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**Factors Affecting Utilization of Insecticide Treated Mosquito Nets among Children under Six Years in Mubende Town Council, Mubende District Uganda**

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**ABSTRACT**

Malaria is the leading cause of morbidity and mortality worldwide, especially among pregnant mothers and young children under six years, and particularly in Tropical Africa where at least 90 percent of malaria deaths occur. More than three-quarters of global malaria deaths occur in under-six children living in malarious countries in Sub-Saharan Africa. Insecticide-treated mosquito nets are the most powerful malaria control tool if used correctly. Yet up to date, utilization is still unacceptably low: only 3 percent of African children are currently sleeping under an ITN, and about 20 percent are sleeping under any kind of net. The aim of this study was to investigate factors affecting the utilization of ITNs among children under six years. A descriptive cross-sectional study was used and the clusters were divided using different zones in Mubende Town Council. Then, unbiased simple random sampling was applied. For those that were part of the inclusion criteria, a written consent form and pre-tested questionnaires were filled out by the caregivers. A total of 378 caregivers of children under six years participated in this study. Data obtained was exported to Statistical Package for Social Sciences (SPSS) version 19 for analysis. The study findings showed that the age of the mother, occupation of the caretaker, and her partner as well as knowledge about insecticide treated mosquito nets were significantly associated with the utilization of the ITNs among mothers of children below six years, majority of the respondents 203(53.7%) accessed insecticide treated mosquito nets from the government programs, 106 (28.0%) received the nets from community outreaches while the rest 69(18.3%) bought their nets from the shops or pharmacies. This study concluded that the utilization of ITNs among under six was relatively affected by the age of the mother, occupational status and partner's occupation. I would therefore recommend that the government carries out more mass distribution of ITNs to malaria-endemic areas and also educate the public on the dangers, prevention and treatment of malaria.

**Keywords:** Malaria, Pregnant Mothers, Under-six Years children, Insecticide-treated mosquito nets, Mosquitoes.

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**INTRODUCTION**

According to the reports of the World Health Organization, nearly 3.3 billion people in 97 countries are potentially at risk of malaria. Globally in the year 2015, an estimated 214 million cases of malaria and 438,000 malaria deaths were enumerated [1]. The problem of malaria in the African region is devastating and causes 78% of all deaths among under six years old children [2, 3]. As a child will typically be sick of malaria between 3-4 times in one year, the disease is a major cause of absenteeism in school-aged children, thus impeding their educational and social development and subsequently robbing the country of its future human resources [4]. Several global and regional attempts have been made at controlling the disease in the past with little success as a result of ineffective strategies

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used and insufficient resources [5]. However, the most recent launching of the Roll Back Malaria initiative has generated a lot of resources for the control of the disease with simple and cost-effective interventions, with a special focus on the most at risk. At the historic Malaria Summit hosted by Nigeria in 2000, African Heads of State made a declaration to halve the burden of malaria by the year 2010. One of the targets set for the first five years was to ensure that the vulnerable groups, children under six years of age and pregnant women, have access to and sleep under insecticide-treated mosquito nets (ITNs) [6]. Malaria can be prevented using cost-effective interventions. It can be prevented at large via the use of insecticide-treated mosquito nets (ITNs) [7, 8]. The use of ITNs decreases malaria mortality rates by 55% in under-six years old children in Africa, realizing the effectiveness, scaling up distribution, and utilization of ITNs to cover up to 100% of children less than six years of age. Knowing the factors affecting ITN utilization is essential for consistent and effective use of it. Many studies in Africa had shown similar findings [9, 10]. The distribution and use of ITNs is one of the main interventions for malaria infection prevention in developing countries [11]. Hence, policies of promoting universal access to ITNs are developed in most malaria endemic states [1]. But, the proportion of the population that slept under ITNs in 2015 in Sub-Saharan Africa was estimated to be 55%; and 68% of them were under-six years old children [1]. Malaria can be prevented and treated using cost-effective interventions including; vector control, which reduces transmission of parasites from humans to mosquitoes and then back to humans achieved largely through the use of insecticide-treated mosquito nets (ITNs) or indoor residual spraying (IRS); chemoprevention which suppresses blood-stage infection in humans; and case management which includes prompt diagnosis and treatment of infections [2, 3, 12]. In Uganda, the major national prevention activities include the distribution of long-lasting ITNs, IRS, and experimental larviciding with about 22 million long-lasting ITNs being distributed between 2013 and 2014 [13]. Although ownership of at least one ITN is widespread throughout Uganda, less than two-thirds of households (62%) have at least one net for every two persons although overall, there has been a substantial upward trend in ITN ownership in Uganda, from 16% in the 2006 to 90% [13]. But a prevalence of malaria in children alone of 30% goes to show that ownership of ITNs doesn't necessarily lead to utilization calling for the need to understand the factors that influence one's decision to utilize ITNs [14-16]. Malaria continues to be the leading cause of child mortality and morbidity in spite of government, NGOs, and the private sector's interventions to ensure that the children under six years, who are most vulnerable access, own, and sleep under ITNs. Malaria predisposes children to anemia culminating in escalating child mortality and morbidity [17-25]. Given the fact that malaria in Uganda continues to be the major cause of child mortality and morbidity in Uganda, yet ITNs have been made accessible to the population, the child mortality rates due to malaria are expected to decline which has not yet been realized [22-25]. It is upon this background that this study explores the intra-household factors that affect net utilization in Uganda. However, little is known about ITN utilization and factors associated with the utilization in under six years old children in the study area yet. Therefore, the purpose of this study is to find out factors affecting the utilization of insecticide-treated mosquito nets among children under six years in Mubende Town Council, Mubende district, Uganda.

## METHODOLOGY

### Study Design

Descriptive cross sectional study was used.

### Study Area

The study was carried out in Mubende Town Council, Mubende district.

### Study Population

Children under the age of six years living in Mubende Town Council.

### Inclusion Criteria

Mothers of all children under the age of six years whose caregivers received informed consent.

### Exclusion Criteria

Mothers of all children under the age of six years whose caregivers denied informed consent. Also, children above six years will be excluded.

### Sample Size Determination

The sample size was determined using the Kish Leslie (1965) formula i.e.  $n = Z^2 p(1-p) / E^2$ :

Where n=sample size

E=margin of errors 5%=0.05

Z=standard normal value corresponding to 95% confidence interval =1.96

P=expected proportions of children under six years that Are utilizing mosquito nets is at 47.8%

X= (1-0.478) =0.522

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$$n = \frac{(1.96)^2(0.522)(0.478)(0.052)^2}{n = 378}$$

The sample size for the study was 378 respondents

#### **Sampling Procedure**

Cluster random sampling where the clusters were divided using different zones in Mubende Town Council. Then, unbiased simple random sampling was applied. For those that were part of the inclusion criteria, a written consent form was filled.

#### **Data Collection Method Tools and Procedures**

Questionnaires with both open and closed ended questions so as to assess the utilization of insecticide-treated mosquito nets among caregivers of children under six years were used.

Households of children under six years were provided with pre-tested questionnaires to be filled out and submitted.

#### **Quality Control**

The questionnaires were pretested to help us to determine the strengths and weaknesses of the survey, wording and order of questions for good quality control. The principal investigator directly supervised data collection, entry and analysis. The filled questionnaires were reviewed for any errors made after each day of collection of data. The research team comprised medical students with extensive knowledge of the study as well as reviewing the tools and knowledge to ensure maximum efficiency.

#### **Data Analysis**

The data obtained was exported to SPSS version 19. Using double entries, the data was cross-checked for consistency and accuracy. Data was presented in the form of statements, graphs, tables and charts.

#### **Ethical Considerations**

An introductory letter was obtained from the Dean of the Faculty of Clinical Medicine and Dentistry, Kampala International University-Western Campus and ethical approval for the study was attained from Kampala International University Institutional Research Ethics Committee. The permission to carry out the study was got from Mubende Town Council authorities. Verbal and written consent from the respondents was sought and they were assured 100% confidentiality for all the information dispensed by them. Participation of the respondents was completely voluntary without any bribery aids for further participation.

## RESULTS

### Socio-demographic characteristics of respondents

Variables	Categories	Frequency(n=378)
Age of caretaker	<20	117(31.0%)
	21-30	153(40.5%)
	31-40	58(15.3%)
	>40	50(13.2%)
Child's birth order	1-2nd born	186(49.2%)
	3rd-4th born	159(42.1%)
	5th and above	33(8.7%)
Child's age	<12 months	104(27.5%)
	13-36 months	192(50.8%)
	37 - 59 months	82(21.7%)
Ethnicity of caretaker	Muganda	234(61.9%)
	Mutooro	106(28.0%)
	Others	38(10.1%)
Marital status	Married	298(78.8%)
	Not married	79(20.9%)
Religious affiliation	Catholic	200(52.9%)
	Protestant	85(22.5%)
	Moslem	72(19.0%)
Level of education of caretaker	Primary school	159(42.1%)
	Secondary level	111(29.4%)
	Tertiary	37(9.8%)
	Never attended school	71(18.8%)
Partner's level of education	Primary level	150(39.7%)
	Secondary level	138(36.5%)
	Tertiary	56(14.8%)
	Other	34(9.0%)
Occupation of caretaker	Waged labour (Casual)	109(28.8%)
	Waged labour (Salaried)	98(25.9%)
	House wife	151(39.9%)
	Others	19(5.0%)
Partner's occupation	Waged labour (Casual)	231(61.1%)
	Waged labour (Salaried)	118(31.2%)
	Others	29(7.7%)

**Table 1: Socio-demographic characteristics of respondents: Data source: study field**

From table one above, out of the 378 sampled respondents, the majority were middle-aged mothers 21-30 years 153(40.5%), followed by teenage mothers aged <20 years. 298(78.8%) of the respondents were married women who had attained at least a secondary level of education 111(29.4%). Most of the mothers had 186(49.2%) children who were either first or 2<sup>nd</sup> borns aged 13-36 months 192(50.8%) and are Baganda by tribe. Regarding occupation, the majority of the mothers were housewives 151(39.9%) followed by 109(28.8%) who were casual workers and the rest were waged labour (salaried) 98(25.9%). The majority of the respondents had partners who had at least attained a secondary level of education and were in waged labour (casual) jobs.

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**Bivariate analysis between socio-demographic characteristics and utilization of ITNs among mothers**

Variable	Category	Use of ITNs		X	df	X
		Everyday	Once in a while			
Age of caretaker	<20	69(59.00%)	48(41.00%)	2.232	1	0.587
	21-30	101(66.00%)	52(34.00%)			
	31-40	38(65.50%)	20(34.50%)			
	>40	33(66.00%)	17(34.00%)			
Child's birth order	1-2nd born	126(67.70%)	60(32.30%)	3.147	2	0.787
	3rd-4th born	94(59.10%)	65(40.90%)			
	5th and above	21(63.60%)	12(36.40%)			
Child's age	<12 months	66(63.50%)	38(36.50%)	10.887	3	*0.047
	13-36 months	126(65.60%)	66(34.40%)			
	37 - 59 months	49(59.80%)	33(40.20%)			
Ethnicity of caretaker	Muganda	146(62.40%)	88(37.60%)	1.102	2	0.947
	Mutooro	68(64.20%)	38(35.80%)			
	Others	27(71.10%)	11(28.90%)			
Marital status	Married	194(65.10%)	104(34.90%)	3.5478	1	0.571
	Not married	46(58.20%)	33(41.80%)			
Religious affiliation	Catholic	120(60.00%)	80(40.00%)	2.111	1	0.577
	Protestant	57(67.10%)	28(32.90%)			
	Moslem	49(68.10%)	23(31.90%)			
	Others	15(71.40%)	6(28.60%)			
Level of education of caretaker	Primary school	105(66.00%)	54(34.00%)	4.547	1	0.478
	Secondary level	65(58.60%)	46(41.40%)			
	Tertiary	26(70.30%)	11(29.70%)			
	Never attended school	45(63.40%)	26(36.60%)			
Partner's level of education	Primary level	89(59.30%)	61(40.70%)	3.578	1	0.499
	Secondary level	90(65.20%)	48(34.80%)			
	Tertiary	41(73.20%)	15(26.80%)			
	Other	21(61.80%)	13(38.20%)			
Occupation of caretaker	Waged labour (Casual)	64(58.70%)	45(41.30%)	9.235	1	*0.051
	Waged labour (Salaried)	50(51.00%)	48(49.00%)			
	Housewife	117(77.50%)	34(22.50%)			
	Others	10(52.60%)	9(47.40%)			
Partner's occupation	Waged labour (Casual)	156(67.50%)	75(32.50%)	8.541	1	*0.05
	Waged labour (Salaried)	69(58.50%)	49(41.50%)			
	Others	16(55.20%)	13(44.80%)			
knowledge about Insecticide-treated Mosquito net	Yes	199(62.00%)	122(38.00%)	15.331	1	*0.002
	No	42(73.70%)	15(26.30%)			

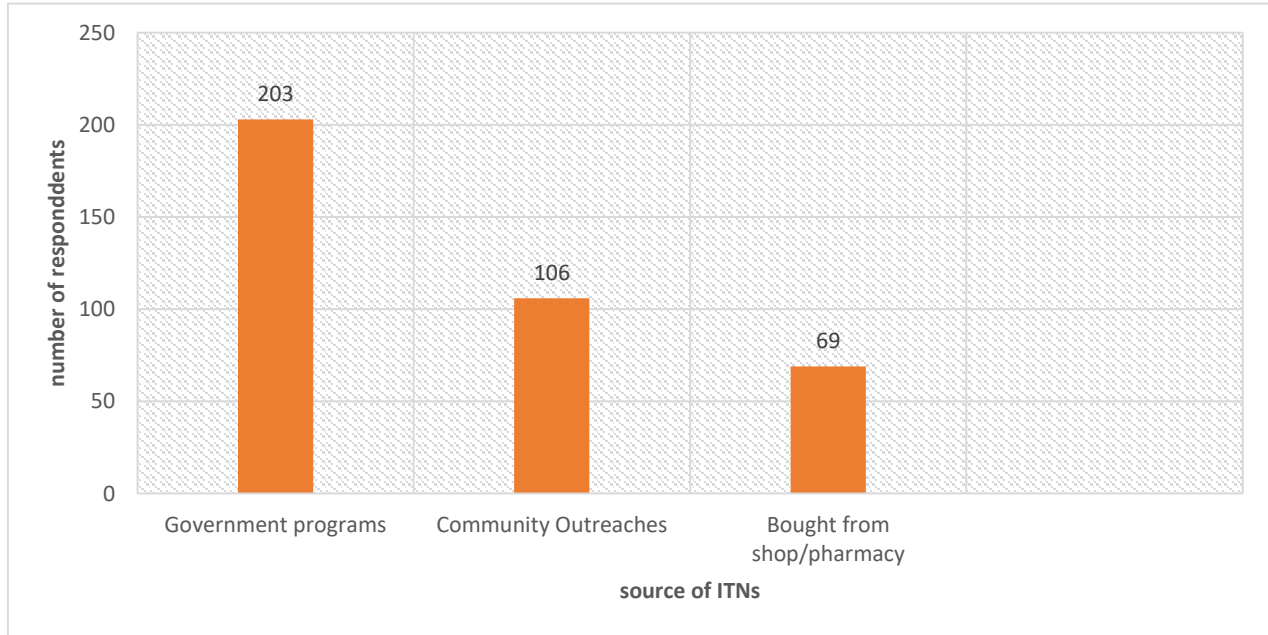
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**Table 2: bivariate analysis between socio-demographic characteristics and utilization of ITNs among mothers: Data source: study field**

The bivariate table above, showed that the age of the mother, occupation of the caretaker, and her partner as well as knowledge about insecticide-treated mosquito nets were significantly associated with the utilization of the ITNs among mothers of children below six years with p-values <0.005

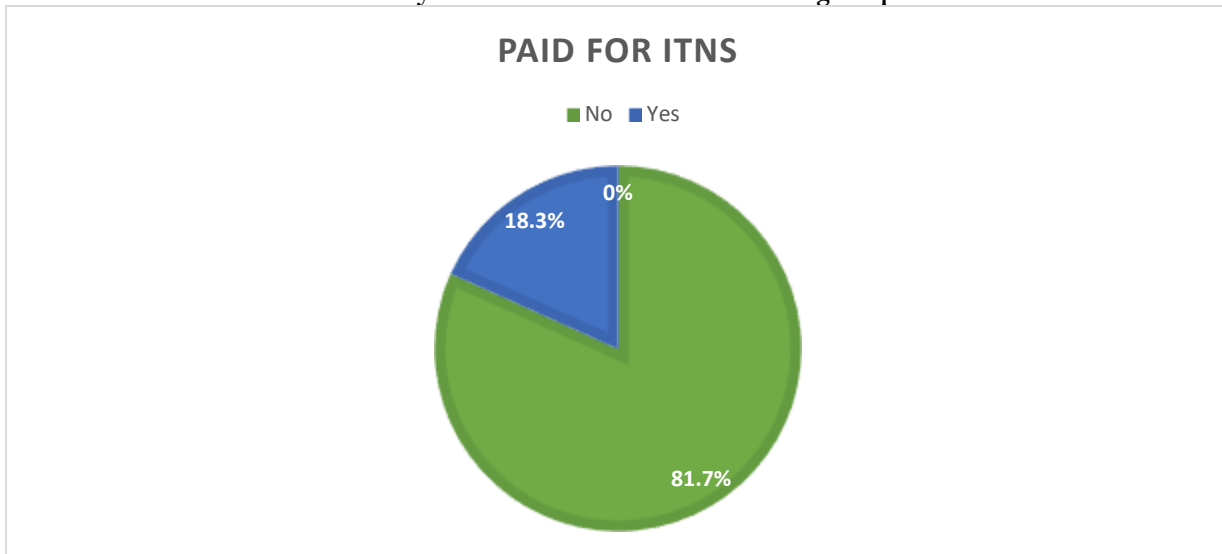
**Accessibility of Insecticide-treated mosquito nets**



**Figure 1: How the respondents access ITNs**

Figure 1 shows that the majority of the respondents 203(53.7%) accessed insecticide-treated mosquito nets from government programs, 106 (28.0%) received the nets from community outreaches while the rest 69(18.3%) bought their nets from shops or pharmacies.

**Affordability of Insecticide-treated nets among Respondents**



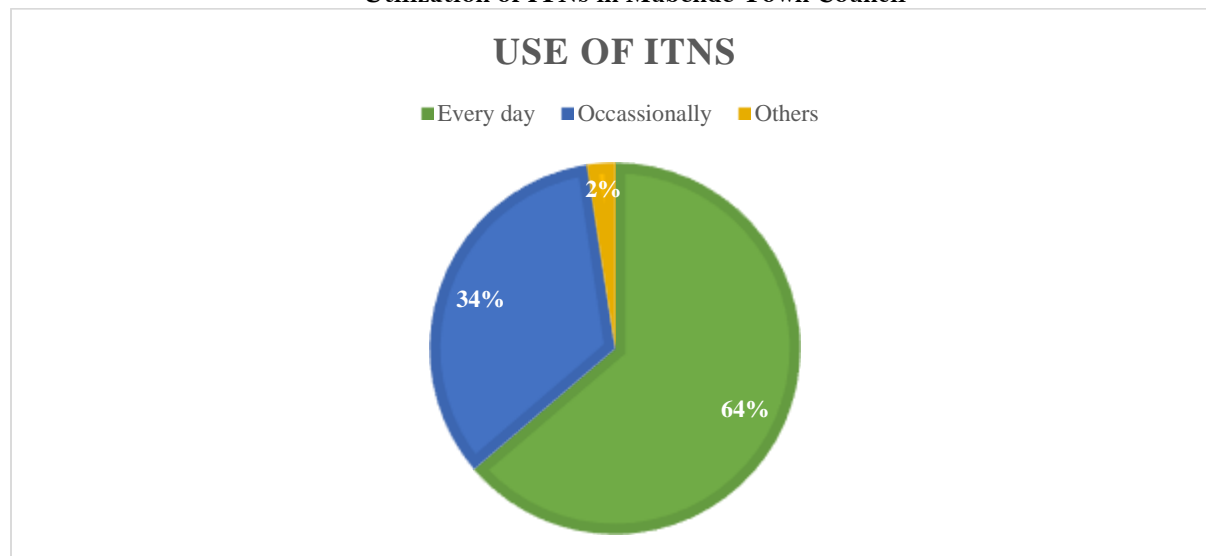
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**Figure 2: A pie chart showing respondents' affordability of ITNs**

The pie chart above shows that only 18.3% paid for insecticide-treated mosquito nets, while 81.7% received the nets freely through donations either from government programs or community outreaches.

**Utilization of ITNs in Mubende Town Council**



**Figure 3: Pie chart showing utilization of ITNs among the respondents**

From the figure above, out of the 378 respondents, 64% of the mothers were using ITNs every day to prevent malaria in their children under six, while 34% used ITNs occasionally, and the rest 2% were undecided.

**DISCUSSION**

**Socio-demographic characteristics of care-takers of children under six years in Mubende Town Council**

On the socio-demographic factors of the mothers, it was noted that the age of the child ( $\chi^2=10.887$ , p-value, 0.047) was significantly associated with the utilization of the ITNs among the under-six-year-old children. Research by Boulay *et al.* [17] showed a similar result where children who were younger were more likely to be put to sleep under ITNs by their mothers in Zambia. Similar results were reported in Mozambique and Uganda [18, 19]. Maternal and partner occupation was also highly associated with the utilization of ITNs among children below the age of six in those mothers who had casual jobs were more likely to afford ITNs whenever they had not received from the government programs than their counterparts who were not employed. This study links directly occupational status to the utilization of ITNS. Knowledge about ITNs in this study was also highly associated with higher utilization and sleeping under ITNs by children whose mothers highly regarded ITNs as crucial in preventing malaria among them. Other socio-demographic factors were insignificantly associated with sleeping under the insecticide-treated mosquito nets.

**Accessibility of ITNs among care-takers of children under six years in Mubende Town Council**

In this study, it was noted that the majority of the mothers accessed ITNs through their government distribution programs 53.7%, and community dispatch teams (28.0%), and only 18.3% bought ITNs from shops or pharmacies and selling points. A similar study finding by Mbonye *et al.* [20] in Kabale Municipality showed that most of the mothers accessed ITNs mainly through national health services rather than private health systems. As a result, delay in implementation in the National Health Service delivery of insecticide-treated mosquito nets was regarded as a hindering factor in the utilization of the nets among respondents. As a result, there was a surge in malaria cases.

**One of the respondents in this reported**

For us in the villages, we always get the nets from the VHTs that the government sends to deliver the nets, however, they take long to reach us, and by the time we receive new nets, the old ones are always very torn that we can't barely use.

**Respondent 1: Anonymous**

**A key informant in this study reported that;**

Most of the VHTs retain these nets during distribution time for their family members or even get to sell them to other people to earn money.

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### Key informant 00: Anonymous

#### Affordability of ITNs among care-takers of children under six years in Mubende Town Council

This study showed that only 24% of the mothers paid for the ITNs they were using, while the rest 76% received the ITNs through government distribution programs like 'Under the net' from the VHTs. The study showed that the government program for every family to receive free treated mosquito nets was relatively adequate as reported by some of the respondents; Respondent 88: I and my family, have never bought a net as we always have enough, especially for me during pregnancy and for my children. Respondent 217: When the VHTs approached my family, they advised us not to sell our nets to anyone as they are very important in preventing malaria.

#### Utilization of ITNs among care-takers of children under six years in Mubende Town Council

The study showed that the majority of the respondents 64% had their children frequently (every day) sleeping under treated mosquito nets, and only 34% reported occasionally using ITNs for their children. In this study, the high utilization of ITNs was associated with the recently concluded mass distribution of nets under the government program dubbed 'Under the Net', where every family was to receive mosquito nets. This program, therefore, cleared the space of the inaccessibility and unaffordability of ITNs among mothers. This study finding is contrary to a study finding in Myanmar where only 18.4% slept under the treated mosquito nets and this was attributed to the fact that the majority of the family members could not afford or access ITNs, therefore higher cases and deaths among the under-six were reported [21-25].

### CONCLUSION

Results from the study findings showed that the utilization of ITNs among those under six was relatively high. Maternal factors such as occupational status and partner's occupation, age of the child, were highly associated with the utilization of the ITNs. Other factors such as the government program for mass distribution of ITNs to malaria endemic areas, general knowledge of the mothers on the importance of ITNs in preventing malaria were among the factors that contributed to the moderate utilization of ITNs.

### RECOMMENDATIONS

#### To Maternal-child health care providers of Mubende district:

Mass distribution of ITNs should be carried out for a specific time limit so that families can have readily available nets to prevent malaria. This involves the excess distribution of ITNs.

The study also provides a proper baseline for health workers to enhance and improve massive maternal literacy improvement on the dangers, prevention and treatment of malaria.

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