

**SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
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**OWNERSHIP AND USE OF INSECTIDE TREATED NETS AMONG YOUNG
PEOPLE IN THE KPONE KATAMANSO DISTRICT**

BY

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MASTER OF PUBLIC HEALTH DEGREE**

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DECLARATION

I, Mabel Nyamekye Barnes hereby declare that apart from references to other people's works which have been duly acknowledged, this dissertation is as a result of my own independent work and has not been submitted for the award of any degree in any institution.

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18/10/2019

DEDICATION

I humbly dedicate this dissertation to the Almighty God for His blessings and mercy throughout the entire period of study. My husband Rev. Enock Otabil Barnes for his unconditional support including financial assistance, encouragement, love and confidence in me which continually strengthened me to achieve this academic ambition, my mother inlaw Comfort Barnes for looking after my kids in my absence and also for her prayers, my mother Comfort Asare Nkrumah for her prayers, love and confidence in me.

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TABLE OF CONTENTS

DECLARATION	Error! Bookmark not defined.
LIST OF TABLES	vi
FIGURES	vii
LIST OF ACRONYMS	viii
DEFINITION OF TERMS	ix
PROPOSAL SUMMARY	x
CHAPTER ONE	Error! Bookmark not defined.
1.0 INTRODUCTION	Error! Bookmark not defined.
1.1 Background	Error! Bookmark not defined.
1.2 Problem Statement	Error! Bookmark not defined.
1.3 Conceptual Framework	Error! Bookmark not defined.
1.4 Justification	Error! Bookmark not defined.
1.4.1 Research Questions.....	Error! Bookmark not defined.
CHAPTER TWO	Error! Bookmark not defined.
2.0 LITERATURE REVIEW	Error! Bookmark not defined.
2.1 Background	Error! Bookmark not defined.
2.2 Insecticide Treated Nets as A Preventive Tool for Malaria	Error! Bookmark not defined.
2.3 Knowledge on Malaria and ITN Use	Error! Bookmark not defined.
2.4 ITNs Ownership and Use	Error! Bookmark not defined.
CHAPTER THREE	Error! Bookmark not defined.
3.0 METHODS	Error! Bookmark not defined.
3.1 Study Area.....	Error! Bookmark not defined.
3.2 Study Design	Error! Bookmark not defined.
3.3 Variables.....	Error! Bookmark not defined.
3.3.1 Independent Variable.....	Error! Bookmark not defined.
3.3.2 Dependent variable	Error! Bookmark not defined.

3.4 Study Population	Error! Bookmark not defined.
3.4.1 Inclusion Criteria:	Error! Bookmark not defined.
3.4.2: Exclusion Criteria:.....	Error! Bookmark not defined.
3.5 Sampling.....	Error! Bookmark not defined.
3.5.1 Sample Size	Error! Bookmark not defined.
3.5.2 Sampling Method	Error! Bookmark not defined.
3.6 Data Collection Tools.....	Error! Bookmark not defined.
3.7 Quality Control.....	Error! Bookmark not defined.
3.8 Data Processing and Analysis	Error! Bookmark not defined.
3.8.1 Statistical Methods	Error! Bookmark not defined.
3.9 Ethical Clearance.....	Error! Bookmark not defined.
3.10 Pretest or Pilot Study.....	Error! Bookmark not defined.
CHAPTER FOUR.....	Error! Bookmark not defined.
4.0 SCHEDULE OF ACTIVITY.....	Error! Bookmark not defined.
CHAPTER FIVE	Error! Bookmark not defined.
5.0 BUDGET.....	Error! Bookmark not defined.
5.1 Budget Justification.....	Error! Bookmark not defined.
REFERENCES:	Error! Bookmark not defined.
APPENDICES	1
Appendix 1 Questionnaire.....	Error! Bookmark not defined.
Appendix 2 Consent Form	1
Appendix 3 Participant Information Sheet.....	Error! Bookmark not defined.

LIST OF TABLES

Table 1: Schedule Of Activity	Error! Bookmark not defined.
Table 2: Proposed Budget For The Research	Error! Bookmark not defined.
Table 4.1 Demographic Characteristics of School Aged Children	24
Table 4.2 Association between ITN background characteristics and ITN use.....	26
Table 4.3 Factors influencing ITN use among school aged children	28

FIGURES

Figure 1: Conceptual Framework 5

Figure 4.1: Ownership Of ITN among children 10-20 years.....24

Figure 4.2: Usage of ITN among children aged 10-20years.....25

LIST OF ACRONYMS

Acronym	Meaning
ITN	INSECTICIDE TREATED NETS
ITM	INSECTICIDE TREATED MATERIAL
LLBN	LONG LASTING BEDNETS
SAC	SCHOOL AGED CHILDREN
NMCP	NATIONAL MALARIA CONTROL PROGRAMME

DEFINITION OF TERMS

School Aged Children

School going children between the ages of (5-15) years

Adolescents

School aged children between the ages of (10-15) years

PROPOSAL SUMMARY

Introduction: Significant gains have been made in the implementation of malaria prevention measures in sub-Saharan Africa, and the use of insecticide-treated nets (ITNs) has been critical in reduction in the incidence of malaria in vulnerable groups such as pregnant women and children under five years. Insecticide treated nets usage is dependent on ownership of insecticide treated nets, Usage of insecticide treated nets among school young people is of importance because they are often considered as reservoirs for malaria parasites, and are likely source for parasite transmission or reinfection, especially of vulnerable group such as pregnant women and children under 5 years.

Objective: The aim of the study was to assess the ownership and use of insecticide treated nets among young people in Kpone -Katamanso district.

Method: The study was a descriptive cross-sectional survey and interviews using self-administered questionnaires was conducted to obtain demographic and clinical data on pupil's history. This exercise was carried out in both private and public basic schools in the Kpone-Katamanso district in the Greater Accra Region of Ghana. According to the Population and Housing Census (PHC, 2010), the district has both private and public educational institutions.

Results: Ownership of ITN among young adolescents (5-15 years) was 62.5% and use of ITN was 51.8%. This current study found that males were more likely to use the ITN as compared to females. Children who were in JHS were more likely to use ITN as compared to children in primary school. There is the need to increase the ownership and use of ITN among the school aged children to help reduce the burden of malaria

Conclusion: Finally, ITN use was equal to ownership among young people in the distric

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Insecticide-treated nets (ITNs) used for protection against mosquito bites have proven to be a practical, highly effective, and cost-effective intervention against malaria. The evidence of the public health impact of ITNs, supporting their wide-scale use in Africa, is drawn from areas of stable malaria transmission where *Plasmodium falciparum* infection prevalence in the community is often over 40% (Atiele et al., 2011). ITNs have been found to be highly effective in protecting those sleeping under them and those nearby. ITNs have also been shown to reduce overall child mortality by at least 20% in regions of Africa where malaria is the leading cause of death among children under five endemic areas in sub-Saharan Africa (From & Eirst, 2012). Among the multi-pronged approaches to malaria control, the use of insecticide-treated nets prevents mosquito bites by repelling them or killing them if they land on the net (Atieli et al., 2011). ITNs can be compared in their cost-effectiveness in preventing deaths and morbidity to that of measles vaccination. Like vaccines, ITNs have both a personal protective effect to the individual user, as well as a community-wide effect because the nets act like baited traps for mosquitoes. The higher the percentage of the whole population covered with ITNs, the greater the number of mosquitoes killed, thus benefiting both individuals using ITNs and others who sleep nearby. To really achieve the full potential of the community effect of ITNs on the vector population, it will be necessary to cover a considerably higher percentage of the whole population (Curtis et al., 2003). Parasite

transmission and prevalence in some sub-Saharan African settings has been associated with reductions in large-scale distribution of ITNs .

Distribution of insecticide treated nets (ITNs) and long-lasting insecticidal nets (LLINs) have been a key malaria prevention and control strategy in Ghana for many years. In the past, this strategy was implemented mainly through social marketing using vouchers, subsidised ITN or LLIN sales at health facilities, and distribution through measles campaigns. The targets of all these approaches were the two vulnerable groups of the population most likely to suffer severe consequences or die from malaria: children under 5 years of age and pregnant women. The combined strategy of social marketing using vouchers, discounted sales and distribution through measles campaigns led to a significant improvement in net coverage: the percentage of children under 5 and pregnant women sleeping under an ITN rose from 47% -52% in children and from 43-50% according to GDHS,2014. After five years of promoting this strategy, ITN coverage leveled off at about 28% of children under 5 and 20% of pregnant women respectively (Harvey, Lam, Martin, & Olórtegui, 2017). Sleeping under LLINs significantly reduced the burden of malaria among children. In the presence of pyrethroid resistant malaria vector, a high LLIN use of 94.5% was observed to have significantly brought down the proportion of subclinical malaria among the cohort children. (Chourasia et al., 2017) Universal coverage is consistent with the goal of malaria eradication: rather than decreasing morbidity and mortality by protecting only those most vulnerable, universal coverage aims to interrupt transmission by eliminating the human reservoir of parasites(Harvey et al., 2017) (Buchwald et al., 2016). Ghana officially adopted the use of treated nets as a vector control programme in 2004 and with the help of The Global Fund to Fight AIDS, TB, and Malaria, The US President's Malaria Initiative (PMI) and the World Bank, about 2.4 million procured ITNs

were distributed to Ghanaian households in 2007, which led to about 30% of households in Ghana owning a net (Owusu Adjah & Panayiotou, 2014)

1.2 Problem Statement

The utilization of ITNs is a critical plan which have been employed to combat malaria spread. Following support from international donors, a need to monitor and assess impact of ITNs has become necessary. Currently, household surveys are used as the yardstick in estimating the impact indicators of ITNs. However, these surveys are relatively costly and not frequently executed hence information on impact is often inadequate. Alternatively, obtaining direct statistics from children of school age have been identified as a more cheaper and quicker approach for routine evaluation of the outcomes of the program in Sub-Saharan Africa (Onwuka, Akinyemi, & Ajayi, 2016). Therefore, the approach of obtaining information from school children with regards to outcomes of the malaria control program is preferred to household surveys.

Investigations and interventions of malaria in prevalent countries often target the group regarded as vulnerable. This is because they are considered the most vulnerable group. A research was conducted study to identify young people and adults in surveillance as reservoirs for malaria infection. The investigation also wanted to assess if these groups of people contribute to malaria transmission. It was realized that children of school age characterised an unnoticed harbour of parasites that cause malaria with minimized effect to malaria management (Walldorf et al., 2015). This study therefore sought to identify reports of children on the possession and usage of ITNs in their various homes in addition to assessing the people who utilize same in the various localities.

1.3 Conceptual Framework

The conceptual framework shows the relationship socio-demographic factors have on ownership and the use of ITNs as well as factors that could positively or negatively influence the use of ITNs for the prevention of malaria. Personal factors (such as beliefs, perception, attitudes , habits), provisional factors(as such ITN rollout, ITN household possession, number and frequency of distribution, retreatment of nets and knowledge on ITNs could also contribute to the ownership and utilization of ITNs. The framework also shows the relationship that factors such as barriers to the utilization of ITNs (availability, accessibility and policies) could affect socio demographic factors.

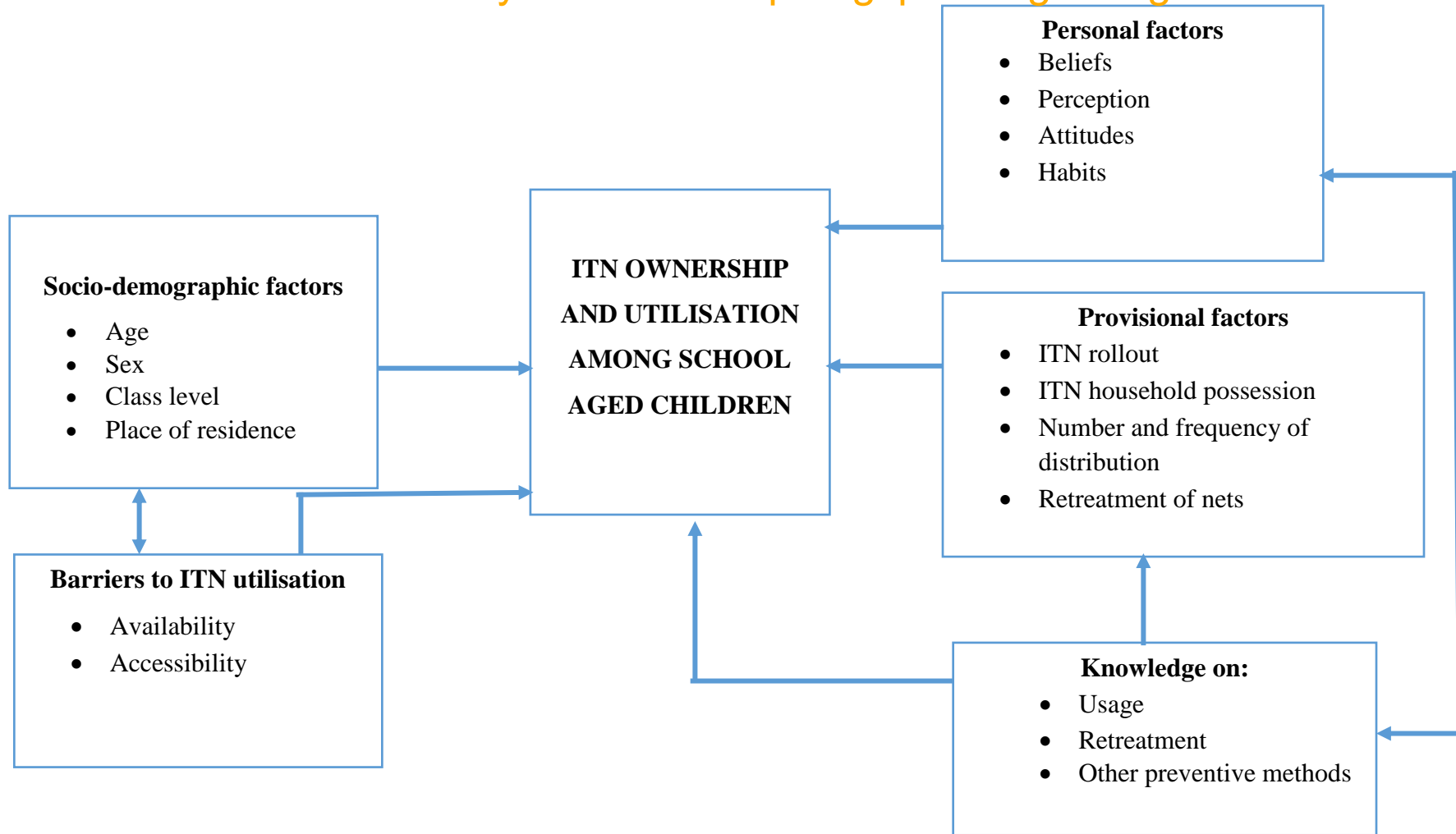


Figure 1: Conceptual Framework

Source: Adapted from Keating et al; (2012)

1.4 Justification

It is estimated that malaria is the cause of several child deaths in African yearly and therefore poses a health risk. Malaria kills over 800 000 African children each year and poses a health threat to millions of adults worldwide. The use of ITNs have been documented as an efficient means of minimizing the exposures of malaria with various international bodies giving consent to ITNs use in pregnant women and infants as far back as 2010 (Roll Back Malaria Partnership,2005). This goal still seems somewhat difficult to attain in some regions in Sub –Saharan Africa though great strides have been made in ITNs coverage and use (UNICEF,2007; WHO 2008). More so, there exist some important difference about how best to distribute ITNs with interventions that ranged from extensive unrestricted distribution (Gingrich, Hanson, Marchant, Mulligan, & Mponda,2011).

Insecticide- treated bed nets provide protection to all who use it properly and those close by. Over the past 10 years, the WHO and UNICEF using the RBM program, advocated ITNs use to prevent the spread of malaria. Malaria, in spite of all the proven interventions such as indoor residual spraying (IRS), continues to affect people negatively. ITNs offer protection from illness and deaths linked to malaria amongst infants. Several studies have shown that the ITNs are the mostly cheap approach to reducing the widespread of malaria in developing countries.

In 2010, Rwanda shared nearly 4.1 million ITNs during a universal coverage campaign with the aim of one ITN for every two persons, thus reaching all sleeping areas in every household. This campaign bring about an upsurge of 25% of usage of ITN compared to 2007-2008(Ruyange et al.,2016)

However, according to Walldorf et al.(2015) malaria continues to occur because Insecticide Treated Nets may not be patronised by groups of people that are serving as reservoirs for transmission of malaria.

1.4.1 Research Questions

1. How many household with school aged children (SAC) have ITNs?
2. How many SAC are sleeping under these bed nets?
3. What is the relationship between household ITNs ownership and utilization as against malaria episodes per year?

1.5 OBJECTIVES:

1.5.1 General Objective: To assess the ownership and use of insecticide treated nets among young people in Kpone -Katamanso district

1.5.2 Specific Objectives:

1. To determine the number of young people whose household own ITNs
2. To determine the number of young people who sleep under ITNs
3. To determine the relationship between ownership and use of ITNs and malaria episodes per year
4. To determine the association between demographic characteristics and ownership or use of ITNs

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Background

Malaria has been a major cause of poverty and low productivity accounting for about 32.5 percent of all OPD attendances and 48.8 percent of under five years admissions in Ghana. (NMCP, 2009).

Malaria control policies in Ghana goes beyond the 1950s with an aim to curtail the magnitude of harm from malaria infection till it's no longer a problem in the community. It was also recognized that malaria cannot be managed by the health sector alone hence advocated a multidisplinary approach. In view of that, plans were put in place to help in the control of the deadly disease. Some of the tools applied at the time included residual insecticide application against adult mosquitoes, mass chemophylaxis with Pyrimethamine medicated salt and improvement of drainage system (NMCP,2017). But there were no results. Ghana then committed itself to the Roll Back Malaria (RBM) initiative in 1999 and developed a strategic framework to guide its implementation. Currently, Ghana provides each household, the opportunity to own and use ITNs without much difficulty. As part of its goals, its states that,

- 100% of households will own at least one ITN
- 80% of the general population will sleep under ITNs
- Increase the number of children under-five and pregnant women sleeping under treated net from current levels to 85%
- 100% (All) pregnant women shall be on appropriate Intermittent Preventive Treatment

- (Receive at least two or more doses of sulphadoxine-pyrimethamine under DOT)
- 90% of all structures in targeted districts will be covered through indoor residual spraying
- All (100%) health facilities will provide prompt and effective treatment using Artemether Combination Treatments (ACTs)
- 90% of all patients with uncomplicated malaria will be correctly managed at public and
- private health facilities using ACTs
- All (100%) communities will have access to community-based treatment for uncomplicated malaria
- 90% of caretakers and parents will be able to recognize early symptoms and signs of
- malaria
- 90% of children under five years of age with fever will receive an appropriate ACT within 24 hours of onset.(NMCP,2017)

Nevertheless, an effective malaria control intervention for Sub-Saharan Africa has been of public health concern. Strategies used, include presumptive treatment of fevers with chloroquine by village health workers, the use of chloroquine prophylaxis for children and pregnant mothers to prevent malaria, environmental management and the residual application of insecticide to house walls. Even in the absence of chloroquine-resistant malaria parasites and insecticide-resistant mosquito vectors, the success of these efforts has been limited by two main factors. First, the principal vectors, mosquitoes of the female *Anopheles* are extremely capable in transmitting malaria. Thus very high levels of correct usage on the part of the local population are necessary to exert a significant impact on the disease. Again, high levels of proper usage are rarely achieved due, in part, to our limited understanding of social and cultural responses to malaria and

a shortage of personnel with adequate training in health communication and the design of community-based health programs. In recent years, the spread of chloroquine-resistant *Plasmodium falciparum* parasites throughout Sub-Saharan Africa has motivated the search for alternative methods of malaria control. Bed nets (mosquito nets), impregnated every six months With pyrethroid insecticides, appear to be a simple, low-cost intervention ideally suited to village conditions. The literature on impregnated bed nets (IBNs) has recently been reviewed (Curtis et al., 2003). When used regularly there appears to be an impact on both the frequency of episodes of malaria in children and on the level of infection in the mosquito population. A study in The Gambia has indicated, moreover, that IBNs can decrease malaria-specific mortality rates in children .At lower elevations in tropical Africa, malaria typically is endemic, meaning that transmission occurs throughout the year. Under these conditions, it will probably be necessary for people to sleep under nets every month of the year if a significant impact is to be seen on transmission. Unfortunately, most trials of bed nets, if they make an attempt to estimate levels of usage at all, measure only at one point in the year.

(Bermejo and Veeken,1992) in a review of field trials of bed nets, note that “malaria is markedly seasonal and has an uneven age distribution, which most trials have taken into consideration; but none of them has taken into account that the use of bed nets and curtains may also be seasonal and age-dependent”. The social science research described in this paper was conducted in preparation for a large trial of insecticide impregnated bed nets in Bagamoyo District, Tanzania. From the outset it was thought that large seasonal variations would occur in levels of net usage, that these seasonal variations had the potential to seriously limit the potential impact of

the nets on malaria transmission, and that information therefore was necessary on local perceptions of the seasonality of mosquitoes and illnesses (Winch et al., 1994).

2.2 Insecticide Treated Nets as A Preventive Tool for Malaria

Globally, about a third of malaria cases, have been reduced using vector control approaches such as the ITNs. Over the last decade in India, sustained has ensured a decline in the cases of malaria by about 45% thus from about two million to one million as at 2015. Also about three-quarters of all cases with evident signs and symptoms prevented between 2000 and 2015, was ascribed to the usage of ITNs. ITNs use is therefore a chief tool in ensuring that the malaria disease is controlled (Kleinschmidt et al., 2018).

Substantial scientific proof exists on the efficiency of ITNs in reducing illness and deaths linked to the disease. In addition, there is evidence suggesting the benefits of bed nets to non-users and the overall impact on the burden posed by the disease. An instance, in situations where early diagnosis and management is done especially in places where the parasite has developed some resistance to the medications, ITNs use offers a complementary effect to curb the condition (Dunn, Le Mare, & Makungu, 2011).

ITNs, treated with safe residual insecticide, offer personal shield from the bites of mosquitoes when likened to that offered by untreated nets. The other chemical substances used in the management of malaria (synthetic pyrethroids), kill the mosquitoes. The rationale use of insecticides is an added advantage when ITN is used.

In Ghana, ITN use is being promoted at antenatal and child welfare clinics, on radio and television. It is also available in pharmaceutical shops. Insecticide Treated Nets are aimed at reducing the man-vector contact during the night and killing the mosquito vector when it gets onto the bed net. Insecticide Treated Nets work in three main ways: by preventing bites from mosquitoes (mosquito-human transmission), by preventing contact between a mosquito and an individual infected with malaria (human-mosquito spread of malaria) and by kills mosquitoes that come into contact with them. According to the WHO, ITNs prevent 69% of the 663 million interventions that reduces the occurrence of malaria between 2001 and 2005. The World Health Organisation since 2007 recommends all insecticide Treated Nets to be long lasting insecticidal nets (LLINs). Thus its make-up should retain insecticide activity for up to 20 standard washes under laboratory conditions and 3 years of use in the field. LLINs have proven to considerably limit the occurrence of malaria and also avoid clinical malaria in children in several locations.

ITNs are vector control approach to preventing the bite of a mosquito and possible transmission of the parasite that causes malaria. They provide greater protection to as much as two times of what untreated nets offer.

Possession of ITNs is not yet globally covered however, it is expected that individuals must use mosquito nets to appreciate the impact of such strategy.

ITNs are a recommended strategy in controlling the vector which has shown to be an effective approach in the elimination of the vector and subsequently, the parasite. That notwithstanding, bed nets being readily available does not translate into increased coverage of bed net use. ITNs usage is significantly subjective to income generated by the household, house type and knowledge on the importance of bed nets to malaria prevention.

In spite of these interventions, there has been no reduction in the burden of malaria in Malawi.

This could be due to lack of access to ITNs being a major factor in the increased prevalence of the parasites. The decline in effectiveness of bed nets after a distribution campaign has also been attributed to decreased use and efficacy in avoiding transmission (Buchwald et al., 2016)

The rate at which people use the ITNs has been observed over the years and seen to be affected by climatic conditions and suitability of the nets with respect to factors such as colour and shape.

Similarly, it has been seen that houses made from cement are 97.7% times less odd of using ITNs than households made from mud.

2.3 Knowledge on Malaria and ITN

The negative effects of malaria are huge, which includes reduced workforce for national development through illnesses, deaths and worker absenteeism. In many nations, ITNs usage significantly increased owing to introduction of other contemporary and complementary approaches which includes but not limited to efficient delivery systems, adequate surveillance and monitoring and combined mass campaigns. ITNs usage remains a vital strategy in the prevention of malaria. This is because it provides direct safety for all users in a house. In ITNs distribution, the vulnerable groups are the prime yardstick before reaching others. However, no agreement has been on acceptable way to give ITNs to the people. Advocates of the ITNs sharing assert that it readily and justifiably gives to the vulnerable ones, the needed tools. Others however claim that, public-private partnerships could ensure an increased and sustainable delivery of ITNs to more people during free distribution campaigns. Another group advocates simultaneous approach of “catch up” programs through ITNs sharing and “keep up” programs that ensure sustained delivery, often provided to pregnant women or mothers at hospital visits. These are given freely at a generous fee (Gingrich et al., 2011). LLINs target individuals, however, coverage of a

community effect could be provided if a proportion of the people are targeted. Previous studies examining ITN community coverage have shown an association with decreased risk of malaria. Much of the literature comes from clinical trials or from modelling rather than research done in the field. In addition, limited investigations have been done in locations of high ITN usage. Forecasting and evaluating intervention campaigns and national strategies largely depends on knowing the importance of community-level ITN coverage to malaria(L Levitz,2018)

The difficulties that obscure the efficiency of malaria control includes but not limited to;

1. Individuals who do not show clinical signs or symptoms after infection (Clinical immunity): individuals who live in areas where it is normally high in the population may develop resistance to malaria. Such people do not show clinical signs and symptoms of the disease though they may be carrying the parasite. The individuals may not seek treatment for a long time thus, they will harbour the disease and transmit it when bitten by mosquitoes.

2. Hot weather which can lead to reduction in the use of ITN (cyclical climatic variations): this impacts on malaria spread hence inability to precisely forecast upcoming disease intensity. The seasonality of malaria has been explored with regards to mosquito biting rates in many studies in relation to temperature. Studies have shown the differences in the biting rates of mosquitoes. Considering the essence of the biting rate as a powerful force for malaria transmission, there is the need to conduct further studies on this so as to discern the factors that bring about changes in the biting rate. Typical of these factors is seasonality. This is because transmission rate of malaria has been reported to peak in certain period of the year. It is quite reasonable to model the biting rates as a function of temperature in order to mimic seasonality.

Although all Ghanaians are in danger of infection by malaria, lowered resistance in vulnerable persons increase the threats in them. Similarly, pregnant females and their unborn ones are greatest at danger of malaria. Malaria episode during pregnancy have complications such as premature births and reduced levels of haemoglobin. Low birth weight is the single highest threat element for death during the first month of life. (Influencing et al., 2017)

A survey recorded showed 274 children in the households which represents 68.5 percent of households. Out of 274 children 84.7 percent had LLIN while 69.4 percent of those who had the net used them. Households with 1-3 children recorded the highest possession (86.8 percent) of LLIN while those with more than 6 children recorded the least (40.0 percent). Meanwhile, respondents with more than 6 children recorded an impressive 100 percent usage (“University of Ghana <http://ugspace.ug.edu.gh>,” 2013)

Also, there were a total of 302 households with pregnant women recorded in the survey which represents 75.5 percent of the households. Out of these, 302 households with pregnant women (256) 84.8 percent possessed at least one LLIN while (185) 72.3 percent of those who owned the net slept under it. For those who alluded to having 1-2 pregnant women in the household, (254) 84.7 percent possessed LLIN whilst (183)72.0 percent of those who possessed used it.

2.4 Ownership and Use of ITN

Encouragingly, the possession of ITNs has considerably improved outcomes in prevalent nations in recent years. Nevertheless, findings from investigations indicate that persons in regions where malaria is mostly high do not use ITN though readily available. Warmth and mosquito population have been shown to be important reasons why inhabitants fail to use ITNs. However, in situations where people own ITNs but fail to use them should be regarded as more intricate than simply a

reaction to high temperature or perceived mosquito density. Issues as technical difficulties in erecting the net, perceived health risks associated with sleeping under a treated net and saving a net for the use in the future have been stated as reasons for not using available ITNS in response to structured survey questions. More research is needed to document the range of contextual, social or environmental factors that influence mosquito net using behaviours (Pulford et al., 2012).

High accessibility to bed net does not automatically translate to higher coverage or bed net use.

Domestic revenue, nature of house and awareness of the capability of bed nets to avert malaria are all self-determining elements that affect usage.

Notwithstanding the proof that the usage of ITNs reduces illnesses and deaths, the use in more areas in Sub-Saharan Africa remains comparatively low.

More in-depth investigations highlight the range of contextual, social or environmental factors that may also influence mosquito net using behaviours (Pulford et al., 2012).

Insecticide-treated nets (ITNs) are an integral part of vector control recommendations for malaria elimination in china. High bed net availability does not necessarily mean higher coverage or bed net use. Household income, house type and knowledge of the ability of bed nets to prevent malaria are all independent factors that influence bed net use.

Despite the evidence that the use of ITNs decreases malaria-related morbidity and mortality, the use of ITNs in sub-Saharan Africa remains relatively low. Estimates from Africa as a whole indicated that, in 2005, only 3% of children less of than five years of age sleep under ITNs, while up to ten times as many are thought to sleep under any bed net (“University of Ghana <http://ugspace.ug.edu.gh>,” 2013).

2.5 Accessibility and cost

People's willingness to buy LLINs as they realized the benefits of its use in reducing mosquito bites and occurrence of malaria fever and as they become habituated to sleep under the net. Because of financial constraints, most people expect the nets to be sold to them at a subsidized price. They express that they could buy if the nets were made available. They also desired to have advance information about sale of the net.

Responses given below highlight the affordability of people readiness to purchase the LLIN for the control of mosquitoes (Gunasekaran, Sahu, Vijayakumar, & Jambulingam, 2009).

Standard public finance analysis implies that health goods generating positive externalities should be publicly funded, or even subsidized at more than 100% if the private nonmonetary costs (such as side effects) are high. Although this analysis applies to goods whose effectiveness is independent of the behavior of the recipients (e.g., vaccines, deworming pills administered to school children), it does not necessarily apply to goods that require active usage (adherence) by their owner for the public health benefits to be realized (e.g., bed nets for reduced malaria transmission, pit latrines for reduced water contamination)(From & Eirst, 2012).

For such goods, charging nonzero prices ("cost-sharing") could improve the efficacy of public subsidies by reducing wastage from giving products to those who will not use them. There are three possible effects of positive prices on the likelihood that people who acquire the product use it appropriately. First, a selection effect: charging a positive price could select out those who do not value the good and place it only in the hands of those who are likely to use it. Second, a mental effect could be triggered which could persuade people to use it more if they exhibited "sunk cost" effects when they pay a good fee for goods provided. In addition, if the quality of the goods is well communicated as a quality product, worth protecting their lives, higher

prices for such quality goods may encourage usage . Although cost-sharing may lead to increased use than free distribution, it may also render the objective of universal coverage unattainable as this could greatly decrease interest.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

This study was a descriptive cross-sectional survey using simple random sampling. This form included obtaining class data recordings and randomly sampling from the primary level to the Junior high School level. Information was obtained from participants using questionnaires. The study was carried out among the Kpone- Katamanso District Basic Schools. The basic schools comprised of both private and public, double and single stream for the public schools.

3.2 Study Area

Kpone- Katamanso District is among the sixteen (16) districts within Greater Accra Region. The district was carved out of the Tema Municipal Assembly in the year 2012. It is located at the eastern part of Greater Accra region, stretching from the coast towards the southern slopes of Akuapim Mountains. It is 38km away from the capital of Ghana, Accra

3.2.1 Population

The Kpone -Katamanso district as of 2010 had a population of 109,864 with a yearly increase rate of 2.6% relative to the nation-wide's 2.3% (Kpone Katamanso District Assembly website, 2014).The district population represents 2.7% of the greater Accra regional population. The district has also a youthful population (under 15years) representing 34.5 %(37,910) out of the total population of 109,864. Of this, 36,862 attend school. 22,443 attends either primary or JHS (5-19yrs) .The

Kpone- Katamanso District Education Office (KKDEO) had 284 basic schools in the district as of the year 2016 of which 52 were government schools and 232 private schools

3.2.2 Occupation

The people of Kpone- Katamanso district are mainly involved in fishing, fish mongering, salt mining and crop production. Fishing is mainly in the southern portion of the district and crop and livestock farming in the north

3.3 Variables

3.3.1 Dependent variable (Outcome variable)

- Household ownership and use of insecticide -treated nets (ITNs)

3.3.2 Independent Variable (Explanatory variable)

Age, Sex, Class level, Place of residence

3.4 Study Population

The study population comprised of male and female pupils from KG2 to JHS 3 from some selected basic schools in the district.

3.4.1 Inclusion Criteria:

The following was included:

Male and female pupils from KG2-JHS 3 between the ages of 5-19 years, and whose household own at least one ITN and gave consent to the study

3.4.2: Exclusion Criteria:

The following was excluded from the study:

Any pupil whose household do not own at least one ITN and refused to take part.

3.5 Sampling

3.5.1. Sampling method

The quota sampling and simple random sampling method were used in sampling the respondents.

The quota sampling method was first used to determine the number of participants to sample from each school as shown in table 3.1.

After determining the quota to be sampled from each school, the simple random sampling using balloting was then employed to sample respondents.

Table 3.1: Sample Proportions

Name of School	Number	Proportion	Sample
Ebenezer Hill JHS	410	$410/540 \times 100$ = 76%	$76/100 \times 270$ = 205
Ebenezer Hill JHS	36	$36/540 \times 100$ = 7%	$7/100 \times 270$ = 19
Gbetsile KKDA 1	22	$22/540 \times 100$ = 4%	$4/100 \times 270$ = 11
Gbetsile KKDA 2	28	$28/540 \times 100$ = 5%	$5/100 \times 270$ = 14
		$10/540 \times 100$	

UK International school	10		1/100x270
Grace International School	34	34/540x100 = 6%	= 2 6/100x270 =16

3.5.2. Sample size determination

A sample size of 245 was derived using Fisher's sample size formula shown below:

$$n = Z^2P(1-P)/(d)^2$$

Where,

n = sample size required.

Z = confidence level (95% level of confidence - 1.96).

P = Estimated prevalence (20%).

d = Margin of error (5% =0.05).

Substituting, $n = (1.96)^2 (0.2 \times 0.8) / (0.05)^2 = 246$.

3.6 Data Collection Tools

Only participants whose household possess ITNs and were provided informed consent prior to participation after a detailed explanation of the study protocol were included in the study.

Interviews using self-administered questionnaires was conducted to obtain demographic and clinical data on pupil's demographic profile. To ensure that the questionnaires were answered independently, the students were supervised. . The interview was basically carried out in the class room after permission was sought from the class teacher. Interviews were carried out by the PI and / or Co-Investigator/Research assistant.

CHAPTER FOUR

RESULTS

4.0 Introduction

This chapter present analysis and detailed description of results based on study objectives. The purpose of the study was to assess ownership and use of insecticide treated nets among school aged children in Kpone Katamanso District. This section presents the demographic characteristics of school aged children, proportion of ITN use and ownership and factors influencing use of ITN among school aged children. The results have been presented in tables and graphs.

4.1 Demographic Characteristics of School Aged Children

Table 4.1 present background characteristics of school aged children sampled for this study in Kpone Katamanso District. A total number of 245 school aged children were sampled with the mean age 13.6 ± 1.94 years. Slightly more than half (53.5%) of the children were aged 14-17 years, followed by 10-13 years (43.3%) and then 18-20 years (3.2%). Females were the most (60.4%) represented school aged children sampled. Most (42.5%) of the children were Ewes followed by Akan (20.8%) and then Ga (18.0%). The children were asked of the number of malaria episodes they had experienced per year. Most (42.0%) of the children said they had experienced only one episode of malaria followed by two episodes (27.8%), no malaria episode (18.0%), three episodes (6.1%) and then four episodes (4.5%). Most (86.5%) of the school aged children had heard of ITN and most (83.3%) of them were in JHS

Table 4.1 Demographic Characteristics of School Aged Children

Variable	Frequency	Percentage (%)
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N=[245]		
Age		
10-13	106	43.3
14-17	131	53.5
18-20	8	3.2
Mean(SD)	13.6(1.94)	
Sex		
Male	97	39.6
Female	138	60.4
Ethnicity		
Akan	51	20.8
Ga	44	18.0
Ewe	104	42.5
Dagomba	7	2.9
Frafra	17	6.9
Gonja	22	9.0
Malaria episodes per year		
0	44	18.0
1	103	42.0
2	68	27.8
3	15	6.1
4	11	4.5
5 and above	4	1.6
Heard of ITN		
Yes	212	86.5
No	33	13.5
Class		
Primary	41	16.7
JHS	204	83.3

Ownership of ITN among school aged children

Figure 4.1 presents the ownership of ITN among school aged children in Kpone Katamanso District. A total number of 62.5% of the children own ITN.

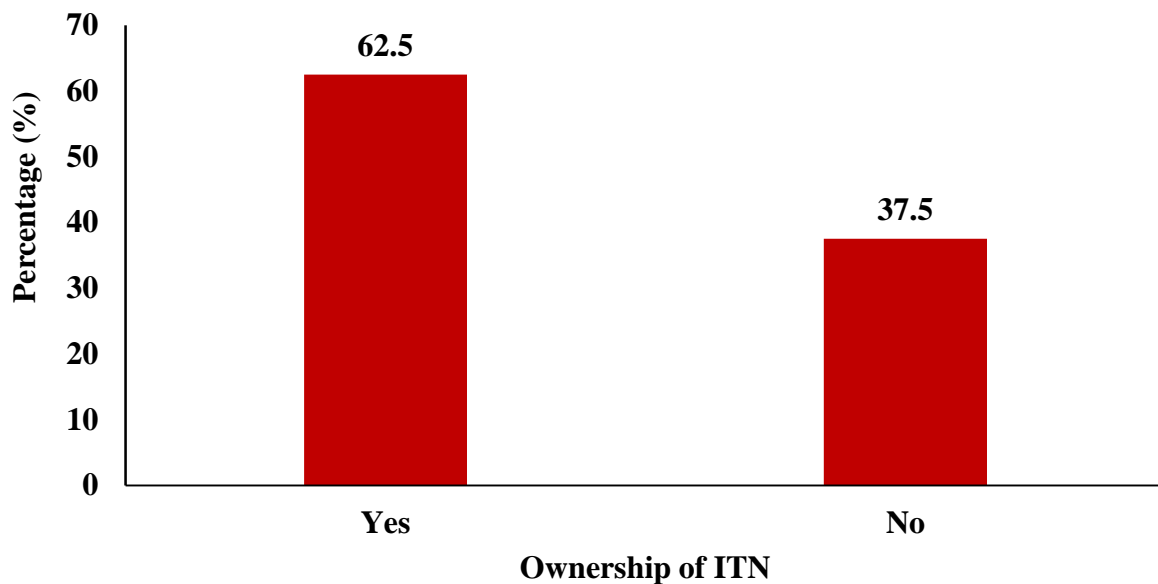


Figure 4.1 Ownership of ITN among children aged 10-20 years

Use of ITN among school aged children

Figure 4.2 presents the usage of ITN among school aged children in Kpone- Katamanso District in assessing the usage of ITN among the children, they were asked if they slept in the INT a night before the study. Out of the 245 school aged children sampled, 51.8% of the children slept in the ITN a night before the survey.

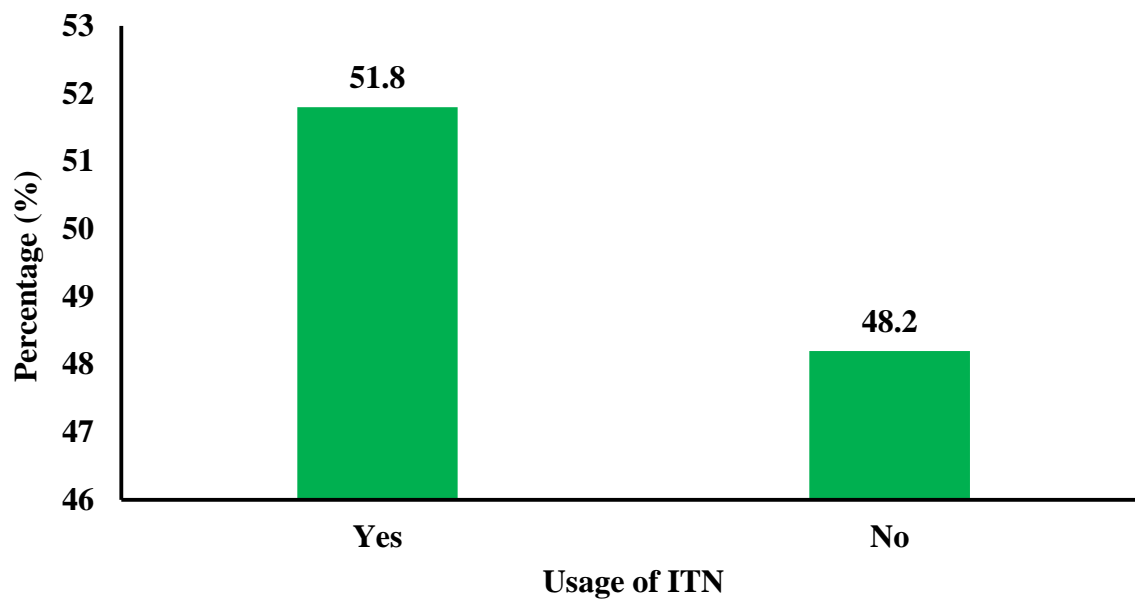


Figure 4.2 Usage of ITN among children aged 10-20 years

Association between background characteristics of school aged children and ITN use

Table 4.2 present the association between background characteristics of school aged children and ITN use. There was a significant association between age and ITN use among the school aged children ($\chi^2 = 7.46$, $p = 0.024$, $\alpha = 0.05$). There was a significant association between sex and ITN use among the school aged children ($\chi^2 = 8.70$, $p = 0.003$, $\alpha = 0.05$). There was a significant association between class and ITN use among the school aged children ($\chi^2 = 48.12$, $p < 0.001$, $\alpha = 0.05$). There was however no significant association between ethnicity and ITN use among the school aged

children ($\chi^2 = 9.88$, $p=0.079$, $\alpha=0.05$). Also, there was no significant association between malaria episodes per year and ITN use among the school aged children ($\chi^2 = 10.83$, $p=0.055$, $\alpha=0.05$).

Table 4.2 Association between ITN background characteristics and ITN use

Variable	Yes N=[127]	No N=[118]	Chi-square (p-value)
Age			
10-13	45 (35.4)	61 (51.7)	
14-17	76 (59.8)	55 (46.6)	
18-20	6 (4.7)	2 (7)	P=0.024
Sex			
Male	39 (30.7)	58 (49.2)	
Female	88 (69.3)	60 (50.8)	P=0.003
Ethnicity			
Akan	23 (18.1)	28 (23.7)	
Ga	17 (13.4)	27 (22.9)	
Ewe	58 (45.7)	46 (39.0)	
Dagomba	5 (3.9)	2 (1.7)	
Frafra	13 (10.2)	4 (3.4)	
Gonja	11 (8.7)	11 (9.3)	P=0.079
Malaria episodes per year			
0	25 (19.7)	19 (16.1)	
1	59 (46.5)	44 (37.3)	
2	35 (27.6)	33 (28.0)	
3	4 (3.2)	11 (9.3)	
4	4 (3.2)	7 (5.9)	
5 and above	0 (0.0)	4 (3.4)	P=0.055
Class			
Primary	1 (0.8)	40 (33.9)	
JHS	126 (99.2)	78 (66.1)	P<0.001

*Statistically significant at $p<0.005$, Chi-square test analysis

Factors influencing ITN use among school aged children (Unadjusted logistic regression analysis)

School aged children aged 14-17 years were 1.87 times more likely to use ITN as compared to children aged 10-13 years [COR=1.87 (95% CI: 1.11-3.14); p=0.018] and was statistically significant. Children aged 18-20 years were 4.01 times more likely to use ITN as compared to children aged 10-13 years [COR=4.01 (95% CI: 0.78-21.09); p=0.095] and was not statistically significant. Males were 2.18 times more likely to use the ITN as compared to females [COR=2.18 (95% CI: 1.29-3.67); p=0.003] and was statistically significant. Children who were Frafra were 3.39 times more likely to use ITN as compared to Akan children [COR=3.39 (95% CI: 1.13-13.79); p=0.031] and was statistically significant. Dagombas, Ewes and Gonjas were 3.04, 1.53 and 1.21 times more likely to use ITN as compared to Akans but the was not statistically significant. School aged children who were in JHS were 6.46 times more likely to use ITN as compared to children in primary school [COR=6.46 (95% CI: 8.70-9.12); p<0.001].

Factors influencing ITN use among school aged children (Adjusted logistic regression analysis)

School aged children aged 14-17 years were 24% less likely to use ITN as compared to children aged 10-13 years [AOR=0.76 (95% CI: 0.41-1.43); p=0.413] and was not statistically significant after adjusting. Children aged 18-20 years were 3.77 times more likely to use ITN as compared to children aged 10-13 years [AOR=3.77 (95% CI: 0.45-31.11); p=0.218] and was not statistically significant. Males were 2.35 times more likely to use the ITN as compared to females [AOR=2.35 (95% CI: 1.31-4.23); p=0.004] and was statistically significant. School aged children who were in

JHS were 7.85 times more likely to use ITN as compared to children in primary school [AOR=7.85 (95% CI: 10.13-16.81); p<0.001]

Table 4.3 Factors influencing ITN use among school aged children

Variable	COR (95% CI)	p-Value	AOR (95% CI)	p-value
Age				
10-13				
14-17	1.87 (1.11-3.14)	0.018	0.76(0.41-1.43)	0.413
18-20	4.01 (0.78-21.09)	0.095	3.77(0.45-31.11)	0.218
Sex				
Male	2.18 (1.29-3.67)	0.003	2.35(1.31-4.23)	0.004
Female				
Ethnicity				
Akan				
Ga	0.77 (0.35-1.74)	0.525		
Ewe	1.53 (0.78-3.01)	0.213		
Dagomba	3.04 (0.53-17.16)	0.207		
Frafra	3.39 (1.13-13.79)	0.031		
Gonja	1.21 (0.44-3.31)	0.700		
Malaria episodes per year				
0	1.01 (0.49-2.07)	0.959		
1	0.80 (0.37-1.73)	0.580		
2	0.27 (0.07-1.00)	0.051		
3	0.43 (0.11-1.70)	0.231		
4	0.32 (0.12-4.23)	0.459		
5 and above	0.12 (0.11-5.66)	0.451		
Class				
Primary				
JHS	6.46 (8.70-9.12)	<0.001	7.85(10.13-16.81)	P<0.001

*Logistic Regression

CHAPTER FIVE

5.0 DISCUSSION

This chapter presents the discussion, conclusion and recommendation of the regarding the ownership and use of insecticide treated nets among school aged children in Kpone- Katamanso district. The discussion explains the findings of the study and compares findings to other related studies. The conclusion presents summary and implications of the results obtained in the study. The recommendations suggest further areas needed to be considered to improve the ownership and use of insecticide treated nets among school aged children.

ITNS have lessened total child deaths by at least 20% in regions of Africa where malaria is the leading cause of death especially among children under five who reside in rife areas in Africa (From & Eirst, 2012). Among the multi-pronged approaches to malaria control, the use of insecticide-treated nets prevents mosquito bites by repelling them or killing them if they land on the net (Atieli et al., 2011). This study sought to assess the ownership and use of insecticide treated nets among school aged children in Kpone Katamanso district. The findings of this study is important to design targeted strategies and implement programmes to help reduce the burden on malaria among school children. However, research done over the years have focused on the vulnerable groups, thus children under five years and pregnant women. Limited research results are found on studies carried out among school children. In this study, slightly more than half (53.5%) of the children were aged 14-17 years and females were the most (60.4%) represented school aged children sampled. Most (42.0%) of the children said they had experienced only one episode of malaria as well as heard of ITN (86.5%). This present study found that 62.5% of the

school children owned an ITN. Large-scale distribution of ITNs has been associated with reductions in parasite transmission and prevalence in some sub-Saharan African settings (Buchwald et al., 2016). In Ghana, the use of treated nets as a vector control programme began in 2004 and with the help of The Global Fund to Fight AIDS, TB, and Malaria, The US President's Malaria Initiative (PMI) and the World Bank. About 2.4 million procured ITNs were distributed to Ghanaian households in 2007, which led to about 30% of households in Ghana owning a net (Owusu Adjah & Panayiotou, 2014). Now pregnant women receive LLIN at ANC and free mass distribution are the means by which households own nets in Ghana. The findings of a study carried out by Nkutu and colleagues in Congo concluded that mass distribution campaigns was effective for rapidly increasing LLIN ownership and use (Nkutu et al., 2017). Even though this distributions are done, studies done on monitoring and evaluation on the use of the ITN focuses only on the vulnerable group excluding school children.

The study again found the use of the ITN among the children to be 51.8%, thus children who slept in the net before the study. The National Malaria strategic plan targets to achieve 80% use of LLIN among children under five years and pregnant women. The target does not capture the study population of interest in this study. However, the use of ITN as found in this study is lower than 80% which is the target set. The low usage of ITN could be due to the fact that the focus of LLIN use has always targeted the vulnerable group and hence no studies are carried out among this study population to identify challenges to help design targeted programmes. There are contributing factors that influence use of ITN. This current study found that males were more likely to use the ITN as compared to females. The results of this study is similar to the findings obtained in the study carried out in Nigeria. The results of their study also showed that males used ITNs regularly (Adaji, & Gabriel, 2019). It is known that females are more careful and conscious of healthy

behaviours. However, the findings of this study indicated that males are rather using the ITN as compared to the females. This could be because the households that the females belong might not have access to the ITN as that is resulting in this findings. The results again found that the likelihood that school aged children who were in JHS would use ITN was higher compared to children in primary school. These findings could be ascribed to the reason that those in JHS were of age and could understand the essence using ITN as compared to those in the primary school.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

The ownership of ITN as found among school aged children in this study was 62.5% and use of the ITN was 51.8%. This current study found that males were more likely to use the ITN as compared to females. Children who were in JHS were more likely to use ITN as compared to children in primary school. There is the need to increase the ownership and use of ITN among the school aged children to help reduce the burden of malaria

6.2 Recommendations

The district health directorate and Malaria control programme should intensify health education among parents, caregivers and school children who can serve as change agents for malaria control with focus on the younger ones

The district health directorate and Malaria control programme should target the distribution of the LLINs to the school children

Further research should be carried out using qualitative study design to explore factors influencing non-use of ITNs among school aged children

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APPENDICES

APPENDIX 1: PARENTAL CONSENT FORM FOR CHILDREN (5YRS-9YRS)

STUDY TITLE: OWNERSHIP AND USE OF ITNS AMONG SCHOOL AGED CHILDREN IN
THE KPONE- KATAMANSO DISTRICT

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and all questions satisfactorily explained to me in a language I understand (English /Ewe / Ga Twi). I fully understand the contents and any potential implications as well as my right to change my mind (i.e. withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name or Initials of Participant.....

Participants' Signature.....

Date:

INTERPRETER'S STATEMENT:

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in the (Ewe / Ga Twi) language to his proper understanding.

All questions, appropriate clarifications sort by the participant and answers were duly interpreted to his/her satisfaction.

Name of Interpreter.....

Signature of Interpreter..... Date.....

Contact Details

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the language he/she understood (English /Ewe / Ga Twi) language.

I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his /her satisfaction before voluntarily agreeing to be part of the research.

Name: DATE:.....

SignatureOR Thumb Print:.....

Date:.....

INVESTIGATOR STATEMENT AND SIGNATURE:

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name.....

Signature.....

Date.....

PARENTAL CONSENT FORM FOR ADOLESCENTS (10YRS-15YRS)

STUDY TITLE: OWNERSHIP AND USE OF ITNS AMONG SCHOOL AGED CHILDREN IN THE KPONE- KATAMANSO DISTRICT

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and all questions satisfactorily explained to me in a language I understand (English /Ewe / Ga Twi). I fully understand the contents and any potential implications as well as my right to change my mind (i.e. withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name or Initials of Participant.....

Participants' Signature.....

Date:

INTERPRETER'S STATEMENT:

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in the (Ewe / Ga Twi) language to his proper understanding.

All questions, appropriate clarifications sort by the participant and answers were duly interpreted to his/her satisfaction.

Name of Interpreter.....

Signature of Interpreter..... Date.....

Contact Details

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the language he/she understood (English /Ewe / Ga Twi) language.

I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his /her satisfaction before voluntarily agreeing to be part of the research.

Name: DATE:.....

SignatureOR Thumb Print:.....

Date:.....

INVESTIGATOR STATEMENT AND SIGNATURE:

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name.....

Signature.....

Date.....

ASSENT FORM FOR ADOLESCENTS (10YRS-15YRS)

STUDY TITLE: OWNERSHIP AND USE OF ITNS AMONG SCHOOL AGED CHILDREN IN
THE KPONE- KATAMANSO DISTRICT

PARTICIPANTS' STATEMENT

I acknowledge that I have read the purpose and contents of the Participants' Information Sheet read and satisfactorily explained to me in a language I understand (English). I fully understand the contents and any potential implications as well as my right to change my mind (i.e. withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name or Initials of Participant.....

Participants' Signature.....

Date:

INTERPRETER'S STATEMENT:

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in the (Ewe / Ga Twi) language to his proper understanding.

All questions, appropriate clarifications sort by the participant and answers were duly interpreted to his/her satisfaction.

Name of Interpreter.....

Signature of Interpreter..... Date.....

Contact Details

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the language he/she understood (English /Ewe / Ga Twi) language.

I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his /her satisfaction before voluntarily agreeing to be part of the research.

Name: DATE:.....

SignatureOR Thumb Print:.....

Date:.....

INVESTIGATOR STATEMENT AND SIGNATURE:

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name.....

Signature.....

Date.....