



## ASSESSING THE PREVALENCE OF MALARIA AND THE USE OF INSECTICIDE TREATED BED NETS IN GHANA

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### Abstract

*Malaria remains a major killer disease in Ghana. Enough evidence abounds that Insecticide treated bed nets (ITN) prevent malaria infections. The use of ITNs seems practical and cheap for the prevention of malaria. Yet the burden of disease is still enormous. The aims of this study were to assess the prevalence of malaria, ascertain the level of ITN ownership and use, as well as factors that hinder ITN use in the two communities of Buipe and Savelugu in the Northern Region of Ghana. A comparative cross-sectional study in which a questionnaire was administered in the two districts in the Northern Region of Ghana (Savelugu/Nanton and Central Gonja Districts) was used. Three hundred and eighty-five respondents (219 females and 166 males) with ages ranging from 6 to over 60 years were questioned on consent (mostly randomly, but a few students too, purposefully at school), with the help of two field workers. The data was analysed using SPSS package version 20. Only 2% of respondents report condemnation of use of ITNs by peers, even though both malaria prevalence and ITN non-use are high. In both research communities, our findings suggest high prevalence of malaria, high levels of awareness about the essence of people sleeping under ITNs (although this can still be improved); and that non-use of ITNs is associated with weather conditions.*

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### INTRODUCTION

Malaria is a global health threatening disease. According to the World Health Report 2011, there were about 216 million cases of malaria and an estimated 655,000 deaths in 2010 [WHO, 2011]. Most deaths occur among children living in Africa where a child dies every minute and the burden is not evenly distributed, with Sub-Saharan Africa accounting for 90% of global malaria cases [WHO, 2002]. Current WHO policy options for malaria control include prompt and effective disease treatment and disease prevention through use of insecticide-treated net (ITN) [WHO, 2000].

A number of studies have found that ITNs

provide varying degrees of protection against malaria morbidity, anemia and Low birth weight (LBW) [Heggenhougen, Hackenthal & Vivek, 2003]. Though studies have demonstrated that ITNs are an effective malaria control strategy, there have been many challenges to ITN distribution, acceptance and utilization especially when trying to implement large-scale ITN programmes (D'Alessandro et al, 1995). Knowledge about the cause of malaria and about the existence of ITNs has been low in many malaria-endemic communities (Aikins, Pickering, & Greenwood, 1994). High cost of ITNs, uncaring husbands, awareness of the

prevention of malaria as a better and cheaper option compared to treatment, the perception that the chemicals used to treat the nets have dangerous effects on pregnancy, the fetus and low utilization of antenatal care were some of the reasons for the low usage (Anyanwu, 2004; Watterson, 1998; Ratnasooriya, Ratnayake, & Jayatunga, 2003).

In Ghana, malaria accounts for at least 20% of child deaths, 40% of admissions of children to hospital and more than 50% of out-patient attendance (Anon: Annual Report of the Ghana National Malaria Control Programme, 2006). The current strategy of the National Malaria Control Programme involves the use of ITN and indoor residual spraying of insecticide (IRS). Since 2001, there has been a tremendous increase in the number of households protected by ITN and IRS. For instance, the operational coverage of the ITNs rose from 742,000 in 2002 to more than 1,477,000 in 2007. As at 2015, reports suggested a 60 percent coverage of ITN distribution compared to 30 percent in 2008; but still with a prevalence of >85/1000 population (WHO, 2015). Also, while there has been evidence of a reduction in deaths due to all species of Plasmodium infections, admissions to public facilities have increased from 1,200 in 2010 to over 1,800 in 2015 (WHO, 2015).

Despite the fact that in Ghana, a number of activities by organizations including non-governmental organizations (NGOs) and the Ghana Health Service have been ongoing for some years now, to date however, no systematic study has been done to assess the knowledge, attitudes and practices targeting malaria endemic communities especially in Northern Ghana. Buipe (Central Gonja District) and Savelugu (Savelugu/Nanton District) were for example, direct beneficiaries of ongoing

national malaria control activities aimed at reducing rates of malaria infections and resulting deaths. Despite the on-going campaign, the records (Ghana Health Service (GHS) Annual Report, 2006) show that more than 40% of the population in Savelugu had malaria as at 2006. The situation is similar in Buipe. The ITN distribution campaign has since the year 2003, been running a major educational mass health education including free (or subsidized) supply of ITNs especially to pregnant women. Between 2003 and 2005, about 40,035 bed nets were received from organizations such as UNICEF and WHO and distributed (WHO, 2008).

Indeed, according to 2006 Multiple Indicator Cluster Survey (MICS), UNICEF Ghana reported in 2007 that the use of insecticide treated nets (ITNs) increased from 3.5 percent of under-five children in 2003 to 21.8 percent in 2006; and that one in five children under five years of age was using ITN. (UNICEF, 2007).

In addition to treated bed-nets by the policy of the Ministry of Health, Ghana, medicaments for malaria treatment (Chloroquine and Fansidar) are also provided free to pregnant women.

The records (UNICEF, 2007) suggest that despite these interventions, malaria continues to be endemic in communities in Ghana. A number of questions therefore remain unanswered: What perceptions inform a person's usage of Insecticide-Treated-Net (ITN); What are the socio-demographic characteristics of people who accept ITN? What are the challenges inhibiting general use of ITN? Against this background therefore, knowledge of people's perceptions of malaria and of the socio-economic implications of the disease need to be assessed regularly for purposes of continually designing innovative health

education programmes (Kudom & Mensah, 2010); hence the need for this study.

The objective of this study was therefore threefold: To assess the prevalence of malaria in the two communities of Buipe and Savelugu in the Northern Region of Ghana; to ascertain the level of ownership of ITN in Buipe and Savelugu districts respectively; and to explore the factors responsible for the use or non-usage of ITN at household levels.

## **METHODOLOGY**

### **Study Design**

This was a comparative cross-sectional study across two administrative districts of the northern region with similar developmental challenges.

### **Study Sites**

The study was conducted in two major districts (Northern region) of similar characteristics in terms of high prevalence of malaria; Buipe (Central Gonja District) and Savelugu (Savelugu/Nanton District).

The Central Gonja district is located at the south-western end of the Northern Region of Ghana with Buipe as its administrative capital. It shares boundaries in the north with the Tamale Metropolis, the north-west, Tolon Kumbungu District, the Kintampo North District of the Brong-Ahafo Region to the south, East Gonja District in the East and the West Gonja District to the West. It covers a total land area of 8,353 sq. kms, representing 12% of the total landmass of the Northern Region. Gonjas are the dominant tribe of the community and, like many northern communities, farming is the main occupation for the people. Fishing is also a common occupation as both the Black and White tributaries of the Volta river traverse the district.

Savelugu/Nanton District is one of the twenty-six (26) administrative districts of

the Northern Region. It shares boundaries with West Mamprusi in the North, Karaga to the East, Tolon/Kumbungu in the West and Tamale Metropolitan Assembly to the South. The District's total land area is 1790.70 sq. kms. with Dagombas as the predominant tribe and farming as the main occupation. In comparison, Savelugu District also has the White Volta passing through, and fishing an attractive occupation. Savelugu is the administrative capital of this district.

Both districts have low lying basins of the Volta that support breeding of mosquitos and high

malaria infection rates in the wet seasons. Both districts also generally have simple mud houses roofed with thatch or corrugated metal sheets and poor nettings to keep insects out.

Central Gonja has a population of 87,877 {with 80.2% being rural}; while Savelugu Nanton has 139,283 {and 60.3% rural dwellers} (2010 Population and Housing Census, 2013 Ghana

Statistical) Service).

Malaria remains the number one disease in both districts; and reduces productivity, income and development.

### **Study Population**

The target population of this study was 20% and 40% urban dwellers in Buipe and Savelugu respectively.

### **Sample size**

The sum of the two target populations was about 73,288 hence, the proposed sample size was 500, using the guide by Krejcie and Morgan (1970); Atindanbila Samuel (2013) but only 385 completed the study.

### **Statistical analysis**

The data were processed using the Statistical Package for Social Science

(SPSS, version 20). Categorical variables were compared using chi-square test. P-value <0.05 was considered statistically significant.

The study was conducted in two major district towns in the Northern region, with similar characteristics in terms of high prevalence of malaria; Buipe (Central Gonja District) and Savelugu (Savelugu/Nanton District). Households were randomly selected using the lottery approach and students away at school were purposefully included upon consent. Selected households were visited and a list was made segregated by sex. For every household selected, an adult female and male considered to be heads of the family) were selected for interviews who also consented for children under ten years. A semi-structured household questionnaire designed for the purpose was used to collect data from respondents. Apart from socio-demographics, questions on whether respondents received information on malaria prevention; ownership of mosquito

nets; whether the said nets were treated or not, and how often they slept under the nets; respondents were also asked to indicate the number of malaria cases in the respective families before the study. The data were processed using the Statistical Package for Social Science (SPSS, version 20).

## RESULTS

In all, a total of 385 people (57% females and 43% males) were interviewed (173 in Savelugu community and 212 in Buipe community respectively). On the issue of owning, sleeping under net and or getting nets treated, findings show that 38% of respondents in Buipe significantly (P=0.002) owned nets compared to 27% respondents from Savelugu (Table 1 below). The study therefore reveals a very low level of ITN ownership in both Savelugu and Buipe but more so in Savelugu. It suggests that despite the campaign, the distribution and accessibility of the nets in these communities was quite limited.

**Table 1: Socio-demographic characteristics of study participants stratified by location**

Variable	Total (n=385)	Buipe (n=212)	Savelugu (n=173)	p-value
<b>Gender</b>				
Male	166(43.1%)	86(40.6%)	80(46.2%)	0.2632
Female	219(56.9%)	126(59.4%)	93(53.8%)	0.2632
<b>Ever had malaria</b>				
No	73(19.0%)	44(20.8%)	29(16.8%)	0.3203
Yes	312(81.0%)	168(79.2%)	144(83.2%)	0.3203
<b>Treated in hospital</b>				
N/A	6(1.6%)	4(1.9%)	2(1.2%)	0.5647
No	43(11.2%)	26(12.3%)	17(9.8%)	0.4501
Yes, 1-5	226(58.7%)	117(55.2%)	109(63.0%)	0.1212
Yes, >5	37(9.6%)	21(9.9%)	16(9.2%)	0.1471
<b>Own a bed net</b>				
No	257(66.8%)	131(61.8%)	126(72.8%)	0.0222
Yes	128(33.2%)	81(38.2%)	47(27.2%)	0.0222
<b>Ever slept in a bed net</b>				

No	177(46.0%)	100(47.2%)	77(44.5%)	0.6023
Yes	208(54.0%)	112(52.8%)	96(55.5%)	0.6023
<b>Still sleep in bed net</b>				
No	258(67.0%)	139(65.6%)	119(68.8%)	0.5038
Yes, 1-5	36(9.4%)	21(9.9%)	15(8.7%)	0.6788
Yes, >5	10(2.6%)	5(2.4%)	5(2.9%)	0.7442
Always	80(20.8%)	47(22.2%)	33(19.1%)	0.4566
<b>Who should use a bed net</b>				
N/A	12(3.1%)	2(0.9%)	10(5.8%)	0.0066
All	199(51.7%)	81(38.2%)	118(68.2%)	< 0.0001
Babes only	14(3.6%)	5(2.4%)	9(5.2%)	0.1381
Children only	19(4.9%)	12(5.7%)	7(4.0%)	0.467
Babes and Children	45(11.7%)	45(21.2%)	0(0.0%)	< 0.0001
Babes and Women	18(4.7%)	16(7.5%)	2(1.2%)	0.0031
Babes, Children and Women	61(15.8%)	46(21.7%)	15(8.7%)	0.0005
Babes, Women and Old	11(2.9%)	2(0.9%)	9(5.2%)	0.0137
Men	6(1.6%)	3(1.4%)	3(1.7%)	0.8015
<b>Anyone condemned the use of bed net</b>				
No	377(97.9%)	208(98.1%)	169(97.7%)	0.771
Yes	8(2.1%)	4(1.9%)	4(2.3%)	0.771
<b>Family and friends who use bed net</b>				
Can't tell	146(37.9%)	117(55.2%)	29(16.8%)	< 0.0001
No	38(9.9%)	24(11.3%)	14(8.1%)	0.2908
Yes	201(52.2%)	71(33.5%)	130(75.1%)	< 0.0001

*Data presented as number (percentage); p<0.05 is statistically significant*

With regards to sleeping under nets, 22.2% in Buipe reported always sleeping under nets against 19.1% in Savelugu. This may explain why self-reported cases of malaria at the household levels were similar in Buipe and Savelugu (79.2% and 83.2% respectively) Table 1.

From Table 2, percentages and p-values for trend analysis, the female participants significantly (p=0.0002) owned nets as compared to their male counterparts. This difference was also true in terms of net treatment. Significantly fewer women were not treated in hospital compared to their male counterparts (p<0,0001). It is also worthy to note that condemnation of the use of nets by peers in both districts was found to be insignificant (p=0.2957) Table 2.

It is reassuring that more than 50% of participants in the Districts did agree that treated nets be used by all categories of people without regard to age or gender (Table 2). It is intriguing therefore that the use of bed nets is so low.

**Table 2: Socio-demographic characteristics of study participants stratified by gender**

Variable	Total (n=385)	Male (n=166)	Female (n=219)	p-value
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<b>Ever had malaria</b>				
No	70(18.2%)	32(19.3%)	38(17.4%)	0.6276
Yes	315(81.8%)	134(80.7%)	181(82.6%)	0.6276
<b>Treated in hospital</b>				
N/A	20(5.2%)	16(9.6%)	4(1.8%)	0.0006
No	60(15.6%)	45(27.1%)	15(6.8%)	< 0.0001
Yes, 1-5	241(62.6%)	86(51.8%)	155(70.8%)	0.0001
Yes, >5	35(9.1%)	19(11.4%)	16(7.3%)	0.1617
<b>Own a bed net</b>				
No	257(66.8%)	128(77.1%)	129(58.9%)	0.0002
Yes	128(33.2%)	38(22.9%)	90(41.1%)	0.0002
<b>Ever slept in a bed net</b>				
No	177(45.9%)	88(53.0%)	89(40.6%)	0.0158
Yes	208(54.1%)	78(47.0%)	130(59.4%)	0.0158
<b>Still sleep in bed net</b>				
No	85(22.1%)	40(24.1%)	45(20.5%)	0.4058
Yes, 1-5	35(9.1%)	9(5.4%)	26(11.9%)	0.0292
Yes, >5	14(3.6%)	7(4.2%)	7(3.2%)	0.5963
Always	74(19.2%)	22(13.3%)	52(23.7%)	0.0097
<b>Who uses a bed net</b>				
N/A	12(3.1%)	3(1.8%)	9(4.1%)	0.1979
All	199(51.7%)	89(53.6%)	110(50.2%)	0.5102
Babes only	14(3.6%)	7(4.2%)	7(3.2%)	0.5963
Children only	19(4.9%)	13(7.8%)	6(2.7%)	0.0224
Babes and Children	69(17.9%)	25(15.1%)	44(20.1%)	0.2024
Babes and Women	13(3.4%)	8(4.8%)	5(2.3%)	0.1724
Babes, Children and Women	46(11.9%)	14(8.4%)	32(14.6%)	0.0642
Babes, Women and Old	4(1.0%)	3(1.8%)	1(0.5%)	0.1956
Men	9(2.3%)	4(2.4%)	5(2.3%)	0.9351
<b>Anyone condemned the use of bed net</b>				
No	377(97.9%)	164(98.8%)	213(37.3%)	0.2957
Yes	8(2.1%)	2(1.2%)	6(2.7%)	0.2957
<b>Family and friends who use bed net</b>				
Can't tell	131(34.0%)	42(25.3%)	89(40.6%)	0.0017
No	53(13.8%)	33(19.9%)	20(9.1%)	0.0024
Yes	201(52.2%)	91(54.8%)	110(50.2%)	0.3718

*Data presented as number (percentage); p<0.05 is statistically significant*

A further probe reveals that the traditional architecture of round huts with very small windows creates excessive heat especially in the dry season in the night. This is the case in line with modern trends where traditional huts built of clay and thatch are fast being replaced with cement walls and roofing sheets, materials which generate much more heat at night than the traditional clay huts. Fatima (45year old mother of 5) was asked why she does not use her mosquito net even though she has one. Her response was;

*'It depends on the season. I agree that a mosquito net is good because it prevents mosquito bites. But then, mosquito nets are best in the rainy season because the weather is cool and there are lots of mosquitoes due to stagnant water bodies from the rains. It is convenient to use then, not only because of the many mosquitoes but also because of the comfort of warmth it offers.'*

Mohammed (48year old farmer married to 3 women and having 12 children) explains:

*'It is just the heat... the heat could be so terrible that you may hardly think about mosquitoes again. It is a difficult thing for especially the women and children. The room is already small, hot and uncomfortable. People hardly remember the threat of mosquitoes when they think about comfort.'*

Affordability of ITN still remains a major concern for respondents. Even though ITNs are sold out under a social marketing principle which means heavy subsidization by agencies, it is clear that the education on the essence has not been accepted fully. Some individuals find it difficult to afford the nets. They blame their inability to use the nets to high cost of ITNs.

Adams (36year old father of three and a fisherman

in Buipe) complains:

*'We cannot buy two nets, as the income from fishing is very low these days. As such only the woman and her children can use the only net we have. I am a man and I have a tough skin for the mosquitoes to contend with.'*

For majority of women interviewed (76%), non-use of ITNs is a function of the uncaring husbands. Ajara (28 years old, a mother of two and a housewife) suggests that her husband did not care enough for her and her two daughters; and would rather spend his money on other women instead of providing for ITNs for her and her daughters:

*'Woie! (expression of wander) How will he get the second wife if he spends his money on mosquito nets for us? His attention is focused on bringing my would-be rival home soon. So we can not even talk about these nets to him.'*

Of the total population interviewed, a large proportion (73%) were of the perception that the chemicals used to treat the nets have dangerous effects on pregnancy and the fetus. Because of this concern, findings suggest that instead of pregnant women benefitting from the programme, some of them rather avoid using the service for fear of getting sick.

## **Discussion**

Our study reveals a very low level of ITN ownership (38% people in Buipe and 27% in Savelegu). It suggests that despite the campaign, the distribution and accessibility of the nets in these communities was quite limited. This is a challenge especially in relation to the volume of ITNs reportedly distributed to households in the two districts respectively. The finding points to some challenges in the distribution network. Indeed, ownership of ITNs has been found to be a major precursor variable to ITN usage in several studies (Grabowsky, et al., 2005; Ezire, 2015).

It would mean therefore that poor accessibility to ITNs in the research communities may explain limited usage irrespective of the general campaign

and perceived usefulness of ITNs.

Apart from poor distribution of ITNs, findings suggest that even for those who said they have bed nets, usage has been relatively poor. In our sample, as high as 51.3% believe that all people should use bed nets but only about 30% of respondents own bed nets and said they use them consistently. The reasons associated with inconsistent use of bed nets point to other factors including environmental issues. It is interesting that respondents point out the concept of convenience as a central concern over usage. Clearly, the availability per se of a given service may not necessarily mean the service would be used. The decision to (or not to) use nets is not dictated only by medical concerns, about the relationship between mosquito bites and malaria infection. The diffusion of the innovation of using mosquito nets always is here tempered also by other environmental issues including the temperature, the quality of housing facilities, and the perceived challenges these pose. This finding agrees with a number of other studies in human ecology which found that people fail to accept new behaviour, not because of lack of knowledge but because the change can be inconvenient, with unwanted side-effects MacCormack, 1984).

The finding that there is low level of ITN usage also agrees with the argument of Ezire et al. (2015) that despite a massive distribution of ITNs in Nigeria for pregnant women, utilization of the net at household level was devastating. This suggests that distribution of ITNs may not necessarily translate into increased utilization. The innovation of using mosquito nets always may be affected by certain inconveniences, and therefore requiring that efforts by programmes in ensuring accessibility of ITNs by households need to go hand in hand with mass education in empowering owners of the nets through behavior change interventions (WHO, 2002; Ezire et.al., 2015) to use them effectively.

Affordability of ITN still remains a major concern for respondents. Even though ITNs are sold out under a social marketing principle which meant heavy subsidization by agencies, it is clear that the education on the essence has not been accepted fully.

Some individuals find it difficult to afford the nets. High cost of ITNs has been mentioned generally. The finding agrees with the literature (Onoride et al, 2015) that availability per se may not necessarily bring about increased utilization (MacCormack (nd); Willey, 2012; Ezire et al., 2015).

The issue of uncaring husbands as mentioned by some married women reiterates a number of husbands who are laggards in accepting behavioral change because such changes can be inconvenient (Maccormack, 1984)

The perception that the chemicals used to treat the nets have dangerous effects on pregnancy and the fetus is perhaps a strong deterrent preventing men from sanctioning the use of these bed nets for family members. The power of rumours in dissuading potential acceptors and innovators have variously been studied (WHO, 2000, 2002).

The finding that a high proportion of those who sleep under the nets do not necessarily own them is another interesting caveat. It implies that even though some people want to use the nets, they are unable to afford and some people who benefit from certain campaign programmes might not actually use them. This finding is consistent with Grabowsky et al (2005) who found 89% coverage (222/248); and only 67% adherence (149/222) in a cohort imbedded in an Expanded Programme of Immunisation for a measles vaccine (Grabowsky, et al., 2005)

## **Conclusion**

Ownership of ITN in both communities was found to be very low, 38% in Buipe and 27% in Savelugu. In both research communities, findings suggest a high level of awareness and knowledge about the essence of people sleeping under ITNs; although this can still be improved. However, generally, despite the knowledge about the essence of using the net, findings suggest that non-use is associated with weather conditions. Some respondents noted irritability, warmth and obstruction to sleep as a major hindrance to effective use of ITNs. Other concerns mentioned include; high cost of ITN, uncaring husbands, perception that the chemicals used in the treatment of nets is harmful to pregnancy



and the fetus, as well as low patronage of antenatal care.

Among other things, the findings point to the need for exploring more innovative materials for making ITNs. What seems to be a major concern for quite a number of beneficiaries was the fact that the net seems to increase discomfort associated with heat in the dry season. This shortcoming is often identified with the quality of the material used for the netting. Clearly further research is needed at the technical level to find solutions to the challenges as posed.

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