried out by Sena et al in Ethiopia showed, there was no any statistical association between gender of head of household and use of LLIN.[12] Socio-economic factors such as education, marital status, ethnic group, occupation and wealth status put into bivariate analysis to identify the association with LLIN use. Education, ethnic group and wealth status were found significantly associated with LLIN use. Several other studies had shown insignificant association with level of education and use of LLIN.[12,15,19] Level of education might have strong implication on use of net.

The study found the significant association of LLIN use with ethnicity of population. The use of LLIN was 5.8 times higher among other ethnic groups than Dalit. This might be due to low social characteristics of Dalit in the community. Similar finding had been observed in study carried out in China by Xu et al in 2014 and they had shown the low use of bed net among Jinuno people the marginalized ethnic community.[20] This study found the more use of LLIN among households from higher wealth status. The association between LLIN use and wealth status was found significant. The use of LLIN was 29.84 and 7.05 times higher among households from highest and middle wealth status than households of lowest wealth status. The study also showed independent association of wealth status of household with use of LLIN in multivariate analysis. The study carried out by Nagolde et al and Graves et al had shown the similar association of LLIN with wealth status.[6,7] Since wealth status is associated with higher education, having standard of living, it was likely that use of LLIN associated with this factor, as was observed by Hwang et al 2010.[21]

The present study found no any association between LLIN use and marital status of household head. This was the similar finding of the study carried out in Ethiopia by Sena et al.[12] Other studies carried out in Kenya and Nigeria reported marital status of head of household was not associated with use of LLIN.[22] Similarly, this study found, there was no any significant association between LLIN use and occupation of head of household. The study carried out by Sena et al in Ethiopia, had shown that there was no any significant association between LLIN use and type of occupation of head of household.[12]

The present study found the high significant association between knowledge about malaria and use of LLIN. The study found knowledge about malaria as independent factor for use of LLIN, which was observed in multivariate model of analysis. Having knowledge about malaria particularly ways of transmission, methods of prevention might have increased the perceived risk of malaria. Several other studies carried out in different part of the globe showed significant association of LLIN use with level of knowledge about malaria.[23,24]

The study found significant association between use of LLIN and net density. Net density of less than 0.5 represents the inadequacy of net and such condition decrease use of LLIN. The study found 3.09- and 1.63- times higher use of LLIN in household having net density of greater or equal to 0.51 and 0.5 respectively than the net density of less than 0.5. In general, increase availability of nets in households as assessed in cross sectional surveys was associated with increased net use.[25,26] The study carried out by Ngondi et al and Graves et al in Ethiopia had similar association observed between use of LLIN and net density.[6,7] The study found that there was no any significant association between household size and use of LLIN as found in study carried out by Tokponnon et al in Benin and Baume et al in Ethiopia.[10,11]

CONCLUSION

The study was carried out across five VDCs of Kailali districts, in which government of Nepal with partnership of development agencies had distributed long lasting insecticidal net free of cost in 2013. The main general

objective of the study was to assess the factors associated with use of LLIN.

Based on the findings and objectives of the study following conclusions are made. The proportion of use of LLIN was found 60%. The retention rate of the nets was found higher in the community where it was 95.95%. Among the users, the practice of using net was good. Majority of users used their nets in their own house, hung nets correctly and tuck their net under the bed while sleeping. Knowledge about malaria, wealth status, education level and net density were associated with use of LLIN. Having good knowledge about malaria showed strong association with use of LLIN. The use of LLIN was 19 times higher among highest wealth status than of having lowest wealth status.

Although free distribution of net is one of the ways of achieving universal coverage of LLIN in the community, it is an important to focus on behaviour change communication part of the program that would promote the use of LLIN. The behaviour program interventions should find on targeted groups in which the use of LLIN was found low.

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