Volume 19 Issue 6
Originally issued as F2



Global Journal of Medical Research: F
Diseases
Volume 19 Issue 2 Version 1.0 Year 2019
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

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Keywords: *residents Insecticide treated nets (ITNs), utilization.*

GJMR-F Classification: *NLMC Code: QW 160*



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Factors Associated with Utilization of Insecticide Treated Nets among Residents of Kamwenge Town Council-Kamwenge District-Uganda

Ikiriza Antony [α], Maureen Andinda [σ], Prof. Rubaihayo John [ρ] & Prof. A R Semana [ω]

Abstract- Background: Malaria continues to be a leading cause of morbidity and mortality in sub-Saharan Africa. In Uganda, malaria remains the leading cause of morbidity, accounting for 30 to 50 percent of outpatient visits, 15 to 20 percent of admissions, and 9 to 14 percent of inpatient deaths. The first national-wide Insecticide Treated Nets (ITNs) coverage campaign was launched in 2010 targeted at households with pregnant women and children below 5yrs of age. The study assessed factors associated with utilization of Insecticide Treated Nets (ITNs) among residents of Kamwenge Town Council, Kamwenge District-Western Uganda.

Methodology: The study design was cross-sectional in which data were collected using an interviewer administered structured questionnaire and analyzed using Stata version 13.

Results: A total of 285 respondents were interviewed of which 39.7% were male. Ownership of ITNs was 60% whereas utilization in the night prior to the study was 54.4%. The factors associated with the ownership of the ITNs included: marital status: married respondents *(p=0.05),* level of education *(p=0.001)*, knowledge of malaria cause *(p=0.033),* presence of children under 5 years *(p=0.025).* The factors associated with the utilization of ITNs included: marital status of the respondents: married respondents *(p=0.018)*, education level *(p=0.009)*, presence of children under five years *(p=0.048),* knowledge of cause of malaria *(p=0.019)*, having faced challenges in using ITNs *(p=0.001),* and malaria episode in the last one month *(p=0.011).*

Conclusion: The study concludes that the ownership and utilization of ITNs were low since they were all below the national target of universal coverage. The factors statistically associated with the ownership of the ITNs included: marital status, level of education, knowledge of malaria cause and the number of children under 5 years in a household. The factors statistically associated with the utilization of ITNs were marital status, education level of the respondents, and presence of children under five years of age in the household, having knowledge about malaria, having faced challenges in using ITNs in the past and malaria episode in the last one month.

Keywords: residents Insecticide treated nets (ITNs), utilization.

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I. Background

Malaria is the leading cause of morbidity and mortality in the tropical religion accounting for 3.2 billion deaths with its peak of 1.2 million in 2013 and Malaria mortality has been steadily decreasing since 1990 but 90% of the deaths occurred in Africa with Uganda having the third highest number of malaria cases after Democratic Republic of Congo and Nigeria [1], [2], [4].

The World Health Organization's Global Malaria Programme recommends use of Insecticide-Treated Nets (ITNs) as one of the three major means of malaria vector control to reduce malaria transmission but in 2013, only 49% of the people at risk in Sub Saharan Africa had access to ITNs yet ITNs efficacy against malaria episodes of approximately 50% [2], [3], [4], [5].

Uganda adopted a policy of universal LLIN coverage of one net per two persons to protect all people from malaria and conducted a community mass campaigns and through public health facilities that target pregnant women and children under 5 years on a routine basis and several community mass distribution of nets since 2010 [6].

However the utilization of ITNs in Kamwenge Town Council is still not known and the study aimed at determining the factors that influence utilization of ITNs among residents of Kamwenge Town Council.

II. Methodology

a) Study Design and setting

This was a household based survey that was conducted in Kamwenge Town Council that the main town of the district and a centre for most of the activities like Administrative services, business and other social amnesties located in Western Uganda a distance of 400km from the capital city Kampala by road.

b) Sample Size estimation, sampling procedure and data collection

The sample 299 was determined using a standard formula by Kish Leslie (8) assuming a standard error of 5% and 77.1% of households with at least one insecticide- treated net in Tooro region and 10% non-response was included [8], [9]. Kamwenge Town council was selected purposively because it in the

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center of the district and has a mix of people from different backgrounds. A household list for each ward was obtained with the aid of the ward agents and they were used to randomly assign households to different research assistants during the data collection process. Household heads were interviewed and incase they were absent, the oldest household member 18 years and above was selected for the interview using a structured questionnaire that contained both close and open ended questions.

c) Ethical Considerations

Ethical approval was obtained from the Mountains of the Moon University, Directorate of Postgraduate Studies & Research seeking permission to conduct the study which was presented to the officials of the Kamwenge Town and written informed consent was obtained from the study participants.

d) Data Analysis

Data was analysed using STATA version 13 for data analysis, Chi square test was used to identify the factors that influence the utilization of ITNs. To identify the factors that are associated with utilization of ITNs, logistic regression analysis was used in which bivariate logistic regression was first used to identify the factors that could be associated with utilization of ITNs at a p-value <0.05 and the factors that were turned out to be associated with utilization of ITNs in the bivariate analysis were included into a multivariate logistic regression model to cater for the effect of confounders and effect modifiers and identify the independent predictors of utilization of ITNs.

III. Results

a) Demographic Characteristics

A total of 285 respondents were surveyed in July 2017. Majority of the respondents were aged 30-49 years 151(53%) with a mean age of 39.7 years, females 172 (60.4%) and married 221(77.8%) more demographic characteristics shown in table 1.

Table 1: Demographic Characteristics of the respondents (n=285)

Variable	Category	Frequency, n (%)
Age in years	10-29	72 (25.3)
	30-49	151 (53)
	50-69	56 (19.7)
	70 and above	6 (2)
Sex	Female	172 (60.4)
	Male	113 (39.6)
Marital status	Single	19(6.7)
	Married	222(77.8)
	Divorced	15(5.3)
	Widow	29(10.2)
Level of Education	No Education	136 (47.7)
	Primary	96 (33.7)
	Secondary	37 (13)
	Tertiary	16 (5.6)
Occupation	Business	45 (15.8)
	Civil Servant	16 (5.6)
	Farmer	210(73.7)
	Housewife	14 (4.9)
Religion	Bornagain	28(9.8)
	Catholic	150(52.6)
	Islam	12(4.2)
	Protestant	95(33.3)
No children under 5years	0	126(44.2)
	1	77(27.0)
	2	59(20.7)
	3	17(6.0)
	4	6(2.1)
the household	1-5	186 (62.3)
	6-10	90 (31.6)
	11-16	8 (2.8)
	17-22	1(0.35)
Ownership of ITNs	No	114(40)
	Yes	171(60)

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Utilization of ITNs by adults	No	130(45.6)
	Yes	155(54.4)
Utilization of ITNs by children <5years	No	54(34)
	Yes	105(66)
Number ITNs observed per household	1	74(43.3)
	2	66(38.6)
	3	22(12.9)
	4	7(4.1)
	6	1(0.6)
	7	1(0.6)
Type of the ITN owned	Polyester nets	42(24.6)
	Nylon nets	129(75.4)

Source: Field data, 2017

b) TN Ownership by Demographic Characteristics

The study found out a significant difference in the ownership of ITNs a cross the different marital statuses *(X^2 =12.50, p=0.006)*, levels of education whereby those with secondary and above level of education were more likely to own the nets *(X^2 =33.55, p=0.001)* as well as occupation of the respondents, number of children <5years in the household and number of people in household shown in table 2 below:

Table 2: ITN Ownership by demographic Characteristics

Variable	ITN ownership		X^2	P-value
	No n (%)	Yes n (%)		
Age				
10-29	30(41.7)	42(58.3)	3.17	0.366
30-49	55(36.4)	96(63.6)		
50-69	25(44.6)	31(55.4)		
70 and above	4(66.7)	2(33.3)		
Sex				
Female	67(38.9)	105(61.1)	0.20	0.656
Male	47(41.6)	66(58.4)		
Marital status				
Single	10(52.6)	9(47.4)	12.50	0.006*
Married	82(36.9)	140(63.1)		
Divorced	12(80.0)	3(20.0)		
Widow	10(34.5)	19(65.5)		
Education level				
No Education	68(50.8)	66(49.2)	33.55	0.001*
Primary	43(43.9)	55(56.1)		
Secondary	1(2.7)	36(97.3)		
Tertiary	2(12.5)	14(87.5)		
Occupation				
Business	14(31.1)	31(68.9)	17.51	0.001*
Civil Servant	0(0.0)	16(100.0)		
Farmer	97(46.2)	113(53.8)		
Housewife	3(21.4)	11(78.6)		
Religion				
Bornagain	15(53.6)	13(46.4)	4.10	0.252
Catholic	62(41.3)	88(58.7)		
Islam	3(25.0)	9(75.0)		
Protestant	34(35.8)	61(64.2)		
Number of children <5 years				
0	62(49.2)	64(50.8)	10.90	0.028*
1	25(32.5)	52(67.5)		
2	21(35.6)	38(64.4)		
3	6(35.3)	11(64.7)		
4	0(0.0)	6(100.0)		

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Number of people in household				
1-5	71(38.2)	115(61.8)	8.53	0.036*
6-10	43(47.8)	47(52.2)		
11-16	0(0.0)	8(100.0)		
17-22	0(0.0)	1(100.0)		

Source: Field data, 2017

* *Significantly associated at p<0.05*

c) *ITN utilization by demographic Characteristics*

There was a significant difference in ITN utilization across the different marital statuses of the respondents, with married respondents utilizing nets more than any other *(X^2 =11.49, p=0.009),* education level where by those educated to secondary level and beyond utilizing the nets than those who are not *(X^2 =35.25, p=0.001)* and other characteristics as shown in table 3 below:

Table 3: ITN utilization by demographic characteristics

Variable	ITN utilization		X^2	P-value
	No n (%)	Yes n (%)		
Age				
10-29	32(44.4)	40(55.6)	1.13	0.769
30-49	69(45.7)	82(54.3)		
50-69	25(44.6)	31(55.4)		
70 and above	4(66.7)	2(33.3)		
Sex				
Female	79(45.9)	93(54.1)	0.018	0.895
Male	51(45.1)	62(54.9)		
Marital status				
Single	10(52.6)	9(47.4)	11.49	0.009*
Married	95(42.8)	127(57.2)		
Divorced	13(86.7)	2(13.3)		
Widow	12(41.4)	17(58.6)		
Education level				
No Education	79(59.0)	55(41.0)	35.25	0.001*
Primary	45(45.9)	53(54.1)		
Secondary	3(8.1)	34(91.9)		
Tertiary	3(18.8)	13(81.2)		
Occupation				
Business	17(37.8)	28(62.2)	17.78	0.001*
Civil Servant	1(6.2)	15(93.8)		
Farmer	109(51.9)	101(48.1)		
Housewife	3(21.4)	11(78.6)		
Religion				
Bornagain	17(60.7)	11(39.3)	5.60	0.133
Catholic	71(47.3)	79(52.7)		
Islam	3(25.0)	9(75.0)		
Protestant	39(41.0)	56(59.0)		
Number of children <5 years				
0	68(54.0)	58(46.0)	10.34	0.035*
1	30(39.0)	47(61.0)		
2	25(42.4)	34(57.6)		
3	7(41.2)	10(58.8)		
4	0(0.0)	6(100.0)		
Number of people in household				
1-5	82(44.1)	104(55.9)	6.13	0.105
6-10	47(52.2)	43(47.8)		
11-16	1(12.5)	7(87.5)		
17-22	0(0.0)	1(100.0)		

Source: Field data, 2017

* *Significantly associated at p<0.05*

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d) *Factors associated with utilization of ITNs among residents of Kamwenge Town Council*

The factors that were identified to have a statistically significant relationship with the utilization of ITNs in the bivariate analysis at a p-value <0.05 included: marital status, level of education, occupation, religion, knowledge of malaria cause, number of children under 5 years in a household, malaria experience in the last one month and challenge in using ITNs. These were included in a multivariate logistic regression model to identify the predictors of utilization of ITNs as shown in table 5 below:

Table 4: Factors associated with utilization of ITNs among residents of Kamwenge Town council

	Bivariate analysis		Multivariate analysis	
Variable	cOR (95% CI)	P-value	aOR (95% CI)	P-value
Age				
18-29	1			
30-49	0.95 (0.54-1.67)	0.861		
50-69	0.99(0.49-2.00)	0.982		
70 and Above	0 .4(0.07-2.32)	0.308		
Sex				
Female	1			
Male	1.03(0.64-1.66)	0.895		
Marital status				
Divorced	1		1	
Married	8.70(1.92-39.42)	0.005*	8.4(1.44-49.40)	0.018*
Single	5.85(1.03-33.33)	0.047*	4(0.40-31.26)	0.257
Widow	9.21(1.75-48.53)	0.009*	12(1.70-84.05)	0.013*
Education level				
No education	1		1	
Primary	1.69(1.00-2.86)	0.050*	1.1(0.58-2.23)	0.713
Secondary	16.28(4.76- 55.67)	0.001*	6.3(1.57-25.65)	0.009*
Tertiary	6.22(1.69-22.88)	0.006*	2.0(0.30-13.64)	0.486
Occupation				
Business	1		1	
Civil servant	9.11(1.10- 75.27)	0.040*	3.7(0.27-50.20)	0.328
Farmer	0.56(0.29-0.09)	0.088	0.5(0.16-1.24)	0.121
Housewife	2.23(0.54-9.13)	0.267	2.5(0.43-14.71)	0.308
Religion				
Bornagain	1		1	
Catholic	1.72(0.75-3.92)	0.197	0.9(0.29-3.10)	0.926
Islam	4.64(1.02-21.00)	0.047*	1.3(0.18-9.23)	0.791
Protestant	2.22(1.00-5.25)	0.070	1.1(0.32-3.62)	0.907
Number of children < 5years				
0	1		1	
1	1.84(1.03-3.27)	0.039*	2.1(1.01-4.47)	0.048*
2	1.59(0.85-2.98)	0.143	3.0(1.34-6.64)	0.007*
3	1.67(0.60-4.68)	0.325	3.3(0.90-12.14)	0.071
Knowledge of malaria cause				
Knowledgeable	1		1	
Not Knowledgeable	1.53(0.33-0.85)	0.009*	0.5(0.26-0.90)	0.019*
Knowledge of use of ITNs				
Knowledgeable	1			
Not knowledgeable	0.44(0.15-1.26)	0.125		
Quality of the nets				
Intact	1			
Torn	1.29(0.46-3.62)	0.628		
Challenge in using ITNs				
Had challenge	1		1	
Had no challenge	4.27(2.50-7.27)	0.001*	6.1(3.12-12.03)	0.001*
Malaria experience in the last one month				
No	1		1	
Yes	0.42(0.25-0.69)	0.001*	0.4(0.20-0.81)	0.011*

Source: Field data, 2017,

* Significantly associated at p<0.05,
cOR-Crude odds ratio,
aOR-Adjusted odds ratio,
CI-Confidence interval.

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IV. Discussions

More than a half of the respondents 54.4% had slept under ITNs the night prior to the study. This could be because some people do not have the bed nets and others prefer not to use them. This agrees with Uganda Malaria Indicator Survey [6] findings that reported that 69% of the de facto household population slept under an ITN the night before the survey.

Of the 159 households that had a child below 5 years, 54(34%) reported that no child had slept under an ITN [10] also found out that despite the fact that ownership has been stable, available evidence shows that utilization of ITNs among children under five years of age has been low which is a gap between ownership and utilization is large.

Marital was found to statistically association with the utilization of the ITNs whereby married respondents slept under ITNs 8 times more than the divorced *(aOR=8.4, 95 CI: 1.44-49.40, p=0.018),* widows also slept under ITNs 12 times more than the divorced *(aOR=12, 95% CI: 1.70-84.05, p=0.013)* and the single respondents also slept under the ITNs 4 times more than the divorced ones. Given the fact they are in stable relationships, sleeping patterns could also be quite stable hence a high level of using ITNs than the divorced whose relationships are not stable.

The study found a statistically significant association between education level of the respondents and the use of ITNs whereby respondents who had attained secondary level of education slept under ITNs 6 times more than the un educated ones *(aOR=6, 95% CI: 1.57-25.65, p=0.009)* and the ones who had attained a tertiary level of education also slept under ITNs 2 times more than the un educated ones. This implies that such respondents are informed about the use of the ITNs and end up using the more than the uneducated who may not know. This finding is in line with findings of the study by Binka and others [11] who found out that demographic characteristics like age, education, size of household and ethnicity also influence use of bed nets.

Households in which there were children under five years of age used ITNs more than those in which there were no children and the association between the numbers of children in the household was statistically associated with the use of ITNs with households with one child using ITNs 2 times more than those in which there are no children and household with two children 3 times more than those without any children. This could be due to the fact that the Government of Uganda promotes use of mosquito nets by pregnant women and children under five years by providing mosquito nets to such women when they were pregnant which increases the ownership as well as use. This could also be due to the fact that the parents want to protect their children from malaria. This is in line with the findings by Biadgilign et al, [12] on determinants of ownership and utilization of insecticide treated nets for malaria control in Eastern Ethiopia that showed that households which had at least one under- five child the odds of owning any net was about 60% higher than those with no under-five children.

Having knowledge about malaria cause was statistically associated with the utilization of ITNs. The knowledgeable respondents slept under ITNs 0.5 times more than those who were not knowledgeable *(aOR=0.5; 95% CI: 0.26-0.90, p=0.019)*. This implies that knowing how to prevent increases possibility for such people to sleep under ITNs and this is in agreement with findings of studies by Berhane, and Worku, 2012 [13] that documented that the key factors which explain the use of ITNs for malaria prevention relate to perceptions, attitude and retention level of ITNs and that use of ITNs was found to be low among people with little knowledge on malaria prevention methods.

Having faced challenges in using ITNs in the past was also statistically associated with the use of ITNs where by the respondents who had no challenges slept under ITNs 6 times more than those that had challenges. This is due to the fact that such challenges like heat and allergies inconvenience the people's sleep and discourage use of the ITNs. This is in line with the findings of the study by [14] that found that the main reasons for not using LLINs were inconveniences due to heat, no LLIN and LLIN is washed or torn, [16] also reported similar findings such as forgetfulness, unavailability of nets, net washed, fatigue, illness, and heat.

Respondents who had suffered from malaria in the last one month slept under ITNs 0.4 times less than the ones who had not suffered from malaria and the relationship between malaria experience and ITNs use was statistically significant *(aOR= 0.4, 95%CI: 0.20-0.81, p=0.011).* This implies that suffering from malaria does not influence the use of ITNs but Onwujekwe *et al, in 2013* reported a different findings that perceived risk of malaria and benefits of the nets by the population also drive demand and that households with a recent attack of malaria were more likely to purchase net than their counterparts and that such communities have a perceived need for utilizing ITNs [15].

V. Conclusions

Utilization of ITNs was found to be 54.4% and almost a half of the respondents surveyed did not sleep under the net a night prior to the study. The factors that were found to be significantly associated with the use of ITNs are marital, education level of the respondents, presence of children under five years of age in the household, having knowledge about malaria, having faced challenges in using ITNs in the past and malaria experience in the last one month. To maximize the

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benefits of use of mosquito nets, strategies to deal with unwanted or damaged ITNs and other bed nets should be put in place since people are still using torn and old ITNs.

List of abbreviations

ITNs	Insecticide Treated Nets
LLINs	Long Lasting Insecticide Nets
MOH	Ministry of Health
NMCP	National Malaria Control Programme
UMIS	Uganda Malaria Indicator Survey
WHO	World Health Organization

Ethics and Consent to participate

Ethical approval was sought from the Directorate of Graduate studies and research Mountains of the Moon University Research and Ethics Committee and all participants consented in writing at the time of interview in their homes.

Competing interests

Authors declare that there is no conflict of interest in this study.

Authors' contributions

All authors conceived and designed the study; I A, RJ and AM collected, analysed, interpreted the data and drafted the manuscript; ARS critically revised the manuscript. All authors read and approved the final manuscript.

Acknowledgments

We thank study participants for providing information. Further, we acknowledge the support of Prof. AR Semana of School of Agriculture and Environmental Science of Mountains of the Moon University for his guidance.

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