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EFFECTIVE UTILIZATION OF INSECTICIDE TREATED NETS AND HOSPITALIZATION OF CHILDREN UNDER FIVE YEARS AT MATETE HEALTH CENTRE IN WESTERN KENYA

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ABSTRACT

Background: Malaria is a leading cause of morbidity and mortality worldwide, with more than a quarter of the deaths occurring in children under five years in sub-Saharan Africa. Utilization of Insecticide-treated nets (ITNs) has reduced malaria infections across countries in sub-Saharan Africa and elsewhere. However, limited studies have been carried out on the effective utilization of ITNs and how effective utilization of ITNs influences the hospitalization of children under-five years.

Methods: A cross-sectional descriptive study was carried out on 100 caregivers with children under-five years at Matete Health Centre in Lugari Sub-County in western Kenya. The study determined effects of effective utilization of ITNs on the hospitalization of children under five years. Purposive sampling method was used and data was collected using semi-structured questionnaires and key informant guide administered to care-givers and health care providers respectively.

Results: 87% of the caregivers possessed ITNs, however only 28% were effectively using them. About 100% understood the importance of ITNs on the protection against malaria but pointed out house structure, number of children and number of bed nets as barrier to effective use of ITNs. The study findings have demonstrated that effective use of ITNs had effect on hospitalization of children under five years. In particular, among those who visited the hospital once in three months, effective utilization of ITNs was 27% (n=17) and those who did not was 73% (n=47) (P<0.0001). Also, for those who visited the hospital twice or more, the effective utilization was 30% (n=11) and those who did not was 70% (n=25) (P = 0.0008).

Conclusion: This study shows high coverage and low effective utilization of ITNs. It further demonstrates that effective utilization of ITNs influences the hospitalization of children under five years. The study therefore recommends further study to identify barriers to effective utilization of ITNs with bigger sample-size and also a more rigorous study on the effect of effective utilization of ITNs on hospitalization of children under five years.

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INTRODUCTION

Malaria is a leading cause of morbidity and mortality worldwide, especially in pregnant and children under five years of age (Sinka et al., 2010; WHO, 2012).

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Tropical Africa is the most hit by malaria and it accounts for 90 percent of malaria deaths worldwide (UNICEF, 2005). Children under five years have been identified as the most vulnerable group to malaria by the Roll Back Malaria. Malaria infection causes deaths, and more than three quarters of global malaria deaths occurs in children aged five years and below and 25% of these deaths occurs in sub-Saharan Africa (Schumacher and Spinelli, 2012) About 800,000 deaths in young children is attributable to malaria (WHO, 2013). Out of

the five species of *plasmodium*, *P. falciparum* is responsible for 95% of malaria cases in sub-Saharan Africa (RBM, 2008), especially in Western Kenya and it causes complicated malaria that if left untreated is fatal (Sinka *et al.*, 2010; WHO, 2012). Due to the disease burden associated with malaria, a number of strategies have been put in place to avert deaths, disability and economic losses due to malaria including the use of Insecticide Treated Nets (ITN's) (Mboera *et al.*, 2007). Utilization of ITNs has been advocated for as the most preventive tool against malaria especially in sub-Saharan Africa where most people are at risk of malaria (Sexton, 2011). It is well documented that use of ITN's reduces death in children by 17% (Lengeler, 2004). Consistent utilization of ITNs has been reported to reduce malaria transmission by up to 90 percent (Alaii. *et al.*, 2013) and overt as much as 44 percent of all-cause mortality among children under five (Bermejo *et al.*, 2002). With the utilization of ITNs, an overall reduction in child death of 50% could be demonstrated, with six lives saved per every 1,000 children protected (UNICEF, 2004). There is also evidence that if more than 80 percent of households in an area sleep under an ITN, malaria transmission is significantly reduced (Oresanya *et al.*, 2008). However, there is a wide gap between net possession and use. Whereas the targets set by governments is to ensure children under five years access and sleep under ITNs, use by vulnerable groups requires that a household owns a net, and that the most vulnerable groups be given priority for sleeping under the net (WHO, 2013). It is upon this background that this study sought to investigate the effect of effective utilization of ITNs on hospitalization of children under five years in Chevaywa location, Lugari Sub-County in Western Kenya.

MATERIALS AND METHODS

Study area and population

The study was carried out at Matete Health Centre in Lugari Sub-County, Western Kenya. Lugari sub-County has a population of 198,955 and malaria prevalence of 10% (Ministry of Health, 2017). Children under five years account for 30% of the malaria cases in the sub-County. A total of 100 caregivers of children under five years and 10 health care providers working at Matete Health Centre consented and took part in the study. The purpose of the study was explained to the study participants before they provided an informed consent. Ethical clearance for this study was obtained from Jaramogi Oginga Odinga Teaching and Referral Hospital Ethics and Research Committee. Administrative approval was also obtained from the Director of Health Services, Kakamega County and Lugari Sub-County Medical Officer of Health.

Research design

Across sectional descriptive research design and purposive sampling was used in the study. Both quantitative and qualitative research methods were employed in data collection. Quantitative data was collected by administering semi-structured questionnaires to 100 caregivers of children under five years. Qualitative data was collected through key informant interviews conducted with 10 health care providers who provide care directly to under-fives in the health centre. Data collection tools were pretested at a nearby dispensary, which is about 8 km from Matete Health Centre. Data analysis

Descriptive statistics of mean, range and frequencies was used to analyse quantitative data; Chi-square was used to further determine the differences in the proportions that effectively utilizes ITNs. Qualitative data from the key informant interviews was analysed thematically.

RESULTS

Demographic characteristics of study participants

In this study 100 female caregivers with a mean age of 29.05 years, and range of 15 to 59 years old filled the semi structured questionnaires. Majority of the respondents (80%) were married, 14% single, 3% widowed and 3% separated. In addition, 53% of the caregivers were unemployed, 26% were farmers, 13% employed while 8% were traders. As regards to the level of education, 68% of caregivers had primary education, 16% had secondary education, 14% had tertiary education while 2% were illiterate.

Knowledge and effective use of ITNs in the households

The study assessed the knowledge of the respondents on the use of insecticide treated nets. All the respondents (100%) agreed that bed nets are necessary in the prevention against malaria. In addition, majority (87%) of the study respondents possessed an ITN (Table 1). On the use, majority of the respondents (76%) said that treated bed nets are good if availed to everyone, 14% said they cause a lot of heat, 10% said they cause suffocation while one respondent said they affect the eye if still new (Table 1). However, many respondents are aware that ITNs prevent malaria (53%), repel mosquitoes (24%) and kill mosquitoes (23%). On the importance of the ITNs to the child, (54%) said that it protects against mosquito bite while 46% said that it prevents malaria. The caregivers further noted that ITNs protects the adult (74%) than the child (54%) suggesting lack of effective use of the ITNs (Table 1). This was further supported when the study respondents were asked on whether their children get mosquito bite despite using the bed net, majority of the respondents (84%), said that they don't get bites from mosquitoes, while 16% said that they get bites from mosquitoes despite using the bed nets.

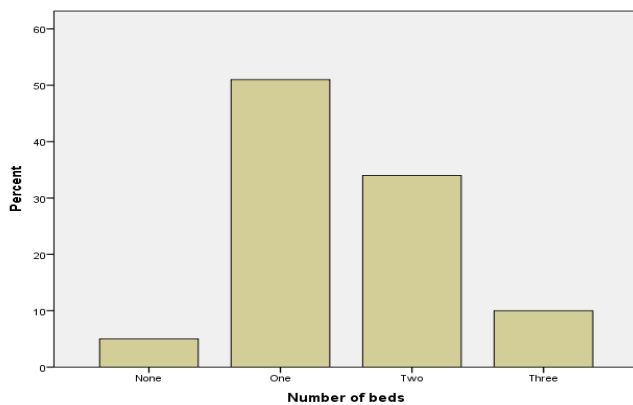
Table 1. Knowledge and effective use of ITNs at household level

Factors	Frequency (%)
Possession of ITN	
Yes	87 (87%)
No	13 (13%)
Views on ITNs	
Good	76 (76%)
Cause Heat	14 (14%)
Cause Suffocation	10 (10%)
Uses	
Prevention of malaria	53 (53%)
Repel mosquitoes	24 (24%)
Kill mosquitoes	23 (23%)
Effectiveness of ITNs	
Mosquito bite	16 (16%)
No mosquito bite	84 (84%)

Household factors and effective use of ITNs

The majority of the respondents (77%) lived in semi-permanent houses, 12% permanent and 11% in grass thatched houses made of mud.

In addition, most of the respondents (49%) lived in two roomed houses, 28% three roomed houses, 18% one roomed and 5% in more than three roomed houses with majority of the respondents (47%) having two ITNs, 22% had one, 17% had none, 14% had three suggesting that some houses did not have space for hanging ITNs. Indeed, majority (53%) of the respondents in this study had space for hanging the ITNs while 47% did not have space. On the number of children under five years per household, majority (50%) had one child, 42% had two and 8% had three children. Also, 73% of the children under-five years did not sleep alone while 27% slept alone. In addition, those children who didn't sleep alone either slept with their parents or the older siblings. Most of the respondents in this study (51%) had one bed, 34% two beds, 10% three and 5% didn't have a bed.



With limited space for hanging ITNs, we assessed if respondents were supervising the hanging of ITNs, majority of the respondents (64%) supervised while 36% did not. Findings from key informant interviews with health care providers showed that bed nets were not used effectively for children under five years due to "ignorance of the caregivers on the use of bed nets", "lack of beds" and "lack of space". Health care providers suggested that effective use of ITNs can be achieved if "the communities are educated on the proper use of ITN's, doing follow up to households to evaluate use of ITNs" and "scaling up the distribution of ITNs".

Table 3. Effective Use of ITNs versus hospital visits

Parameter	Effective Utilization of ITN	Non-Effective Utilization of ITN	P- value
Visited hospital once (n=64)	17 (27%)	47 (73%)	<0.0001
Two or more hospital visits (n=36)	11 (30%)	25 (70%)	0.0008

Effective Use of ITNs

Considering effective utilization of ITNs as use of one bed one net for one child under five years, only 28 of the 100 households in this study effectively utilized insecticide treated nets. Of the 28% of respondents who effectively utilised the ITN's, 32% (n=9) had one net for one child, 64% (n=18) had two nets for two children and 4% (n=1) had three nets for three children (Table 2).

Table 2. Effective use of the ITNs

Parameter	Frequency	Percentage
One net, one child	9	32%
Two nets and two children	18	64%
Three nets and three children	1	4%
Total	28	100%

Effective Utilization of ITNs versus hospital visits

For those who visited the health facility once, 27% were effectively utilizing ITNs and 73% were not (Table 3). Using Chi-square (N=1) to test the level of significance, the difference was observed to be highly significant with a P value <0.0001. For those who visited the health facility twice or more, those who were effectively utilizing ITNs were 30% and those not were 70% (P<0.0008). The finding suggests that effective utilization of ITNs determines the number of hospital visits or hospitalization for children under five years in this study area. The possession of ITN's in this study is 87%. This is higher than a study done in Western Kenya in which the prevalence of ITN's was 71% (Atieli *et al.*, 2011). Additionally, a research study by Esimai (2014) reported ITN ownership of 32.3% (Esimai and Aluko, 2015). Furthermore, Mantey (2011) reported an ITN ownership of 50%. The findings of this study on bed net possession relates with those from a study done in Cameroon (87.6%) also linked to a mass distribution of bed nets (Bennett *et al.*, 2012). The high prevalence of ITN ownership in this study can be attributed to efforts of Malaria Control Program in distributing free Insecticide Treated Bed nets rolled out in Western Kenya in 2013. This shows that the bed nets were able to reach the most vulnerable population especially in the rural areas where malaria burden is high (Hightower *et al.*, 2010). Ownership of Insecticide Treated Nets is not effective in the prevention against malaria. Ownership should go hand in hand with effective utilization for its protection against malaria to be realized. In this study, the effective utilization of ITN was lower as compared to ownership. All the participants in this study owned ITN but only 28% effectively utilized them. In addition, Mantey (2011) reported ITN ownership of 50% in her study done in Nigeria, however, only 21% used them appropriately. It is important to note that the Nigerian study assessed the ownership of ITN and its usage but it did not look at its effective use. In a study carried out in Mbarara District, Western Uganda, it was found that mosquitoes were perceived as a cause of malaria but at the same time use of bed nets was low (26 %). People who did not utilize bed nets cited discomfort due to heat and humidity and the high cost of ITNs as reasons for nonuse (Nuwaha., 2002).

This therefore accounted for low usage of ITNs. Previous studies have reported non-utilization of ITN's to be due to the house being small and also the house serving a lot of purposes whereby the net has to be fixed at night and removed in the morning ((Toe *et al.*, 2009). People who own ITNs should effectively use them in order for them to enjoy the benefits of being protected against mosquito bites and malaria (Ntonifor and Veyufambom, 2016). Further, all the respondents in this study agreed that ITN's were important in the prevention of malaria. The results of this study (100%) are higher than those reported in a Nigerian study in which 54.4% of the caregivers understood the importance of use of ITN's. The findings of this study agree with a study done in Mukono district, Uganda. The study involved pregnant women and all of them agreed that mosquito nets prevents against malaria. The study also affirmed that groups at risk such as pregnant women and children under the age of five years should sleep under an

insecticide treated bed net (Mbonye *et al.*, 2005). The good knowledge of the participants in this study on the importance of ITN's use can be due to the awareness done in televisions, social media and during net distribution campaigns. Some of the challenges faced when utilizing ITN's as reported in this study include affecting the eye when new, causing suffocation and causing a lot of heat. Similarly, a study done in Osun State, Nigeria, reported difficulties in use of ITNs such as lack of a place to keep them and also lack of knowledge on setting up the bed nets (Esimai and Aluko, 2015). Documented barriers to the utilization of ITN's include house structures, weather, economic status and health seeking behavior (Mantey., 2011). Research studies have reported the utilization of ITNS to be effective in preventing the occurrences of malaria cases (Mantey., 2011). Other studies report that appropriate utilization of ITN can be enhanced by educating the community on the health benefits of sleeping under a treated bed net and also boosting the economic status of the care givers (Mantey, 2011). The study sought to establish the relationship between effective utilization of ITNs and hospital visits. The study concludes that there is a relationship between effective utilization of ITNs and hospital visits. Further, the findings show that majority of the respondents who effectively utilized ITNs, only made one visit to the hospital. This finding is similar to a study in Nigeria in which caregivers said that usage of ITN's reduced the number of visits they made to the hospital and their children rarely fell sick (Mantey., 2011). Insecticide Treated Nets have been reported to be effective in killing and repelling the female *Anopheles* mosquito thus reducing the number of mosquitoes which can bite man as he sleeps at night. Effective utilization of ITNs provides protection against mosquito bites which reduces malaria cases thus few visits to the health facility (Ntonifor and Veyufambom, 2016). This study did not examine the condition of the bed nets at the households. The researcher recommends future studies with increased sample-size and also examines conditions of the bed nets.

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