UNIVERSITY OF EDUCATION, WINNEBA

KNOWLEDGE AND USE OF INSECTICIDE TREATED NETS IN KRACHI EAST MUNICIPALITY-OTI REGION

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DECLARATION

Student's Declaration

I, **Divine Njoya Magar** declare that this Dissertation, except quotations and references contained in the published works which have all been identified and duly acknowledged, is entirely my own original work and it has not been submitted, either in part or whole, for another degree elsewhere.

Signature: ……

Date: …….

Supervisor's Declaration

We hereby declare that the preparation and presentation of this work were supervised in accordance with the guidelines for supervision of thesis as laid down by the University of Education, Winneba.

Name: Dr. Kojo Oppong Yeboah Gyabaah (Principal Supervisor)

Signature: ……

Date: …….

Name: Dr. Victor Owusu (Co-Supervisor)

Signature: ……

Date: …….

DEDICATION

I am dedicating this thesis to my loving parents, Mr. Njoya Bindignum and Mrs Martha Njoya, whose words of inspiration and push for tenacity ring in my ears. Although they are no longer of this world, their memories continue to regulate my life.

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LIST OF ACRONYMS

ANC	Anti-Natal Care
DDT	Dichlorodiphenyltrichloroethane
DHIMS	District Health Information Management System.
FY	Fiscal Year
GHS	Ghana Health Service
GTS	Global Technical Strategy
HFG	Health Finance and Governance
IRS	Indoor Residual Spraying
ITNs	Insecticide Treated Nets
KAP	Knowledge, Attitude and Practice
LLITNS	Long-Lasting Insecticide-Treated Nets
MDG	Millennium Development Goal
NMCP	National Malaria Control Program
RBM	Roll Back Malaria
SADA	Savannah Accelerated Development Authority
SD	Standard Deviation
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
TSB	Treatment Seeking Behaviors
UNICEF	United Nations International Children's Emergency Fund
USAID	United State Agency for International Development
WHO	World health organization

ABSTRACT

Malaria is one of the commonest diseases affecting people in Sub- Saharan Africa of which Ghana and the Krachi East Municipality are included. To reduce its prevalence and incidence in Krachi East Municipality, health authorities rolled out a number of interventions including the use of the insecticide treated nets. The study examined population's knowledge and attitude towards the use of bed nets. Cross-sectional design with a mixed method approach that involved 300 respondents were employed in the study. SPSS was used to process and analyze quantitative data and thematic content analysis for qualitative data and the result triangulated. The malaria case analysis results showed a fluctuation trend in the municipality. It was also found out that free distribution of the bed nets reduced malaria incidence but the prevalence rate remain high, attributable to the misuse of the nets for other purposes rather than sleeping under them. The findings in the study also revealed that majority of respondents were aware of the free Insecticides Treated Nets distribution policy in the municipality and thus received and used them. It was also noted that respondents have different perceptions about the use of the bed nets. The study recommended that diverse educational strategies on the use and vitality of bed nests be intensified, reinforcement of good behaviors to demystify the myths and misconceptions held by respondents about malaria prevention and control measures, watchdogs be instituted to sanction people who use bed nets for other purposes apart from the intended purpose.

CHAPTER ONE

INTRODUCTION

1.1 Background

Malaria, one of the most important causes of morbidity and mortality especially among infants in the world is a vector– borne infectious disease caused by a eukaryotic protist of the genus Plasmodium. The disease is transmitted by female Anopheles mosquitoes which carry infective sporozoite stage of Plasmodium parasite in their salivary glands (Okwa, 2012). The infection accounts for approximately 250 million cases and nearly one million deaths each year (Corradin, 2010).

Malaria is the world's most prevalent serious infectious disease with major health problems, and has attracted global concern. There were approximately 198 million cases and 584,000 deaths in 2013. The World Malaria Report indicated that Africa bears the heaviest burden and the highest risk of malaria infection. Hence, it was estimated that one death occurs each 30 seconds with 90% of malaria deaths occurring in Sub-Saharan Africa, and 90% of malaria deaths are children below the age of five and pregnant women (WHO, 2014).

Malaria in pregnancy has been identified in many studies to worsen certain pregnancy outcomes, leading to an increase in morbidity and mortality. Pregnant women are susceptible to malaria as pregnancy decreases a woman's immunity to malaria, making them more vulnerable to anaemia, still birth, placental parasitisation and increasing the risk of illness leading to death. For the unborn babies, maternal malaria increases the risk of spontaneous abortion, stillbirth, premature delivery and low birth weight, and is a leading cause of child mortality (World Health Organization, 2010).

It remains a major cause of morbidity and mortality in the tropical regions of the world. Globally, there are approximately 300 million clinical cases and about one million deaths due to malaria each year (Karunamoorthi, 2010). Malaria is not pleasant for commerce; the disease is accountable for the rise in health care expenditure, reduction in productivity, and employee tendency to be away from work, which has unfavorable influence on a firm's image (WHO, 2011).

Over 90% of the disease burden occurs in sub-Saharan Africa (Snow et al., 2005; Müller et al., 2003), affecting predominantly children and pregnant women (Snow et al., 2005), who have little access to health care (Teklehaimanot et al., 2007).

In 2009, 39 regions in the WHO African division out of 83 regions have had ITNs free of charge. The IRS, with the WHO legalized chemical like DDT continues to be one of the key interventions for lessening and breaking off malaria distribution by vector control in the environment. WHO (2009) reported that 71 regions along with 27 in the African region put into effect IRS and 17 regions reported utilizing DDT for IRS.

Regardless of the birth of a Malaria Control Program in several parts of the globe for the past decades, the influence of malaria on humans persists, particularly, in most of the tropics and subtropics (WHO, 1998; Sachs, 2002; Sachs & Melaney, 2002).

Malaria control still remains a challenge in Africa, as evidenced by the 163 million estimated cases and 528,000 deaths in 2013 (WHO, 2014). Despite tremendous efforts made to reduce the morbidity and mortality of malaria among children and pregnant women around the world over the past decade, malaria still remains a scourge in sub-Saharan Africa (WHO, 2012). The greatest percentage of the global burden of malaria

is disproportionately carried by sub-Saharan Africa with 90% of cases and 92% of malaria deaths, thus making malaria a serious public health threat and a huge epidemiological burden to Africa (WHO, 2016).

Recent estimates from World Health Organization suggest that 3.3 billion people are at risk of the disease in 106 countries and territories (WHO, 2012).

Malaria is the third leading cause of death in children under five years worldwide, after pneumonia and diarrheal diseases (UNICEF, 2007). The World malaria report 2018 estimates that there were 219 million cases of malaria in 2017.The 10 highest burden African countries saw an estimated 3.5 million more malaria cases in 2017 compared with the previous year (WHO, 2018).

Malaria incidences in different African nations have declined owing to productive malaria resistance drugs, improvement in these drugs and major advancements in control initiatives (Protopopoff et al., 2013).

Despite the effort of the government in controlling malaria burden through chemotherapy and Roll Back malaria (RBM) initiatives, malaria continues to be on the increase due to poor community perception relating to causation, transmission, prevention and treatment. The success of malaria control programs relies heavily on community perception and practices in the prevention, treatment and control of the disease.

Malaria in Ghana is consistently reported as the leading cause of outpatient visits, hospitalization and death in health facilities. Despite considerable efforts in past decade to eradicate or control malaria in Ghana, malaria remains a major public health problem (Oberländer, 2000) despite decades of control and prevention

efforts. It remains a major cause of morbidity and mortality in the tropical region of the world (Karunamoorthi, 2010). Globally, there are approximately 300 million clinical cases and about one million deaths due to malaria each year (Karunamoorthi & Abdi, 2010). Over 90% of the disease burden occurs in sub-Saharan Africa (Snow et al. 2005 & Müller, et al. 2003), affecting predominantly children and pregnant women (Snow et al., 2005), who have little access to health care (Teklehaimanot et al., 2007).

The malaria burden faced by African countries continues to be a challenge for governments. In this light, focus and efforts in finding a lasting if not permanent solution to the malaria menace never ceased. Consequently, in their quest to reinvigorate the fight against malaria, the World Health Organization (2021) recommends widespread of RTS,S/A01 (RTS,S) malaria vaccine among children in sub-Saharan Africa and in other regions with moderate to high *p. falciparum* malaria transmission. Until a universal coverage of all at risk group of malaria the use of ITNs remains the most recommended and effect means of controlling malaria in Ghana and the world at large. In Ghana, malaria is a major cause of illness and death, mainly among children and pregnant women.

1.2 Problem Statement

The malaria burden faced by African countries continues to be a challenge for governments. In Ghana, malaria is a major cause of illness and death mainly among children and pregnant women (MoH, 2009). The National Malaria Control Programme in the first quarter of 2016 reported about 2.2 million suspected cases of malaria in Ghana, which represented a 3.50% increase from the malaria incidence in 2015 (NMCP, 2016).

Mwangangi et al. (2012) posited that the Key causes for the high malaria incidence in Ghana are attributed to poor quality of environmental sanitation which is strengthened by fast unplanned urbanization and climatic factors. Although, Ghana's entire population of 29 million1 is at risk of malaria infection, children under five years of age and pregnant women are at higher risk of severe illness due to lowered immunity. From 2012 to 2016, according to Ghana's District Health Information Management System (DHIMS2), malaria cases seen in health facility outpatient departments have increased from approximately 300 per 1,000 population in 2012, to about 316 per 1,000 population in 2016 (President's Malaria Initiative Ghana, Malaria Operational Plan Fiscal Year, 2018).

Insecticide-treated nets (ITNs) are one of the most effective and available methods for preventing malaria, having averted an estimated 68% of malaria cases between 2000 and 2015 (Bhatt et al. 2015).

Current policy options for malaria control include prompt and effective disease treatment, and disease prevention through use of insecticide (permethrin)-treated bed nets (WHO, 2000). A review of results of efficacy trials of ITNs in sub Saharan Africa concluded that their correct use can save up to six lives for every 1,000 protected children less than five years of age (Lengeler, 2002).

Reductions in malaria cases have stalled after several years of decline globally, according to the new World malaria report 2018. In 2017, there were an estimated 219 million cases of malaria, compared to 217 million the year before. But in the years prior, the number of people contracting malaria globally had been steadily falling, from 239 million in 2010 to 214 million in 2015.

In 2017, approximately 70% of all malaria cases (151 million) and deaths (274 000) were concentrated in 11 countries: 10 in Africa (Burkina Faso, Cameroon, Democratic Republic of the Congo, Ghana, Mali, Mozambique, Niger, Nigeria, Uganda and United Republic of Tanzania) and India (World Malaria Report 2018 launched: 19 Nov. 2018).

Insecticide-treated bednets (ITNs) are a cornerstone of malaria prevention; multiple rigorous studies in sub-Saharan Africa have shown ITNs to be effective in preventing malaria morbidity when used consistently (Alonso et al., 1991; Lengeler, 2004).

A number of studies have demonstrated that the use of insecticide-treated nets (ITNs) is effective in reducing malaria-related morbidity and mortality (Alonso et al., 1991).

Following the increased financing for and effort to combat malaria with the Millennium Development Goals, ITN coverage in Africa rose from below two percent in 2000 to an estimated 55 percent in 2015. The increased number of people sleeping under an ITN is one of the main contributing factors to the 60 percent reduction in malaria deaths since 2000, and the 6.2 million lives saved since 2001 (World Health Organization, 2015).

Due to their effectiveness as a vector control method, the WHO recommends that every person at risk from malaria, in areas identified for ITN use, should sleep under a net. This method is effective against mosquito bites and reduces the morbidity and mortality rate associated with malarial disease (Hilary et al., 2011).

Community perceptions relating to causation, transmission, prevention and treatment are the main socio-cultural factors that can influence malaria control (Agyepong, 1992). The success of malaria control programmes at present relies on community

perceptions of the disease; incorrect beliefs or inappropriate behaviour can interfere with the effectiveness of a control measure such as vector control or chemotherapy (Deressa et al., 2002).

These issues are particularly important in tropical areas where malaria control options are limited because of the parasite and vector resistance to antimalarial drugs and insecticides, respectively. For the participation of the community to be meaningful the views of the community should be sought and incorporated into any control program.

With the widespread resistance to chloroquine, other antimalarial drugs and the bleak prospects for a vaccine in the future (Neville et al., 1996; UNICEF, 2000), the most available option in the fight against malaria is the development and application of new and existing control measures to check man-vector contact. The current strategy is the promotion and use of insecticide treated mosquito nets (ITNs), a device known to have caused dramatic reduction in community malaria cases and 25% reduction in child mortality (UNICEF, 2000).

The World malaria report 2017 showed that, by 2016, global progress against malaria had stalled and the world was off track to meet the Global Technical Strategy (GTS) for malaria milestones for 2020 (WHO, 2017 & 2015b). The World malaria report 2018 reinforces this message; despite gains in some countries, the analyses show a slight increase in malaria cases in 2017 compared with 2016, suggesting a generally flat progress over the past 3–4 years (WHO, 2018).

Ghana had a culture of mosquito net use particularly among students in boarding schools prior to the introduction of treated nets in 1998 (GHS, 2015b).

The high prevalence rate of malaria, coupled with its resistance to anti-malarial medicines has called for new preventive policies of vector control such as free

distribution of ITNs and IRS as the main interventions to reducing malaria at community level from very high levels to close to zero. Despite all these efforts made by the Ministry of Health and the Ghana Health Service, the objective of achieving malaria incidence-free in Ghana looks illusive.

The 2018 report is a sobering reminder that humanity's oldest enemy will not go down without a fight and following 15 years of significant progress in reducing malaria between 2000 and 2015, progress has now stalled in many countries (Commonwealth Malaria Report, 2019).

A 2018 World Health Organization (WHO) malaria report shows new malaria cases are high in Ghana yet progress to halt the trend has stalled. Although the National Malaria Control Strategic Plan emphasizes the use of insecticide treated nets (ITNs) by households, very few studies have been conducted in specific localities on ownership and use of insecticide treated nets by households in Ghana (Atiayure et al. 2013).

The free distribution of ITNs in Krachi East Municipal and its catchment areas in line with National Malaria Control Program (NMCP) had been carried out for the past years. Available data from the Municipal Health Directorate indicates that a total of 12,886 ITNs had been distributed to people across the Municipality and its catchment areas between 2014 to the first quarter of 2019.

Data from the Municipal Health Directorate also show that, in 2014 the municipality recorded 30,903 clinical cases of malaria. There was however a slight dip in 2015 which recorded 22,062 malaria cases. This figure soared again in 2016 where a total of 25,351 malaria cases were recorded. Glimpses of hope of steady reduction in the

number of malaria cases in the years after 2017, 2018 and the first quarter of 2019 were 24,849; 23,275 and 17,591 respectively. In total, 143,759 clinical cases of malaria were recorded between 2014 and the first quarter of 2019.

Despite the concerted efforts at implementing the policy of the free distribution of ITNs, no research has been conducted on recipient knowledge and use of ITNs in and around the municipality. There is therefore paucity of information on recipient's knowledge and use of ITNs for informed feedback and action. In view of the forgoing, efforts aimed at curbing malaria in Krachi East Municipality through the mass distribution of ITNs risk failure due to lack of behavioral data. This report attempts to fill this information void in the municipality by assessing people's knowledge and use of ITNs for the purpose of controlling malaria in the Krachi East Municipality.

1.3 Aims and Objectives

The main aim of the study was to examine people's attitude and knowledge towards the use of ITNs as a tool in preventing malaria.

Specific objectives of the study were to:

1. Establish the incidence of malaria since the introduction of mass ITNs distribution in Krachi East Municipality.
2. Assess the level of awareness concerning ITNs in Krachi East Municipality
3. Examine people's attitudes towards ITNs use in Krachi East Municipality.

1.4 Research Questions

i. What is incidence of malaria in Krachi East since the introduction of mass distribution of ITNs?

ii. What is the level of awareness concerning ITNs and related interventions in Krachi East Municipality?

iii. What attitude do people in Krachi East Municipality have towards ITNs use?

1.5 Research Hypothesis

H0: There is no significant relationship between people's attitudes towards the use of ITNs and malaria prevalence in the municipality.

HI: There is significant relationship between people's attitude towards the use ITNs and malaria prevalence in the municipality.

1.6 Justification

Many policies and programmes have been put in place in controlling and preventing malaria. Ghana as a country has adopted and implemented policies such as Indoor Residual Spraying exercise and the free distribution of ITNs for the prevention of malaria. Data from the Krachi East Municipal Health Directorate indicates commitment to the fight against malaria through the mass distribution of the ITNs to the people over the years.

For a total about 12,886 ITNs distributed, the incidence of malaria shows no sign of slowing down. Over the same period however, a total of about 143,759 cases of malaria were recorded within the period between 2014 to the first quarter of 2019. The contradiction to the widely acclaimed efficiency of the ITNs in preventing and controlling malaria must yet be investigated in relation to the attitude and knowledge towards its effective use in the municipality.

The findings and recommendations of this study will guide the Krachi East Municipal Health Directorates in its educational campaign on effective use of ITNs in its policy implementation of free distribution of ITNs to help reduce malaria cases in the Municipality and the country at large. The study will further add to the existing knowledge on ITNs as an effective tool in controlling malaria and how people's knowledge and attitude affects the policy as an effective tool for controlling malaria. It will also provide the Krachi East Municipal Directorate appropriate information of recipients' knowledge and attitude towards ITNs use for informed feedback and actions.

1.7 Scope of the Study

The scope of this research was defined by the geographical location of the area, and the subject matter of the study. The research location is Krachi East Municipality in the Oti Region of Ghana. The survey looked at the free distribution of ITNs, attitude and knowledge of the people towards the use of ITNs as an effective tool in malaria control and prevention. It is going to be community based and involved interviewing respondents from selected at-risk group from selected households in communities within the Krachi East municipality. Thus, Dambai, Yarika No2, Dormabin, Kpelema and Kwame Akora.

1.8 Organization of the Study

This report was organized into five chapters. The first chapter presents introduction, problem statement, objectives, hypotheses, significance and scope of the study. The second chapter delved into the review of relevant literature that would be rooted on the stated objectives. The theory that underpins this study including the malaria conceptual framework. The methodology employed in the study was outlined in this

chapter. It focused mainly on the study area, sampling technique, sources of data, data collection methods and instruments, sample size and sampling technique, and methods for data analysis and presentation.

Chapter four provided a comprehensive analysis and discussion of the data on each of the stated objective by the use of analytical tools such as SPSS and Excel to generate tables, graphs, and draw meaning from data into information to aid discussions. The fifth and final chapter presented the summary of key findings, conclusion and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Churchill (1999) observed that malaria is a tropical disease caused by the presence of parasitic protozoa of the genus Plasmodium within the red blood cells and is transmitted by infected female mosquitoes of the genus Anopheles. Robert (1996) in his own contribution as stated by Okoye et al. (2014) said that malaria is a disease that causes chills, fever and sweating and is transmitted by the bite of female Anopheles mosquitoes, which have previously bitten infected person. Malaria is a widespread and potentially lethal infectious disease. It has afflicted people for much of human history and has affected human settlement patterns (Okoye & Nwachukwu, 2014). Africa retains a dominant share of the global malaria burden. In 2015, the region had 88% of malaria cases and 90% of malaria mortality world-wide (WHO, 2015b).

In Ghana, malaria is a central focus of the Health Finance and Governance (HFG) project's health financing efforts, where the project aims to support and help address the large financial and health burdens that malaria poses in the country (HFG, 2015). Despite the measures put in place by the government and its partners, malaria remains a public health concern, a major cause of mortality and morbidity especially in pregnant women, nursing mothers, and children under five years in Ghana (NMCP, 2013).

2.1 Malaria Situation in Ghana

Malaria is the single most significant disease in Ghana since 1985, being partly responsible for 45% of all outpatient cases at health facilities. It also contributes to 15% of mortality every year (GHS, 2004). Ghana has one of the highest rates of malaria morbidity and mortality in the world.

According to the National Malarial Control Programme (NMCP), in 2017, 34% of all reported outpatient diseases in Ghana were malaria cases (NMCP, 2018; WHO, 2018).

Accordingly, the global fight against malaria, over the past decade, involved the implementation of several interventions to fight the disease, with some success (Opokua et al. 2020). For instance, in 2017 there were about 20 million fewer reported malaria cases than there were in 2010 (WHO, 2018). Malaria is endemic in Ghana, which means that all 27 million inhabitants (WHO, 2015b) are susceptible to malaria infection (NMCP, 2013).

In Ghana, almost all malaria cases are caused by Plasmodium falciparum, which spreads through the mosquito bite GHS, 2004a).

The incidence of malaria still accounts for 40.0% of all outpatient attendance (Ameme et al. 2014), with the most vulnerable groups being children under 5 years of age and pregnant women (GHS, 2013; NMCP, 2013).

Within Ghana malaria transmission is heterogeneous and differs along varying ecological zones. Parasite prevalence is highly seasonal, peaking in a single wet season (June–October) in the northern savannah area (Nkrumah , et al., 2014; Koram

et al., 2003). However, in both forest and coastal ecological areas, malaria parasite prevalence peaks twice in a year (Nkrumah et al., 2014; Owusu-Agyei et al., 2012).

Ghana recorded total outpatient morbidity of 5, 041, 025 constituting 47.4% of the total recorded as a result of malaria (Anon, 2010). In 2017, the country recorded approximately 10.2 million suspected malaria cases representing about 34% of OPD cases. About 19.0% and 2.0% of total admission and total death respectively were attributable to malaria (GHS, 2017).

A 2018 World Health Organization (WHO) malaria report shows new malaria cases are high in Ghana yet progress to halt the trend has stalled. The report, which highlights some considerable progress made in the past decade, named Ghana among 10 African countries where new cases of malaria are high.

According to a World Health Organization (WHO) report, malaria is responsible for approximately 1,800 admissions at health care system and 10 deaths for every 100,000 population in Ghana (WHO, 2015b).

From 2012 to 2016, according to Ghana's District Health Information Management System (DHIMS, 2018), malaria cases seen in health facility outpatient departments have increased from approximately 300 per 1,000 population in 2012, to about 316 per 1,000 population in 2016. From 2013 to 2016, Ghana has also significantly increased malaria testing of suspected cases from 39% to 78%, and with increased laboratory testing, confirmed malaria cases have increased from 143 per 1,000 population to 166 per 1,000 population. Importantly, malaria-attributable mortality has declined significantly from 19% in 2010 to 4.2% in 2016.

According to President's Malaria Initiative Ghana, Malaria Operational Plan Fiscal Year, 2018, plasmodium falciparum accounts for 85-90% of all infections. Plasmodium malariae (<10%) is also found and more rarely P. Oval (0.15%). No cases of P. vivax infection have been detected in Ghana.

2.2 Malaria Prevention Interventions

Global efforts to fight malaria have proven tremendously successful in recent years, leading to a 32% reduction in malaria-attributable mortality and an 18% reduction in the incidence rate between 2010 and 2016 (WHO-Geneva, 2018). This success is evident in sub-Saharan Africa, which accounts for around 90% of all worldwide malaria cases; from 2010 to 2016, where there was a 20% decrease in malaria incidence (Bhatt et al., 2015).

According to the global malaria elimination program classification, Ghana and much of West Africa are currently classified among nations considered to be in the control phase (WHO. 2016). Since the call for malaria elimination was made about a decade ago, Ghana and other sub-Saharan African countries have made great strides to achieve reductions in the burden of diseases associated with malaria (Global Health Action, 2017).

The World Health Organization (WHO) Global Technical Strategy for Malaria (WHO-GTS) 2016–2030 sets the goal of universal access to malaria prevention, treatment and diagnosis (WHO-Geneva, 2015a). This includes a core package of recommended interventions for reducing malaria related morbidity and mortality: diagnosis and treatment of clinical and severe malaria, vector control with long-lasting insecticide-treated bed nets (LLINs) or indoor residual spraying (IRS) and chemoprevention for high-risk groups (infants, children in areas of seasonal

transmission, pregnant women), (WHO-Geneva, 2015a; Patouillard, et al., & WHO, 2017).

Much of this success has been attributed to the scale-up of mosquito control interventions, primarily the distribution of long-lasting insecticide-treated nets (LLINs) and to a lesser extent the use of indoor residual spraying (IRS) of insecticides to target malaria vectors. However, the downward trends in incidence and mortality stalled between 2015 and 2017 (WHO-Geneva, 2018).

Alonso and Noor, 2017 also asserted that WHO has described the global fight against malaria as being at a crossroads, calling for increased funding and highlighting the need to develop, optimize, and implement new tools to combat malaria.

The continued success of malaria vector control and ultimately the goal of elimination are threatened by the rapid spread of resistance in mosquito populations to insecticides used for both LLINs and IRS (Norris et al., 2016).

Ghana has implemented a national malaria program to reduce the disease burden. While malaria has attracted the attention of both researchers and policy makers in Ghana (Asante-Okyereand, 1997; Ghana Statistical Service, 2012), there have been very few attempts to assess the effectiveness of malaria control strategies, and more particularly the level of awareness concerning ITNs and related interventions, and perceived use of ITNs within specific localities in the country. Luyiga (2013), also highlights the contextual nature of beliefs and practices and the need to understand them before one can design interventions meant to address malaria prevention and control at the community level.

In reaction to the malaria menace, the World Health Organization (WHO) approved the Global Malaria Control Strategy (GMCS). The Ministry of Health initiated a general Malaria Control Action Plan (MCAP) in November 1992 after Ghana had accepted the Global Malaria Control Strategy (GMCS), with the intention to decrease the incidence of malaria and death in the country (Ahorlu et al., 1997).

Key components of the National Malaria Control Programme (NMCP) strategy include integrated vector control through universal coverage of LLINs, and IRS targeted to districts with greater than 40% parasite prevalence. Following a mass campaign in 2014, during which 14 million LLINs were distributed, the percentage of households owning at least one LLIN increased in both rural (78.4 to 82.4%) and urban (60.1 to 65.3%) areas from 2014 to 2016 (Abuaku, et al., 2018). Being able to effectively prioritize which interventions to fund and on what scale becomes increasingly important in malaria control and prevention in Ghana and Krachi East Municipal at large.

2.3 The Roll Back Malaria (RBM) Initiative

The Roll Back Malaria initiative was launched in 1998 (Tayler, 1998) at a time when Africa was grappling with an unprecedented disease epidemic (Snow et al., 2012). Increases in overseas development assistance, bilateral and multilateral support including the establishment of the Global Fund in 2001, led to significant improvements in the numbers of vulnerable populations protected against malaria infection and who have access to medicines that effectively treat the disease (Snow & Marsh, 2010; WHO, 2012).

The government of Ghana launched an aggressive Roll Back Malaria (RBM) initiative in 1999 that emphasized the strengthening of health services through multi and inter-

sectoral partnerships and making treatment and prevention strategies more widely available (NMCP, 2020).

At the launch of the Roll Back Malaria (RBM) initiative, calls for universal coverage of all available interventions was probably an appropriate response to the epidemic that affected most of sub-Saharan Africa during the mid-late 1990s (WHO, 2000; Snow et al., 2012).

The 2015 goals of the World Health Organization's Roll Back Malaria Partnership are to reduce global malaria cases by 75% from 2,000 levels and to reduce malaria deaths to near zero through universal coverage by effective prevention and treatment interventions. Among other preventive interventions, WHO recommends the use of insecticide-treated nets (ITNs), particularly long-lasting insecticidal nets, which have been shown to be cost-effective in reducing malaria episodes among children less than 5 years of age by approximately 50% and all-cause mortality by 17% (Barbara et al., 2012).

Malaria incidence in different African nations has declined owing to productive malaria resistant drugs, improvement in these drugs and major advancements in control initiatives (Protopopoff et al., 2013). Ensuring universal access to prompt and effective diagnosis and treatment of malaria is both a health system priority as well as an ethical goal (WHO-Geneva, 2015b).

2.4 Insecticide-Treated Nets (ITNs)

Insecticide-treated nets are seen to be one of the effective tools in malaria control. Between 2016 and 2018, a total of 578 million insecticide-treated mosquito nets (ITNs), mainly LLINs, were reported by manufacturers as having been delivered

globally, with 50% going to Côte d'Ivoire, the Democratic Republic of the Congo, Ethiopia, Ghana, India, Nigeria, Uganda and the United Republic of Tanzania. In 2018 about 197 million ITNs were delivered by manufacturers, of which more than 87% were delivered to countries in sub-Saharan Africa (WHO, 2019) where Ghana benefited.

Half of people at risk of malaria in sub-Saharan Africa are sleeping under an ITN; in 2018, 50% of the population was protected by this intervention, an increase from 29% in 2010. Furthermore, the percentage of the population with access to an ITN increased from 33% in 2010 to 57% in 2018. However, coverage has improved only marginally since 2015 and has been at a standstill since 2016 (WHO, 2019).

Insecticide Treated Bed nets (ITNs) were deployed nationally in 2004, following evidence from field trials of their effectiveness in 1996 in Ghana and elsewhere. A policy was also made to subsidize delivery of ITNs in 2007 (NMCP, 2013).

Malaria control in Ghana focuses on case management and on promoting the use of ITNs (WHO, 2006). Prominent among the interventions is the promotion of the use of insecticide-treated nets (ITNs), particularly long-lasting insecticide-treated nets (LLINs) (Loll et al., 2013). Insecticide-treated nets (ITNs) impregnated with inexpensive and long-lasting pyrethroids have been shown to reduce human-vector contact inoculation of humans with sporozoites, clinical episodes of fever, high-density parasitemia, malaria-attributed mortality, and overall mortality (Lengeler, 1998).

PMI continues to support Ghana's ITN strategy aimed at achieving universal coverage of ITNs through complementary distribution channels, mass campaign distribution,

and continuous distribution via primary schools, antenatal care (ANC) clinics, child welfare clinics, and through private sector (PMI-Ghana, 2018).

Kwaku (2015), as cited by Diema et al. (2019), indicated that government has taken several initiatives in the prevention of malaria and these include the free distribution of Long Lasting Insecticide Treated Nets (LLITNs) to pregnant women and children five (5) years and below, the subsidizing of the cost of LLITNs to the rest of the population, the subsidizing of the cost of artemisinin based combination therapy used as first line treatment for uncomplicated malaria cases, and training in the community of local health assistance capable of managing uncomplicated malaria cases and providing adequate advices.

PMI-Ghana (2018) affirms of distributing 1.3 million ITNs through schools and supported the NMCP to manage a successful national continuous distribution system, and promote ITN use through targeted, effective communication efforts. In recent times, the ultimate implementation processes for malaria control persist with measures to control anopheles' mosquitoes. The control initiatives aim at every point of the spread pattern of malaria that is the relation between anopheles' mosquitoes, the parasite and host (Gosoniu, 2008).

Vector control is implemented in all malaria-endemic countries, with the specific intervention mix between LLINs, IRS and other methods influenced by the distribution, relative abundance and behaviors of different vector species, as well as other context-specific factors such as the historical use of a particular form of vector control (WHO, 2019).

The WHO recommends universal coverage of the population at risk of malaria with either LLINs or IRS (WHO-Geneva, 2015) and whilst a combination of the two is

deployed in some areas (primarily for insecticide resistance management), WHO recommends attaining high coverage of a single method like the free ITNs distribution in malaria endemic areas.

Mabaso et al. (2004) state that major control initiatives are put in place to decrease the relation of the human-vector connection. The decline in the longevity of the mosquito vector influences its duration to spread parasites. Delves et al. (2013) analyzed the possible associations that influence measures to stop parasites being transferred from host to mosquito. Alonso et al. (2011) conducted a study in southern Africa, on IRS and LLINs in Ghana indicating the advantages of fundamental control initiatives of the mosquito vector in the region based on WHO suggestions (Mabaso et al., 2004).

In vector control, it has been widely recognized that to maintain the effective use of IRS, LLINs and ITNs for malaria prevention, there is an urgent need to develop and use new, non-pyrethroid insecticide products with improved residual efficacy (WHO, 2012; Katureebe et al., 2016; WHO, 2016) that can limit vector-human contact.

2.5 Indoor Residual Spraying (IRS)

Fewer people at risk of malaria are being protected by indoor residual spraying (IRS), a prevention method that involves spraying the inside walls of dwellings with insecticides (WHO, 2019). Indoor residual spraying remains one of the two main vector control strategies (IRS report 2007 Draft), but globally, as indicated by (WHO, 2019), IRS protection declined from a peak of 5% in 2010 to 2% in 2018, with declining trends seen across all WHO regions apart from the WHO Eastern Mediterranean Region where IRS protection increased between 2016 and 2018 (WHO, 2019).

Many countries have opted to include IRS in their national malaria control strategies (Unpublished Documents and Reports of NMCPs, 2006-2007), and Ghana sprayed organophosphate (pirimiphosmethyl), (IRS report 2007 Draft).

In Southern Africa, IRS and ITNs are the cornerstone of malaria control programs. About 15 million people in 9 countries [Botswana, Madagascar, Mozambique, Namibia, South Africa, Swaziland, Tanzania (Zanzibar Island), Zambia and Zimbabwe] are protected from malaria by IRS and ITNs every year (Unpublished Documents and Reports of NMCPs, 2006-2007).

2.6 Malaria in Pregnancy

Since 2015, Ghana's National Guidelines for Malaria in Pregnancy was revised to adopt WHO's recommendation of a three-pronged approach for the prevention and treatment of malaria in pregnancy, which includes: providing sulfadoxine-pyrimethamine (SP) for the intermittent preventive treatment of malaria in pregnancy, which is recommended for all pregnant women at each scheduled ANC visit; distributing ITNs at the first ANC visit and promoting the use of ITNs during pregnancy; and effective case management of malaria during pregnancy (PMI-Ghana, 2018).

With Fiscal Year (FY) 2018 funding, PMI continued to support ANC clinics at health facilities and, where available, community-based health planning and services compounds to effectively deliver a package of malaria prevention services to pregnant women to include supportive supervision and on-site training of intermittent preventive treatment of pregnant women at every ANC visit and to ensure distribution of an ITNs to every pregnant woman during their first ANC visit (Malaria Operational Plan FY, 2020).

2.7 Case Management

Malaria control in Ghana focuses on case management and on promoting the use of ITNs (IRS report 2007 Draft). The NMCP requires confirmation of all suspected malaria cases in all age groups, by either microscopy or rapid diagnostic test. For confirmed malaria cases, the NMCP strategy calls for widespread and prompt access to appropriate antimalarial treatment. The NMCP remains focused on improving the quality of microscopy at higher-level facilities and scaling up the use of rapid diagnostic tests at all levels, particularly in peripheral settings, including community-based health planning and services compounds (Malaria Operational Plan FY, 2020).

Currently, PMI's clinical outreach training and supportive supervision covers all public sector facilities at least twice a year since 2012. PMI works closely with NMCP and Ghana Health Service Clinical Laboratories Unit to improve the quality and scale up of malaria diagnosis in Ghana (PMI-Ghana, 2018) whilst intensifying free distribution of ITNs alongside to malaria control infection rate.

2.8 Effectiveness of Use of ITNs

The consistent use of the net is required for maximum effectiveness. Ghana Health Service, 2018 Annual Report of the National Malaria Control Programme indicated that Two-thirds (66%) of the household population in Ghana have access to an LLIN and ITNs. Effective application of insecticide-treated bed nets for malaria control comprises three main components including bed net acquisition or ownership, regular retreatment of bed nets with insecticide and using bed nets correctly and/or consistently. The successes achieved in efficacy trials have been associated with strict research conditions to maintain regular use of bed nets and bed net re-treatment. The realities of bed net use, however, differ to that in a controlled environment. In areas of

low bed net use and where bed nets are used mainly for reasons other than disease prevention, optimal adherence is often not easily achievable. People primarily use bed nets to avoid nuisance biting, rather than for malaria prevention (Zimicki, 1996), hence irregular use.

Successful ITN use is highly dependent on community acceptance and participation (Tomashek et al., 2001). Research finding indicates that, the practice of sleeping under ITNs every day is generally poor. Most people especially women who had nets were not sleeping under it and the reason for not doing so was because the weather is hot, and they are not comfortable sleeping under the net (Envuladu et al., 2012). Consistent use of the nets is required for maximum effectiveness; but studies indicate that the nets are often jettisoned in periods of low mosquito activity and high night-time temperature (Envuladu et al., 2012).

An important aspect of achieving universal coverage of ITNs is by successfully promoting their correct and regular use. Behaviour change communication (BCC) campaigns that encourage consistent ITN usage and care are critical to ensuring that a culture of net use is established and maintained (Malaria Consortium: Advocacy Press, 2016).

Globally, there have been gains in malaria investments over the years and they have resulted in availability of cost-effective interventions and substantial reductions in malaria deaths (Menendez et al., 2015**)**. However, effective utilization of these Interventions to attain the key targets of the National Malaria Control Strategic Plan (2008–2015) in Ghana has not been fully achieved. This strategy among other things aimed to increase the number of pregnant women sleeping under treated nets from the 2008 levels of 32.3% to 80% by the year 2015 (National Malaria Control Programme

(2013). Insecticide-treated nets (ITNs) are one of the proven cost-effective components of malaria prevention through vector control approach. Appropriate use of ITN is shown to reduce malaria transmission by about 90%. Use of ITN during pregnancy is shown to reduce miscarriages and still births by 33% (Mehlhorn, 2008 & GMIC, 2011).

2.9 Attitudes of People towards ITNs Use

Singh et al. (2013) found that some reasons given for not using ITNs include discomfort, heat or inconvenience, limited perceived benefit or the preference to use other malaria preventive methods. This is supported by a study conducted by Aluko and Oluwatosin (2012) where more than one-quarter of women who slept under ITNs experience at least one form of discomfort with excessive heat being the major discomfort. This might be attributable to the typical hot weather of Africa and lack of electricity (Abubakar, 2017).

Further evidence has also shown that education and correct knowledge about malaria, its modes of prevention as well as its fatal consequences were found to be significantly associated with increased use of ITNs (Arogundade et al., 2011; Deressa et al., 2011). However, Aluko and Oluwatosin (2012) in their study of effective use of ITNs in malaria control found that despite the relatively high knowledge of malaria by the respondents, the use of ITN is significantly low. This has been attributed to the negative attitudes of the respondents to ITN use, poverty or unavailability of bed nets.

While access to an ITN within the household is the best predictor of ITN use, given the differences in use conditional on access seen across Ghana, it is important to understand what additional variables might explain use behaviour when household members theoretically have access to a space under a net within their household.

Some self-reported reasons for not using nets by most people as alluded to by Koenker & Yukich (2017) include discomfort due to heat fluidity of sleeping arrangements i.e. moving from inside to outside or vice versa during the night (Monroe et al., 2015)), and little perceived need to use a net when mosquito density is low (Koenker & Yukich, 2017; Pulford et al., 2011).

It is important to remember that net distribution will not ensure that the nets will be kept, will be used properly, or that the most vulnerable members of households will benefit from their use. As indicated in International Rescue Committee, unpublished data, 1997 report on bed nets usage among displaced populations, ITNs can be viewed as a valuable commodity to be traded for other desired goods, such as food items, or sold for cash among some bed net users. This is a problem that may diminish over time as communities become more stable and the benefits of net use are more widely appreciated, but trading or selling nets rather than using them can clearly compromise the public health impact of an ITN program (Curtis & Mnzava, 2000)

Successful ITN use is highly dependent on community acceptance and participation. Not only does the community need to use the nets, but its residents must also adhere to reimpregnation schedules for optimal effect. Among some stable populations, nets are often used exclusively by the male head of household, leaving the more vulnerable children unprotected (Makemba et al., 1995; Van Bortel et al., 1996).

2.10 Knowledge of ITNs Use

Malaria is unique among diseases because its roots lie so deep within human communities (Heggenhougen, et al., 2003). Beliefs and practices related to malaria are often associated with culture and can influence the effectiveness of control practices (Adera, 2003). Similarly, Kimbi, et al. (2014) noted that the practice of malaria

prevention is related to the level of knowledge and belief of people. The understanding of the possible causes, modes of transmission, and decision about adoption of preventive and control measures vary from community to community and among individual households that own bed nets. Nkuo-Akenji et al. (2005) reported that an adequate knowledge of mothers of under-fives about malaria has a great correlation with reduced morbidity and mortality among children less than five years. Common principles used to measure knowledge about malaria include questions about transmission, interventions, treatment and consequences (Obol et al., 2011). But Batisso et al. (2012) and NMCP (2018) as cited by Opokua et al. (2019) however states that, poor user practices, misconceptions and insufficient knowledge affect the longevity of the LLINs (i.e., user-determined end of the useful life), and this threatens the sustainability of gains that are achieved through concerted efforts over time.

Several studies have identified the presence of correlation between the level of knowledge about malaria and its preventive measures and the utilization of ITNs among pregnant women across varied socio-demographic groups (Kwaku 2015; Lover et al., 2012). The processes involved in handling and using LLINs can limit or enhance their utility based on a household's knowledge, experiences and expectations (Loll et al., 2013; Kibe et al., 2019).

Pregnant women generally receive health education including information on malaria prevention and control during antenatal care visits to health facilities (Amako, 2016) where they are issued free ITNs. This service is generally provided by doctors, nurses, midwives and other auxiliary staff in English language and the local dialect of the community (Fagbamigbe & Idemudia, 2015).

Arogundade et al. (2011) found that one of the key predictors of ITN use among pregnant women in Nigeria is the knowledge that ITN use prevents malaria and opined that women who knew about the specific risks of malaria in pregnancy (such as anaemia, low birth weight, abortion) were more likely to use ITNs than those who did not. This was also emphasized by Russel et al. (2015) and Belay & Deressa, (2008). However, Russel et al. (2015) found in his study of knowledge on effect of malaria that, despite knowing that mosquitoes cause malaria, only 2.3% of the respondents knew that malaria could result in spontaneous abortion, stillbirth, prematurity or intrauterine growth restriction. But Obol et al. (2011) noted that women erroneously believed that malaria is a sign of pregnancy and most resort to using traditional herbs as a remedy for both malaria and other pregnancy ailments which eventually results in complications that detrimental to their health and the unborn child.

The level of education was found to have variable effects on the utilization of ITNs among pregnant women in several studies (Ankomah et al., 2012). Some studies found a good correlation between the possession of higher education and increased use of ITNs (Muhumuza et al., 2016) found that although possession of a higher education increases the likelihood of possessing ITN, it was not found to increase utilization.

Key barriers to people receiving and using ITNs their low knowledge of ITNs, household or cultural constraints such as low social position or economic dependency, high cost and lack of availability of ITNs. Among healthcare providers, key barriers to delivering ITNs to beneficiaries were provider knowledge, provider attitudes, health facility organization, fees for services, and stock-outs of ITNs (WHO, 2018).

Alexander et al. (2013) reported that Knowledge about malaria prevention was high amongst the respondents in their study. They reported that malaria can be prevented to some extent by avoiding mosquito bites using insecticide-treated bed nets (ITNs), burning of coils and strong-scented leaves.

This study showed that the use of ITNs as malaria prevention measure was well known by respondents. However, as reported from the Kintampo Birth Cohort Study conducted in 2010, ITN use among women in the study area was low, 47% (Asante et al., 2013). In a previous study conducted in Nigeria in 2012, Aluko and Oluwatosin (2012) knowledge about the usefulness of ITNs in preventing malaria and the risk of malaria in pregnancy was concluded as the most likely factor required to increase ITN use. This does not seem to be the same in Ghana with the role out of the mass ITNs distribution.

Efforts to increasing the knowledge level on ITNs usage is key to achieving its main objectives. To this end, Hang-Up Campaign Evaluation – Final Report (10th May 2013), was purposed to increase knowledge on the use of LLINs and ITNs and promote ownership and participation in the Hang-Up Campaign at all levels with the major focus being on the consistent and sustained effective use of ITN.

2.11 Free Distribution of ITNs and Malaria Prevalence

Free delivery of ITNs has been shown not to necessarily increase ITN use (Cochrane Database of Systematic Reviews, 1996). Since 2000, there have been increased funds and resources mobilized for the widespread control and elimination of malaria (Yukich et al., 2017). As a result, there has been a rapid scale-up of existing effective anti-malaria interventions, particularly insecticide-treated nets (ITNs). This has led to

unprecedented levels of vector control coverage across sub-Saharan Africa (Bhatt, et al., 2015).

ITNs are the most widely used intervention for malaria control in Africa, representing the main vector control tool in nearly all malaria endemic African countries (WHO, 2015). They are effective for reducing malaria-related morbidity and mortality by acting as a direct barrier to mosquito biting and by providing community-wide protection through killing of mosquitoes resulting in reductions in vector density and average lifespan (Lengeler, 2004).

The cost-effectiveness of ITNs in the prevention of malaria has been demonstrated in a variety of settings (White, Conteh, Cibulskis & Ghani, 2011; Lengeler, 2004; Yukich, Lengeler, Tediosi, Brown, Mulligan, Chavasse, et al., 2008; Willey, Paintain, Mangham, Car & Schellenberg, 2012). While ITNs have been highly effective at reducing prevalence and incidence across the continent, sustaining and increasing access to these interventions remains a concern. Maintaining high ITN coverage is particularly problematic due to the continuous loss of nets from households due to wear and tear, repurposing, or movement of nets out of target areas (Bhatt, et al., 2015).

In 41 of 45 countries in the World Health Organization (WHO) African Region, the policy is to distribute ITNs free of charge (WHO, 2015). The WHO recommends that to achieve and maintain universal ITNs coverage, countries should apply a combination of mass and continuous distributions through multiple channels (WHO, 2017).

Mass distributions have been identified as an excellent tool for "catch-up"– if carried out efficiently and successfully they are able to rapidly and efficiently increase coverage and usage of nets on a large scale (Koenker et al., 2011; Hightower et al., 2010; Bonner et al., 2011; Taylor et al., 2017). . While the WHO recommends that mass distributions be implemented every 3 years, often distributions are delayed so that the gap is longer than 3 years (WHO, 2017). This recommendation assumes that the useful life of an ITN is 3 years. However, the lifespan of ITNs may be closer to two rather than 3 years (Tan et al., 2016; Wills et al., 2013 and Hakizimana, et al., 2014).

While mass distributions are a cost-effective way to quickly achieve high coverage over a particular area, coverage gaps begin to appear almost immediately post-distribution through net deterioration, loss of nets, and population growth, therefore, requiring complementary continuous distribution channels to sustain or "keep up" coverage over time (Koenker et al.,2011; Zhou et al., 2014; Paintain et al., 2013).

Some studies have shown that a personal decision to purchase a net may motivate one to use the ITNs (Baume & Franca-Koh, 2011) rather than getting it for free. Therefore, it is important to encourage commercial distribution of ITNs but at a subsidized price that is at the barest minimum (Sexton, 2011). Such a strategy, backed by education on the proper care and maintenance of the nets to ensure their durability, is also likely to lay the foundation for a sustained supply of ITNs (Manu & Abrafi, 2017).

Again, as indicated by Manu and Abrafi (2017) in a study conducted in the Kintampo Municipality and Nkoranza North and South Districts in the Brong-Ahafo Region, indicated that respondents knew about insecticide-treated nets (ITNs) and their

importance in malaria prevention. They perceived sleeping under ITNs as very beneficial because it protects a pregnant woman and her unborn child from malaria which can lead to other health problems.

Apart from using ITNs, all respondents acknowledged the use of other malaria-preventive strategies such as the use of mosquito repellents, wearing protective clothes, and practice of environmental hygiene as a way of controlling malaria (Lover et al., 2011).

2.12 Theoretical Underpinning of the Study

2.12.1 The theory of planned behaviour (TPB)/Reasoned Action (TRA)

Ajzen and Fishbein formulated the Theory of Planned Action (TRA) in 1980 as an attempt to provide consistency in studies of the relationship between behaviour and attitude (Fishbein & Ajzen, 1975; Wermer, 2004).

Fishbein et al. (2004) writes that the main assumption of TPB and TRA is that individuals are rational in considering their actions and the implications of their actions, adding that, there are two main conceptions in TRA: Principles of Compatibility and the concepts of behavioural intention. Principles of compatibility specify that in order to predict a specific behaviour directed to a specific target in a given context and time, specific target, time and context should be assessed.

The concept of behaviour intention, on the other hand, states that an individual motivation to engage in behaviour is defined by an attitude that influences the behaviour. Behaviour intention indicates how much efforts an individual will like to commit to perform such behaviour.

TRA also claims that all other factors which influence the behaviour only do so in an indirect way by influencing the attitude or subjective norms. Fishbein and Ajzen (1975) refer to these factors as being external variables. These variables can be for example, the characteristics of the tasks, of the interface or of the user, the type of development implementation, the political influences, the organizational structure, etc (White et al., 2013).

A meta-analysis on the application of the theory of reasoned action shows that the model can produce good predictions of choices made by an individual when facing several alternatives (Hennekens & Buring, 1988).

The diagram in Fig 1 is representation of the intervening variable to attitude change, theorized by Ajzen and Fishbein.

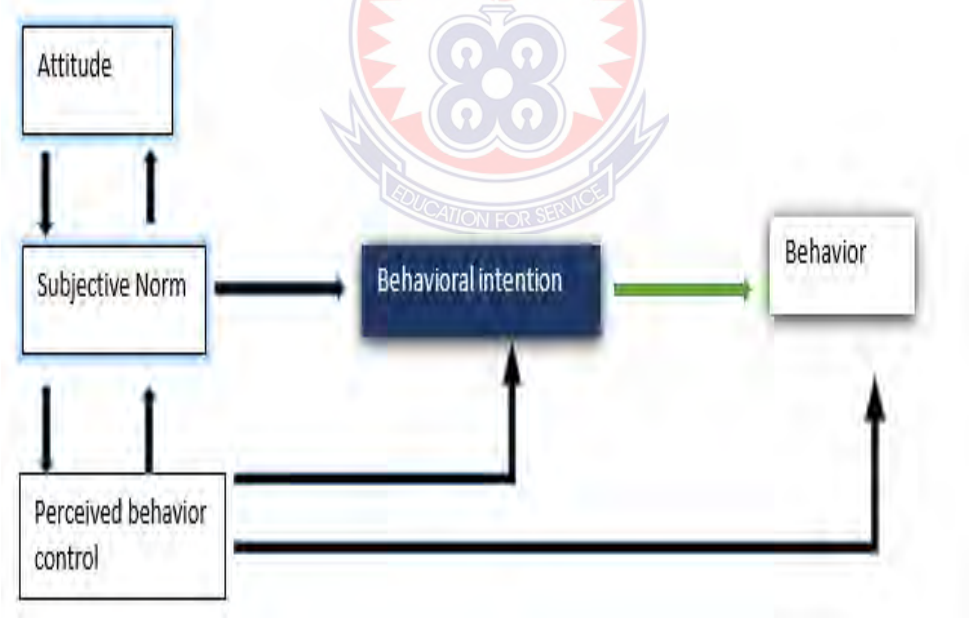

Figure 1: The Theory of Planned Behaviour, adopted from Ajzen (1991)

2.13 The Ecological Triad Model

Numerous researches have used the ecological models in malaria study, malaria Treatment Seeking Behaviours (TSB) and malaria Knowledge, Attitude and Practice

(KAP) (Oresanya et al., 2008; Gordis, 2014). The ecological model consists of a triangle that consist of an external agent, a susceptible host, and an environment that brings the host and agent together (Sagar, 2019). Malaria therefore results from the interaction between the agent (female anopheles' mosquito), the susceptible host (humans) aided by the environmental conditions which support the breeding, survival and transmission of the agent from source to the people who are exposed to mosquito bite.

Agent: The female *anopheles'* mosquito is the main of several agents that caries the infectious malaria virus.

The Host: The human being offers subsistence and lodging for a pathogen if there is opportunity for exposure of human body to mosquito bite. The host is associated special qualities of humans as natural organisms which serve as the possible host of disease (Meade & Emech, 2010).

The Environment: The physical space and surroundings, including temperature, humidity, rainfall which influence the existence and survival of the carrier of the malaria virus by the agent (anopheles' mosquito) to infect humans through biting. It is made up of physical, built and social environment,

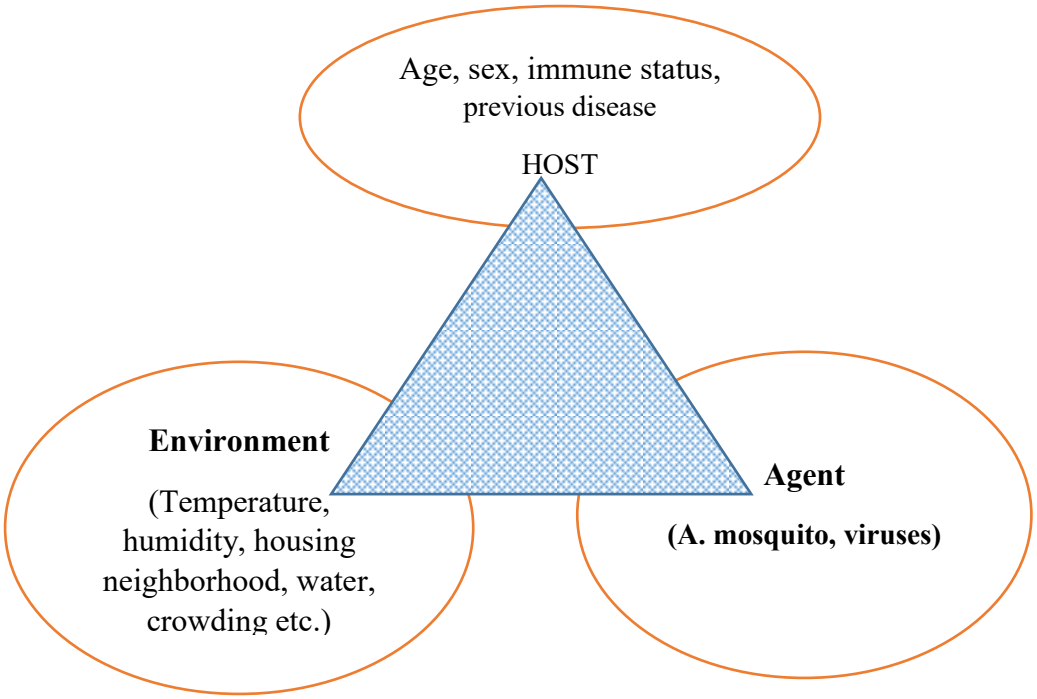

Figure 2: Ecological triad

Source: Self construct, 2022.

2.14 Conceptual Framework

A conceptual framework, according to Jabareen (2009), is defined as a network of interlinked concepts that together offer an inclusive understanding of a phenomenon or phenomena.

Malaria in the forest and the transitional belts, including all other malaria endemic areas of Ghana can be observed as an exclusive combination of environmental conditions and social reactions which is caused by ecological, political, economic and cultural circumstances. Recent methods to curb malaria demand a combination of ecological and social methods, including societies and government. These methods depict an ecological context of health (Curtis, et al., 1996) indicated in the description of "health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1986).

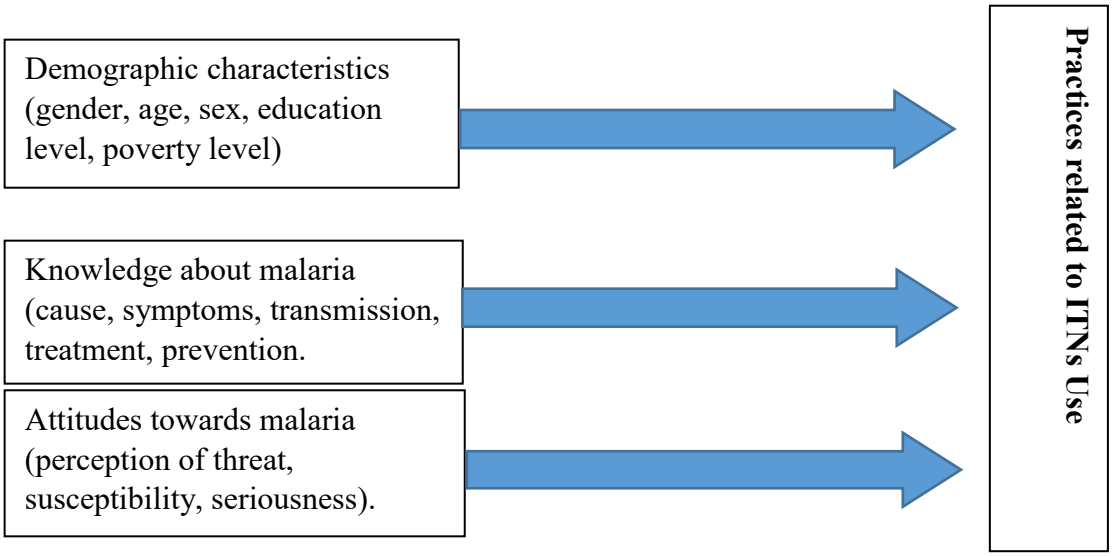

Figure 3: Conceptual framework indicating factors relating to malaria prevention and control

Source: Luyiga Faridah and Mwanje (2013)

The illustration in figure 3 shows the relationship between the dependent and independent variables. It shows the factors that affect adoption of malaria preventive practices. These factors include socio-demographic characteristics, the community's knowledge about malaria and their attitudes towards malaria prevention and control.

Several research studies have shown that high knowledge about malaria among a community enables practice of preventive and control strategies (Hakizimana et al., 2009; Ahmed et al., 2009). Other studies have also associated gender, age, education and poverty level, to practices towards malaria prevention and control (Appiah-Darkwah & Badu-Nyarko, 2011). Perceptions, threat and susceptibility are believed to have an influence on practices adopted by the community to prevent and control malaria (Appiah-Darkwah & Badu-Nyarko, 2011).

Paaijmans et al. (2008), evaluated the function of many features impacting the understanding of insecticide-treated bed nets (ITN) with the focus on estimating

development concerning malaria in the Millennium Development Goal (MDG) and discovered that the utilization of ITNs and practices related to ITNs use within an area is influenced by religion, income, education and ethnicity (Noor et al., 2003) as demonstrated in figure 3.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter of the study comprised of the geographic location of study area, research design and methodology that guided the study, the study population, sample and sampling procedure, data collection instruments, and methods of data analysis and presentation to accomplish the objectives of the study. Ethical consideration of respondents as vital part of this study was also taken into account.

3.1 The Study Area and Location

According to Mordy and Jerry (2018), Krachi East Municipal is one of the 261 Metropolitan, Municipal and Disrict Assemblies in Ghana and forms part of the eight of Municipalities in the Oti Region. The Municipality can be located at the North Western corner of the Volta Region of Ghana and which lies between latitude 7^{o} 40'N and 8^{o} 15'N and longitude 0^{o} 6'E and 0^{o} 20'E with its administrative capital of Dambai.

It is located on the eastern side of the Oti River, a tributary of the Volta Lake. It was declared the capital of the region which was carved out of the existing Volta Region. It was given the Legislative Instruments as capital by President Nana Akufo-Addo on 15th of February 2019 after it was chosen to be the capital. It is located in the heart of the Savannah Accelerated Development Authority (SADA) area.

Due to its proximity to Oti River, which provides fertile land and ample water, the Krachi East area has a variety of animals and plants. The outskirts of Dambai, the administrative capital contain wild animals such as lions and elephants, duikers, cobs,

several marine and land snakes such as vipers, and pythons, and buffalo. The Oti River provides substantial fish including tilapia, cat fish, Nile perch, electric fish, puff fish. There are several types of oysters and clams as well as several types of crocodiles including the Nile crocodile. Fig 4 shows the map of the study area.

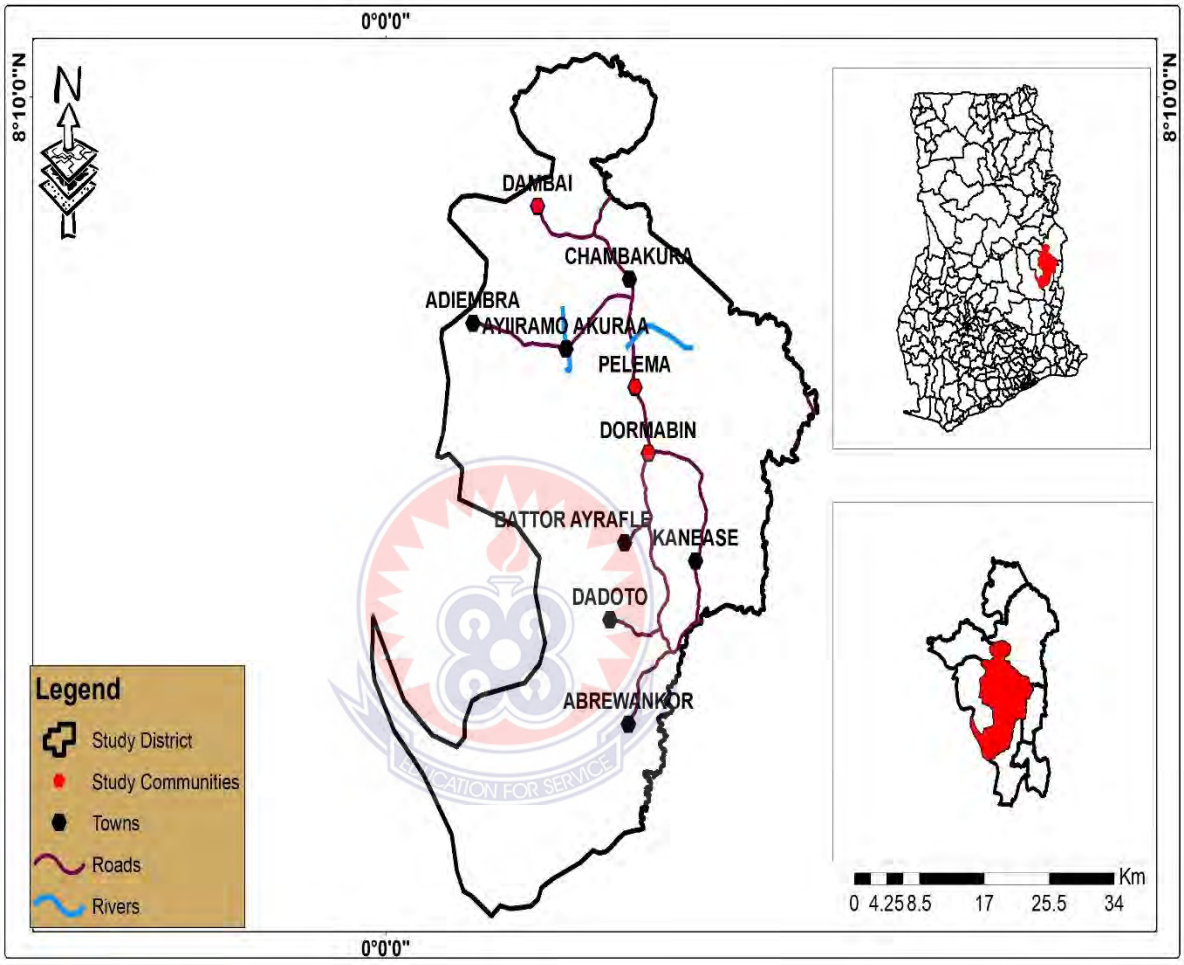

Figure 4: The map of the Study Area

Source: Self construct (2022)

3.2 Research Design

The researcher employed a cross-sectional design for the study. A cross-sectional study is an observational study that evaluates and compares different groups at the same time. This design is considered appropriate since the researcher engaged five separate communities, Dambai, Kwame Akora, Yarika No2, Kpelema and Dormabin

at the same time for the study, and that this design guided to observe multiple variables at the same time with household heads that accurately represented a sample of the population in the selected communities in the municipality. This means that participants in a cross-sectional study have a variable that connect them, such as living together and the sampled communities are all located within Krachi East Municipal and sharing common characteristics.

Cross-sectional studies are popular for looking at the health of a population. With the focus of this study on people's knowledge and use of ITNs in controlling malaria, it therefore offered the most appropriate guide in examining people's level of awareness on ITNs use, perception on the use of ITNs and as well establish the incidence of malaria since the introduction of mass ITNs distribution in curbing the menace in the Municipality.

3.3 Research Philosophy

Although philosophical ideas remain largely hidden in research, they still influence the practice of research and need to be recognized, and is very important that individuals undertaking research come out explicitly on the philosophical pathway the research is following (Creswell, 2009). In the thinking of Bruku (2016) the philosophical worldview of a research provides explanation to how people perceive, think and know about reality. Thus, individual's perceptions about the world provide a baseline that guides enquiries into any problem identified by the researcher (Bruku, 2016). There are four philosophical worldviews of research: the postpositive, social construction, advocacy/participatory and pragmatic worldviews (Creswell, 2009).

This study employed pragmatic worldview to explore people's knowledge and use of ITNs in malaria control in Krachi East Municipality. Pragmatic worldview arises out

of actions, situations, and consequences rather than antecedent conditions (Creswell, 2009). Kalolo (2015) further acknowledged that the etymological meaning of pragmatism is identified as finding a practical approach to finding solutions for existing problems. The idea of pragmatism provides the researcher the opportunity to choose the methods, techniques and procedures of research that best meet the objectives of their study (Creswell, 2009). Thus, for the mixed method researchers, pragmatism opens the door to multiple research methods, different worldviews, different assumption, as well as different forms of data collection and analysis rather than subscribing to one way (Creswell, 2009). Greene (2006) has indicated that philosophical assumption of the mixed method needs to enlighten in social inquiry, debating that the philosophical assumption of ontology, epistemology, objectivity should be much enlightened.

Thus, a mixed method approach underpinned by pragmatic philosophy was adopted in the study which offered detailed explanations to issues of knowledge and use of ITNs in malaria control in Krachi East Municipality. In line of this, the importance of pragmatism for this study was a guide and allowed for the gathering of a wide range of information through the use of varied methods.

3.4 Methodology

Methodology is generally a guideline system for solving a problem with specific components such as phases, tasks, methods, techniques and tools. Research methodology helps us engage the appropriate tools and techniques to be able to explore research problems in an effective manner through which relevant information is obtained for a study. In this study, the researcher employed the mixed (qualitative and quantitative) method in the conduct of this study. According to Creswell (2009) s

mixed method approach has the advantage of incorporating both qualitative and quantitative research methods hence it is able to fill the shortfalls in each of the two methods. Teye (2012) also stated that employing qualitative and quantitative strategies in research studies promote cross-valuation of each strategy around a common reference. The quantitative data provided the basis and aid in performing the required statistical test and analysis to arrive at generalization. The qualitative data on the other hand served as a tool that provided in-depth description and insight into the problem under investigation.

3.5 Source of Data

This study relied on two data sources, that is primary and secondary data sources.

The primary data was obtained from respondents from field survey as they responded to research questions through the administration of questionnaires, in-depth interviews of the respondents and as well as field observation. This focused on establishing the incidence of malaria since the introduction of mass ITNs distribution, assesses the level of awareness concerning ITNs and related-interventions, and also examined perceptions on the use of ITNs in Krachi East Municipality. Photographs of visible misuse of ITNs as well as well as environmental conditions that promote and sustain the anopheles' mosquitoes was taken to augment the primary data.

Secondary data was gathered from websites, reports, books journals and articles, newspapers magazines among other relevant sources and the reviewed literature. The projected population for calculation of sample size was obtained from the Krachi East Municipal Statistical Office while data on malaria reported cases was also obtained from the Krachi East Municipal Health Directorate as reported by the Municipal

Health Center, the EP Clinic and the other recognised health facilities in the Municipality.

3.6 Sampling Techniques

3.6.1 Purposive sampling

This sampling method was used by the researcher in selecting the five communities ie Dambai, Dormabin, Kpelema, Kwame Akora and Yarika No2 since they form the focal point with clinic centers where the ITNs are distributed. This sampling method was deployed to obtain information from the Krachi East Municipal Directorate on ITNs distribution as well as data on malaria recorded cases in the municipality. In-depth interviews were conducted on health personnel from the Municipal Health Center, and the EP Clinic to ascertain level of awareness concerning ITNs use and related-interventions in the Municipality, and on the criteria for ITNs distribution and effectiveness of ITNs in reducing malaria. Household heads were also targeted as the main respondents in the field survey since they are mostly those who are involved in receiving the ITNs during the mass distribution periods.

3.6.2 Systematic sampling

The researcher employed systematic random sampling technique in selecting household heads or any matured member of the selected household to respond to the questionnaires. To ensure for greater chances of the household heads to be selected as respondents, the researcher engaged only one respondent in the selected house in the study communities. Using the sample size of 300, the fix sampling interval in each of the selected communities were determined by dividing the household size of the individual communities by the sample size. This sampling technique was considered

most appropriate since it enabled the researcher to select respondents without bias in the selected communities at regular interval.

3.7 Study Population

The study used the 2010 population and housing census, focusing on the household size data of the sampled communities which were obtained from the Krachi East Municipal Statistical Department for the study. The focus was on Dambai, Yarika No.2, Kwame Akora, Kpelema and Dormabin, which were the five selected communities for the study. Respondents were carefully selected from these sampled communities based on the total household sizes as obtained from the Krachi East Municipal Statistical Department. Table 1 provides information on the household sizes of the selected study communities.

Table 1: Community and household size

Community	Household Size
Dambai	6557
Dormabin	1037
Kpelema	849
Yarika No.2	181
Kwame Akora	360

Source: Ghana Statistical Service, 2010 PHC.

3.8 Sample Size Determination

A simple equation can aid in the selection of a representative sample size. In determining the sample size for a study, some important elements about the study population and the required sample must be determined. These include the total

population of the study area, margin of error, confidence level and the standard deviation. The study adopted the Krejcie & Morgan (1970) Formula.

$$n = \frac{X^2 Pn\,(1- p)}{e^2\,(N-1) + X^2 p\,(1-p)}$$

n = sample size

N = population size = 8,984

e = acceptable error of sample size

χ^2= Chi-square df = 1

reliability level 95% (X 2 = 3.841)

p = the population proportions (Assumed to be 0.5)

$$n = \frac{3.841\times 8,948 \times 0.5\,(1-0.5)}{0.05^2\,(8,948-1) + 3.841\times 0.5(1-0.5)}$$

$$n = \frac{3.841\times 8,948 \times 0.5 \times 0.25}{0.05^2\,(8,948-1) + 3.841\times 0.5(1-0.5)}$$

n = 300

3.9 Proportional Calculation of Sample Size for the Study Communities

Dambai = $\frac{6557}{8984} \times 300 = 219$

Dormabin = $\frac{1037}{8984} \times 300 = 35$

Kpelema = $\frac{849}{8984} \times 300 = 28$

Kwame Akura = $\frac{360}{8984} \times 300 = 12$

Yarika No 2 = $\frac{181}{8984} \times 300 = 6$

Table 2: Summary of the population and sample sizes of the various communities

Community	Household Size	Sample size
Dambai	6557	219
Dormabin	1037	35
Kpelema	849	28
Yarika No.2	181	6
Kwame Akora	360	12

Source: Field Survey, (2022)

3.10 Tools and Methods of Data Collection

3.10.1 Questionnaire

Semi-structured standardized questionnaire was used to gather primary data from respondents. This helped the researcher obtained information from respondents on whether or not they own ITNs, sleep under ITNs and how often they use ITNs. It was also used to obtain information from the health personnel on the criteria for ITNs distribution, the effectiveness of ITNs in reducing malaria as well as other policy interventions put in place to control malaria in the municipality. It sought information on the level of awareness concerning ITNs and related-interventions, perceptions on

the use of ITNs, as well as incidence of malaria since the introduction of mass ITNs distribution in Krachi East Municipality.

3.10.2 Observation

Observation was employed to gather information on the attitude of the people towards the use of ITNs in the selected study communities in the municipality and also help ascertain sanitary conditions in the communities that serve as breeding grounds of mosquito vector.

3.10.3 In-depth interview

With the aid of an interview guide, in-depth interviews were conducted with the personnel who are directly involved in the implementation of the free distribution of ITNs campaign, mainly at the municipal health directorate. They included the Malaria Focal Persons, Disease Control Officers and Municipal Director of Health Services.

3.11 Validity of the Quantitative Instrument

Validity means that the researcher checks for the accuracy of the findings by employing certain procedures. Validity is one of the strengths of qualitative research and is based on determining whether the findings are accurate from the standpoint of the researcher, the participants, or the readers of an account (Creswell & Miller, 2000). Terms abound in the qualitative literature that address validity, such as trustworthiness, authenticity, and credibility (Creswell & Miller, 2000), and it is a much-discussed topic (Lincoln, Lynham & Guba, 2011). Validity was ensured by pre-testing the instruments which were deemed appropriate in gathering of data required to achieve the study objectives.

3.12 Reliability

Reliability is the researcher's consistency of approach across different researchers and projects (Gibbs, 2007). To ensure reliability, the items on the research instruments were put into different sections in line with the objectives and cross checked by the supervisor for consistency. Measuring items were categorized for knowledge, awareness and use of ITNs. Cronbach's alpha reliability scale in IBM SPSS version 22 was used to run the items. Cronbach's alpha coefficient obtained for the internal consistency of the items in the ITNs distribution and malaria incidence obtained 0.77. The measuring items for Awareness of ITN's and related interventions in malaria control obtained Cronbach alpha coefficient 0.80 and the items for that on ITNs use of 0.75. According to Moshen and Reg (2011) Cronbach alpha coefficient $0.5 > \alpha$ is unacceptable, $0.6 > \alpha \geq 0.5$ is poor, $0.70 > \alpha \geq 0.6$ is questionable, however $0.8 > \alpha \geq 0.7$ is acceptable, $0.9 > \alpha \geq 0.8$ is good, and $\alpha \geq 0.9$ is excellent. Drawing on this interpretation, Cronbach alpha 0.77, 0.75 and 0.80 of the internal consistency of the measuring items are reliable.

3.13 Data Analysis and Presentation

The data Collected was analysed by using excel and descriptive statistical analysis in the SPSS. The results were then presented in the form of tables, pie charts, line graphs and bar graphs. SPSS was used to process and analyze quantitative data and thematic content analysis for qualitative data and the result triangulated.

3.14 Ethical Considerations

Ethical consideration plays a pivotal role in the field of research and its significance cannot be undermined. It ensures credibility, validity and integrity in research. In this regard ethical concerns of the respondents were duly observed during the study.

Respondents were informed that their consent would be needed and that participation was voluntary during questionnaire administration and other field activities that involved respondents. Also, the objective of the study was clearly outlined to the participants and that no monetary or financial reward was to be expected from the researcher. Participants were assured of anonymity and that their permission was sought and granted for their pictures to be used where necessary in this research. Finally, participants were assured that their responses to questions would be kept confidential.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.0 Introduction

This chapter presents data analysis and discussion. The main objective of this study was to examine people's attitude and knowledge towards the use of ITNs as a tool in preventing malaria. The objectives that guided this research include: 1.To establish the incidence of malaria since the introduction of mass ITNs distribution in Krachi East Municipality, 2.To assess the level of awareness concerning ITNs in Krachi East Municipal. 3. To examine perception on ITNs use.

To address these objective of the study, the chapter looked at the following areas; free ITNs distribution and malaria incidence, awareness and Perception on ITNs use, and related interventions in malaria control. To relate the socio-demographic characteristics of the research participants to the findings of the study, the study included gender, age, education, religion, occupation and marital status of the respondents in the questionnaire. In view of this, the study commenced the analysis with such characteristics.

The descriptive Table 3 reports on background characteristics of the respondents. The socio-demographic characteristics attracted **Mean (M)** and **Standard Deviation (S.D)** scores which ranges from 1.52-3.11 and .501-1.383 respectively. With the first characteristic (gender) attracted (M = 1.52, S. D =.501) indicating how close the number of both the male and the female respondents are.

The second item was age, with (M = 2.87, S. D = 1.26) implying the vast differences in the ages of participants. Marital status attracted (M = 1.78, S. D =.741) indicating

the divergence in the range of the participants marital status followed by education with (M = 3.11, S. D =1.383) also indicating the differences in the educational background of the respondents in the study area**.** This was proceeded by religion and occupation of participants (M = 1.6, S. D =.714) and (M = 2.66, S. D = .968) respectively, indicating the differences in the religious and occupational backgrounds of the respondents in the study area.

4.1 Socio-Demographic Characteristics of Respondents

The research was conducted in five communities in Krachi East Municipality. The selected communities include Dambai, Dormabin, Kpelema, Yarika No 2 and Kwame Akora. Demographics of the respondents were therefore obtained during field survey and presented in Table 3.

Table 3: Socio-Demographic Characteristics of Respondents

Category	No of Respondents	Percentage (%)	Mean	Std. D
Gender				
Male	50	17	1.52	.501
Female	250	83		
Age				
10-20	40	13	2.87	1.26
21-30	60	20		
31-40	100	33		
41-50	70	24		
51 above	30	10		
Marital Status			**1.78**	**.741**
Single	70	23.3		
Married	220	73.3		
Devoiced	5	1.7		
Widowed	5	1.7		
Education			**3.11**	**1.383**
None	110	36		

Primary	50	17		
J.H.S	60	20		
S.H.S	60	20		
Tertiary	20	7		
Religion			**1.6**	**.714**
Christianity	210	70		
Islamic	70	23.4		
Traditional	10	3.3		
Others	10	3.3		
Occupation			**2.66**	**.968**
Gov. Employee	40	13.3		
Self-employed	70	23.4		
Farming	150	50		
Trading	40	13.3		

Source: Field Survey, (2022)

The first item on the descriptive socio-demographic characteristics of the respondents above is gender. The table reports a 17% of male respondents as against an 83% of female respondents in the study area. The involvement of more female participants could be that females care much about the health implications of the family than the males as they are much concerned with the issues of mosquito nets distribution as the males are always on their jobs (Scerri, 2014).

The variable on the background characteristics of the participants is the age. The age group of the respondents in the study area was put into six groups. The groups were participants within the ages of 10-20, 21-30, 31-40, 41-50 and 50 and above. The largest proportion of the participants (33%) of the participants were within the ages of 31-40, 24% also within 41-50, 20% within 21-30, 13% within 10-20 and the last group of the participants composed 10% of the population above 51 years. The population of the study area is largely youth which confirms the results of the GSS results that the Ghanaian population is largely youth. It could also be inferred from

this that people who mostly suffer from malaria are the youth, (World Health Organization, 2018).

To ascertain the group of participants who are mostly concerned when it comes to the usage of the insecticide treated nets in terms of marital status, the results in table 3 indicate that 73.3% of the participants were married, 23.3% were singles, 1.7% were widowed and 1.7% devoced. It can be inferred that most of the participants that are married could have children who are young and susceptible to malaria and hence their much concern in the free ITNs distribution if they are males but if they are females, they could be pregnant who have high risk of malaria as reported by Newman, (2012). The other 23.3% of the participants were unmarried but however have concern for ITNs distribution since malaria has no regard for anyone.

On educational background of respondents, 36% had no education, 20% had both J.H.S and S.H.S education, 17% had primary education and 7% of the participants had tertiary education. Generally, it can be concluded that 64% of the total participants had access to formal education whereas 36% had no access to formal education. This, however is contradictory to the GSS result that.

With regards to religious background of the respondents, 70% of the participants were Christians, 23.4% were Muslims, 3.3% Traditional and others. It indicates that majority of the people in the study area are Christians with traditional religion been the least.

In the area of occupation, 23.4% were self-employed, 50% were farmers, 40% were traders and 13.3% were government employees. Majority of the population (50%)

were farmers confirming the assertion by most of the people in Krachi East area are farmers, as furthered by GSS (2022).

4.2 Objective 1: Establishing the Incidence of Malaria since the Introduction of Mass ITNs Distribution in Krachi East Municipality

Purposive sampling method was used by the researcher to select respondents for data on the number of ITNs distributed as well as the recorded cases of malaria over the past six years in Krachi East Municipality. Personnel from the Krachi East Municipal Health Directorate who are directly involved in keeping records on the mass distribution of ITNs as well as keeping the epidemiological records of malaria in the municipality were selected as respondents. Closed-ended questionnaires were used to generate quantitative data on the recorded malaria cases vis-a-vis the number of ITNs distributed within the years under review.

Semi-structured and open ended questionnaires were also administered to selected health personnel in Municipal Hospital and some other selected clinics in the municipality to generate qualitative data to establish challenges they faced during ITNs mass distribution, its effectiveness as a tool in malaria control among others.

4.2.1 Trend analysis of malaria cases and ITNs distribution in Krachi East Municipality

A total of 12,885 **ITNs** were distributed over the last six years, 2014/19 at Krachi East Municipality (Dambai) in Oti region. The average ITNs distributed over the six years period was 29,927 with a maximum and minimum at 30,903 and 17,591 distributed respectively. Results from the record review showed a fluctuating trend in the number of ITNs distributed within the past six years, (Figure 5).

A total number of 12,885 (26%) nets were distributed at the end of the six year period. Between the years 2014/15, there was a statistically significant decreased (-89.3%) in ITNs distribution followed by a sharp increment between the years 2015/16 and 2016/17 ($\chi 2$ = 943:91, d: f: = 4, P < 0:00). The number of ITNs distribution witnessed a decrement from 17.8% in 2016/17 to -11.3% and -23.6% in 2017/18 to 2018/19 respectively, (Table 4 & Figure 4).

Table 4: Trend in ITNs distribution and malaria cases in Krachi East Municipality

Year	Recorded Cases	% Change In Malaria Cases	No. ITNs Distributed	% Change ITNs Distribution
2014	30,903		484	
2014/15	22,062	-29	52	-89.3
2015/16	25,351	15	1519	28.21
2016/17	24,849	-2	4222	17.8
2017/18	23,275	-6.3	3745	-11.3
2018/19	17,591	-24	2863	-23.6
Total	**144,031**		**12,885**	

Source: Fieldwork, 2022

4.2.2 Trend in ITNs distribution in Krachi East Municipality

Figure 5: Trend in ITNs distribution in Krachi East Municipality

Source: Field Survey, (2022).

4.2.3 Trend of Malaria Cases in Krachi East Municipality

As seen in the case of ITNs distribution, total number of cases recorded within the six years' period was 119,207 with average of 29,927. The maximum cases stood at 30,903 with the minimum of 17,591 cases, (Table 5). The malaria case results showed a fluctuating trend within the past six years. In 2014, a total number of 30,903 (25.9%) cases were recorded. Within 2014/15, there was a statistically significant decrement of malaria morbidities from 30,903 to 22,062 (-29%), (Table 5 and Figure 4). This was followed by a sharp rise in malaria cases within 2014/15 and 2015/16 from 22,062 to 25,351 (-29% to 15%). Between 2016/17, 2017/18 and 2018/19, there was a further decrease in malaria cases recorded from 24,849 (-2%) in 2016/17 from

the previous year 2015/16 of 25,351 (15%) to 23,275 (-6.3%) in 2017/18 and 17,591 cases (-24%) in 2018/19, (Table 4 and Figure 6).

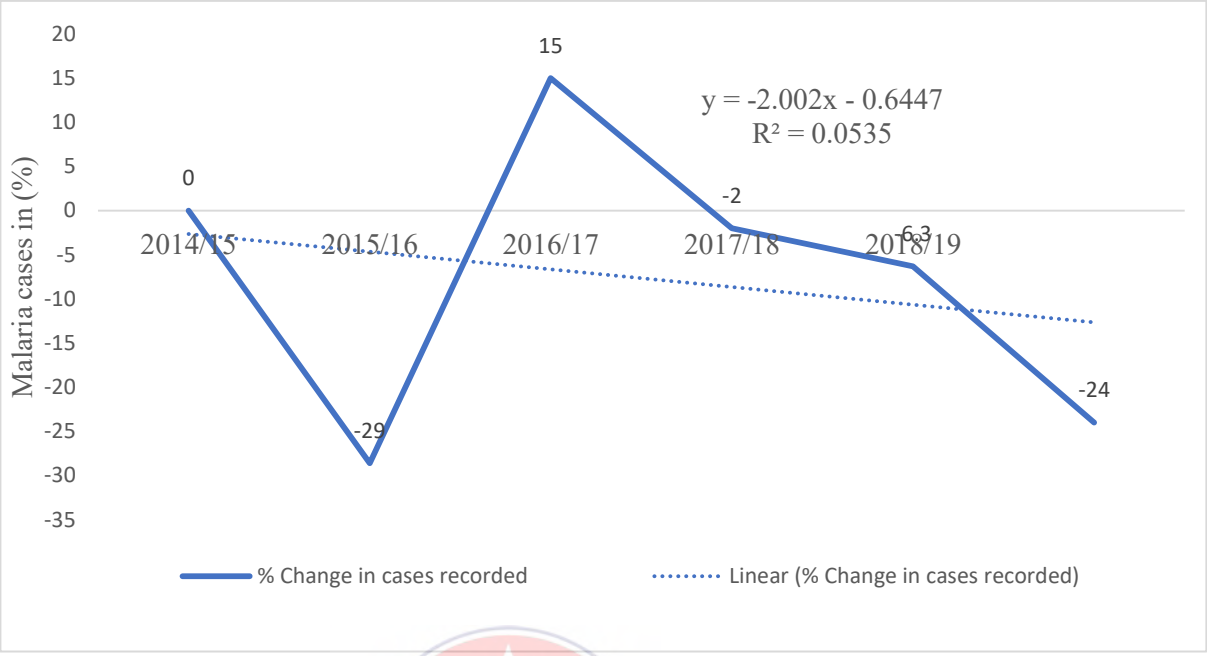

Figure 6: Trend of malaria cases in Krachi East Municipality from 2014-2019

Source: Field Survey, (2022)

4.2.4 Correlation matrix of ITNs distribution and malaria cases

Table 5: Correlation matrix of ITNs distribution and malaria cases

	ITNs	**CASES**
ITNs	1	-0.693*** (-0.127)
CASES	-0.693*** (-0.127)	1

*** Significant correlation at w$p < 0.01$ (P-values in parenthesis)

A Pearson correlation was conducted between ITNs distribution and malaria cases recorded. Cohen's standard was used to evaluate the strength of the relationship where coefficients between .10 and .29 range indicates a weak association, values between .30 and .49 range indicate a moderate association and coefficient above .50 indicates strong association (Cohen, 1988). The results indicate that there was no or negative correlation between ITNs distribution and malaria cases recorded in the area

with the duration of the six years. This means that as the number of ITNs increases or decreases, malaria cases may decrease and increase irrespectively. As indicated, (Table 5) there was no or negative correlation between ITNs distribution and malaria cases recorded. The relationship scored a correlation coefficient of -0.693*** at a significance level of -0.127. The relationship is further exhibited by the figure 7. It is indicated that as ITNs distribution increases from -89.3% to 28.2% between 2024/15 and 2015/16, malaria cases even though decrease as well from -29 to -2 in the same period but does not reflect the ITNs distribution level.

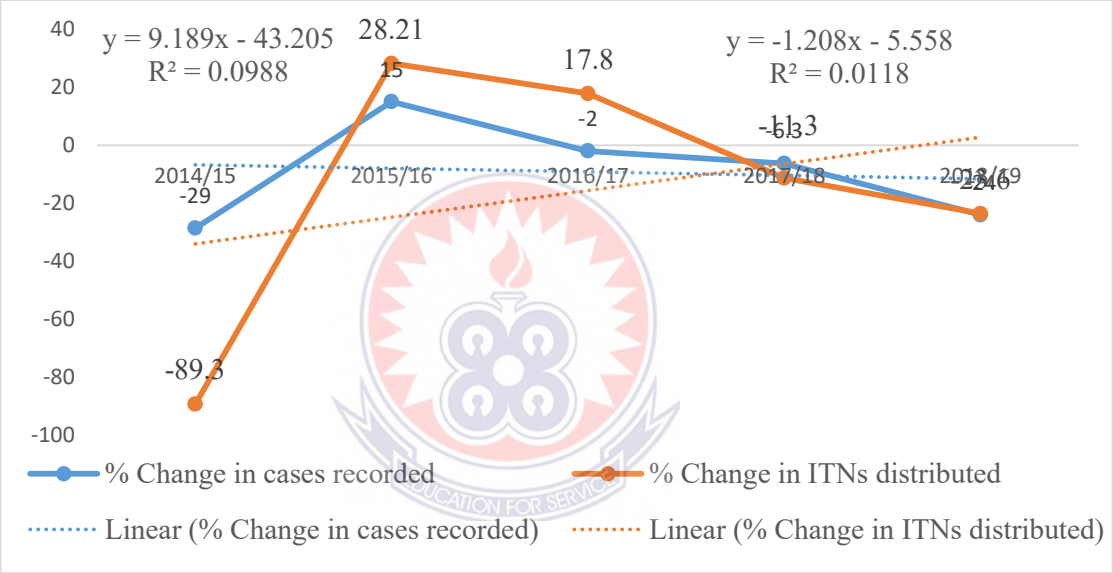

Figure 7: Relationship between ITNs distribution and malaria cases

Source: Field Survey, (2022)

4.3 Objective 2: Assessing the level of awareness of ITNs distribution in Krachi East Municipality

Closed ended questionnaires were used by the researcher to solicit information regarding respondents awareness of the free ITNs distributions and how it affects ownership, usage and its impact on malaria incidence in the municipality. The findings were analyzed and presented in table 6.

Table 6: Respondents awareness of ITNs distribution and malaria incidence

Statement	Yes	(%)	No	(%)	Uncertain	(%)	M	SD
Awareness of free ITNs distribution policy in the municipality	210	70	60	20	30	10	1.23	.573
Participation in ITNs distribution	241	80.3	59	19.7	0	0	1.6	.35
Benefit from ITNs distribution exercise	200	67	70	23	30	10	1.16	.364
Household members sleeping under ITNs	100	33	160	53	40	14	1.95	.823
ITNs distribution reduce malaria infection	210	70	70	23	(20)	7	1.35	.479
Malaria can kill if not **treated well treated**	170	56	60	20	70	24	1.39	.771

Source: Field Survey, (2022)

The responses in table 6 suggest majority (70%) of the participants in the study area were aware of free ITNs distribution, whiles 20% and 10% were not aware and don't know whether the free distribution of ITNs policy existed and takes place in the municipality respectively. These revelations is an indication that majority of the participants have heard of ITNs confirming the findings of Nungbaso et al. (2021) that 92.1% have ever heard of ITNs and 87% knew the purpose of ITNs in preventing malaria. However, the 20% and 10% who were not aware and didn't know could have not received the campaign and other information about it free ITNs distribution. It could also be that they were found at areas where it was difficult for the health workers to have access to during the free ITNs distribution exercise. One respondent posits that the following could be done to create the awareness of the unenlightened population;

> *Logistics be provided to the health workers in the municipality, Motor bikes should be made available to convey health workers to and from the hinter areas for campaign on the use of the ITNs and distribution*

> *as well. Those who receive the ITNs and use it for other purposes instead of the intended purposes should be punished.*
> *(Health worker num. 1)*

The interview also revealed that the ITNs were actually distributed and that the last time the ITNs were feely distributed was on 21st June 2021. This confirmed the assertion of the participants during the field survey that the ITNs were freely distributed to everyone qualified under the distribution classifications. The participants were health workers who were involved in the distribution process. It was also revealed from the interview by the health personnel that everyone was qualified to benefit from the free distribution of ITNs in the municipality. This again reveals the massive distribution of the ITNs of 12,886 INTs between 2014 and 2019 in the municipality (Krachi East Municipal Health Directorate, 2020). One of the participants made this comment;

> *Any time the government makes the ITNs available, because we are the health workers, we normally involve actively in the distribution process. All population are qualified to receive the nets. A greater part of the area is always under coverage under ITNs distribution.*
> *(Health worker num. 2)*

Similar trend was also reported from regions outside Ghana as reported by Omonijo and Omonijo work (2019) who showed that awareness was high (91.8%) in Ekiti State Nigeria (Nooret al., 2007; Twinget al., 2008). This corroborates the impact of campaign on long-lasting insecticide treated nets (LLINs) coverage and the need to maintain such strategy in sustaining the progress recorded (Deressa et al., 2011).

The trend observed in the contribution campaign strategies of ITNs awareness is in agreement with the result from behavior change communication survey reported by Ankomah et al. (2014). From the reports, it means many of the participants are aware of ITNs distribution in the area.

However, 20% and 7.4% were not aware and do not know of the free distribution of ITNs respectively, and this could be as a result of inaccessibility to hinter areas, coupled with inadequate education and campaign. Some of those areas could be as a result of bad road networks, island communities and cut out roads by streams as well as lack of means of transport by health personnel to these areas during the free ITNs distribution. One participant has this to say:

> *In the days of ITNs distribution, I always face the problem of getting to other areas due to bad roads, streams and means of reaching these areas. As a result, some residents within the area are not able to get the nets and even awareness on information of the distribution and the use of it. (Health worker num. 3)*

The responses further suggested that the majority (80.3%) of the participants participated in the free ITNs distribution policy and 19.7% did not. The involvement of the participants in the distribution of ITNs could actually be informed by the high level of awareness which brought about the high-level involvement in the distribution exercise. This implies that as the residents were enlightened on the role and the importance of the ITNs in reducing the risk of people getting malaria, they (participants) highly (80.3%) availed at the distribution centers to benefit from the mass distribution exercise. This further indicates that the more people are enlightened on a policy, the more likely they are ready to be involved in its implementation.

Furthermore, the study's findings revealed that ITN distribution benefited the vast majority of respondents (67%). This is consistent with the findings of a study that examined that ownership, usage, and knowledge of Insecticide Treated Nets (ITNs) in Prevention Strategies in the Hohoe Municipality, Ghana, using the WHO 30-cluster system, which revealed that perhaps the majority of respondents had benefited from free distribution of ITNs (Nyavor et al., 2017). Manu et al. (2017) argue that mostly when ITNs are given to mothers, they assemble them and either sell to others to be

used to make gardens or used to make gardens themselves. This is because some of these targeted populations (pregnant women and postnatal mothers) have benefited from ITN free distribution more than once. The field survey showed that participants benefited from free ITNs distribution especially pregnant women and postnatal mothers which support the earlier discussion that majority who are concerned with the distribution exercise were females and mostly married in the area.

It was also revealed that 23% did not benefit from the free ITNs distribution policy. The in-depth interview results revealed that the challenges that faced the health personnel in the free ITNs distribution were logistical, financial and accessibility challenges. This could result to why the 23% participants did not receive the ITNs and hence the incidence of malaria in the area persist and therefor health treat on the life of the people in the municipality.

It was also reasoned that 33% of respondents sleep under ITNs while 53% do not. Another significant finding of this study was that 33% of those who revealed ever using their mosquito nets did so during the "mosquito season," which runs from May to September. This is consistent with the health models that state that perceived susceptibility to a particular disease yields the desired change in health behavior if other factors such as knowledge, personality, age, and socio-economic are controlled (Green et al., 2020).

The participants of this study knew much about the benefits of ITN utilization but did not use them for the rest of the season because they did not perceive any susceptibility to malaria in these seasons. This finding confirmed the TRA claims that all other factors (external variables) which influence the behaviour of individual only do so in

an indirect way by influencing the attitude or subjective norms (Fishbein & Ajzen, 1975).

The responses imply that even though majority of the participants possess the ITNs, they however don't use it consistently. This buttresses findings by Diema et al. (2019) that possession necessarily does not translate into usage. As revealed by Sidiki et al. (2020), the reasons that could be attributed to the high percentage of mosquito net possession but low utilization included adverse effects and discomfort.

Moreso, the study's intension to find out the view of participants on whether the ITNs distribution reduces malaria infection revealed that 70% and 23% of the respondents accepted and did not accept that ITNs distribution reduces malaria respectively. It is believed that, if individuals get to understand the benefits derived from using the ITNs, they would effectively utilize them (Anene-okeke et al., 2018).

In the case of this study, participants were considered to be largely knowledgeable as 70% of respondents in the present study know about the importance of ITNs in preventing malaria. This could be explained by the fact that education on malaria is topical and a lot of campaigns have been lodged to educate the general population on the prevention of malaria.

The in-depth interview with the health personnel revealed that there has been a reduction in malaria cases in the area since the introduction of the free distribution of ITNs. A health worker in one of the health centers in the area made this statement;

> *The distribution of the ITNs reduced the incidence of malaria. Even though, some of the residents do not use the ITNs despite been given. In the time past, per day record of malaria cases in the health center that I work has reduced now confirming that most of residents who received the nets are using it.*
> *(Health worker num.-4)*

Finally, the responses on whether malaria can kill if not well treated received a majority of the respondent (56%) revealing that it is true, 20% disagreed whiles 24% indicated that they do not know whether or not malaria can kill if not well treated. This explains that largely, the respondents are aware of the health implications of malaria if proper treatment is not sought. It could be as a result of earlier awareness programs and later, involvement of participants in the free distribution of ITNs exercise across the municipality.

4.4 Objective 3: Examining people's attitude towards ITNs use in malaria control

Systematic random sampling technique was in selecting household heads or any matured member of the selected household to respond to the questionnaires. To ensure for greater chances of the household heads to be selected as respondents, the researcher engaged only one respondent in each house in the selected study communities. Semi-structured questionnaires were administered to respondents to generate data to establish respondents' awareness in ITNs use in controlling malaria.

4.4.1 Respondents' views on whether malaria is preventable

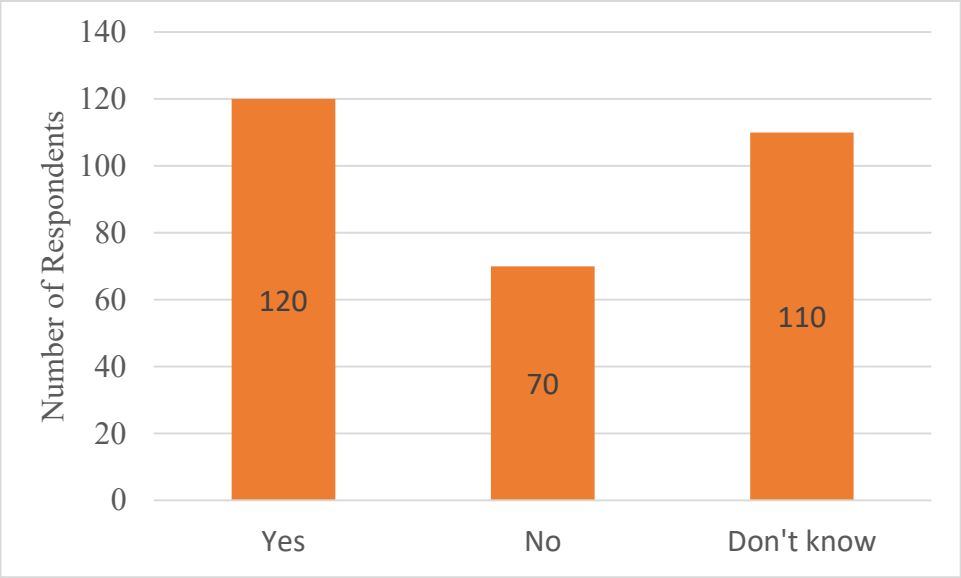

Figure 8: Respondents' views on whether malaria is preventable.

Source: Field Survey, (2022)

On the awareness on the part of the respondents on weather malaria is preventable or not, 40% of the respondents accepted that malaria is preventable, 36.7% do not know whether malaria is preventable or not while 23.3% assessed that malaria is not preventable. The responses show that majority (40%) of the respondents are aware that malaria is preventable which means that they have much knowledge on malaria and its implications on their health. This large level of awareness on the preventability of malaria might be due to the intense campaign by Ghana Health Service during the mass distribution campaign in 2018 (USAID, 2020).

4.4.2 Personal protection measures use by respondents to guard against malaria

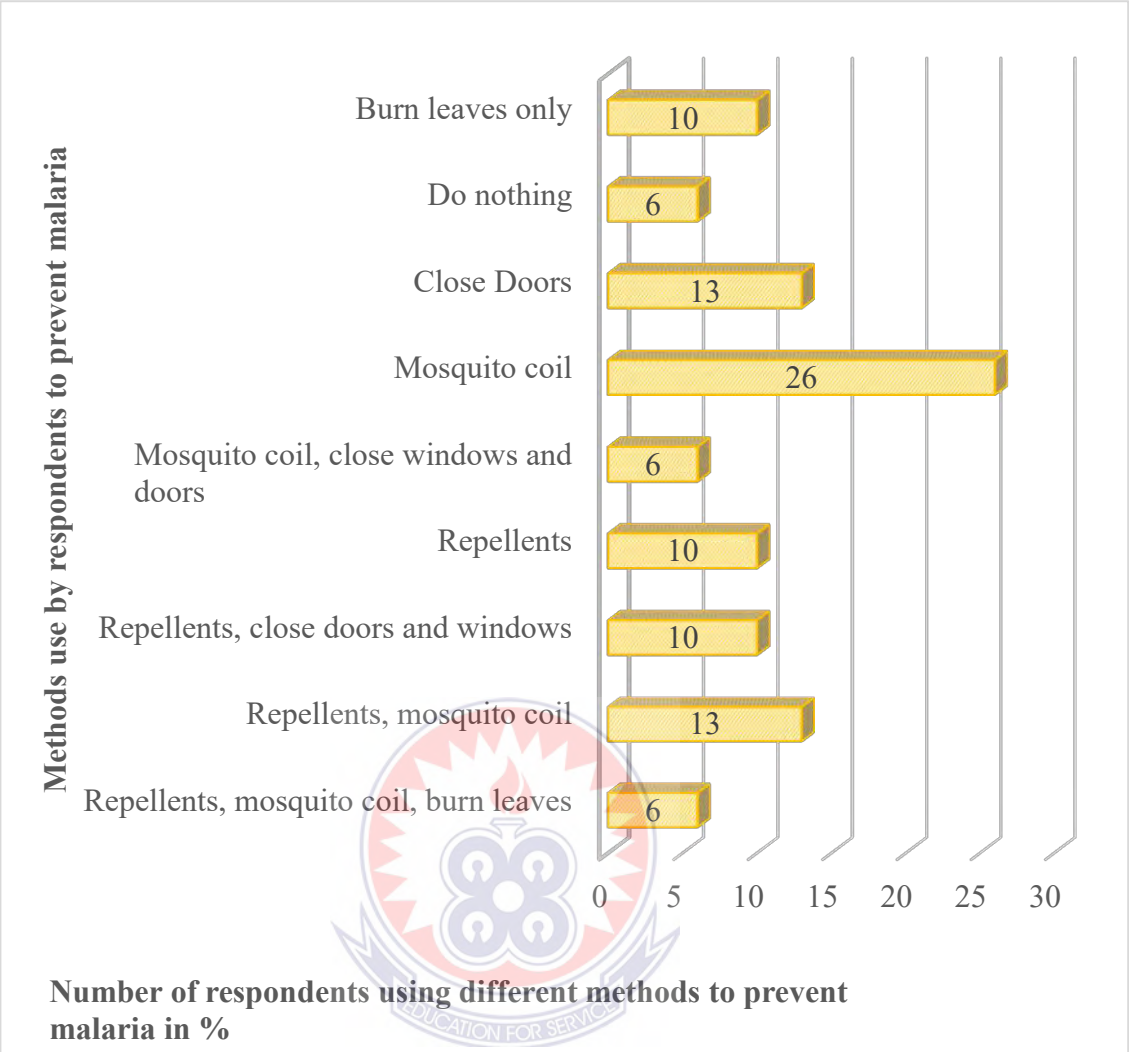

Figure 9: Personal protection measures use by respondents to guard against malaria

Source: Field Survey, (2022)

When asked about what they do to protect themselves from malaria, respondents gave divergent views on what they use to personally protect themselves from malaria. Fig 9 presents the various personal methods used by respondents to protect themselves from malaria. The data show that majority (26%) of the respondents use mosquito coil alone as a personal strategy in preventing and controlling malaria. Mosquito coil is a mosquito repellent antigen that prevents mosquitoes from staying in one's sleeping place. The study also indicated that 13% applies mosquito coil and repellents and

close doors to prevent mosquito from entering the rooms as a strategy to prevent malaria. Aside this, 10% also use coil, repellents and close doors, repellents and burn leaves as ways of malaria control. Some other 6% do nothing, 6% also use repellents, mosquito coil and leave and other 6% close window and doors and mosquito coil to prevent malarial.

Whereas, some use one method of controlling malaria, others use either two or three strategies in controlling malaria. This could be as a result of the intense awareness campaign by Ghana health service. One indigenous way residents indicated that they use in malaria control was burning leaves to produce smoke that repels mosquitoes away. This revelation indicates how the respondents believe in their traditional method of controlling malaria. This finding agrees with Mwanje (2013) when he found out that respondents use such methods as nets, coil, repellent, close doors and windows and do nothing to control malaria.

The study sorts the knowledge of the participants in the area on ITNs usage. The descriptive table 4.0 presents the responses of the participants in frequencies, simple percentages, means and standard deviations to establish the level and kind of knowledge possess by residents on the ITNs distribution in the area.

4.5 Attitude towards ITNs Use

Table 7: Attitude on ITNs use

Question	Response	Frequency	Percentage	Mean	St. D
Ownership of ITNs	Yes	230	82.8	1.17	0.379
	No	70	17.2		
Type of bed net used	ITNS	140	46.7	1.89	0.987
	LLIN	75	25		
	Untreated	85	28.3		
Usage of bed net in the Room	Yes	170	73.1	1.27	.445
	No	130	26.9		
Frequency of sleeping in the nets	Always	65	21.7	2.05	0.67
	Some times	150	50		
	Never	85	28.3		
Level of effectiveness of ITNs	very effective	70	24.8	2.34	1.057
	Effective	95	35.2		
	Less effective	71	20.7		
	Undecided	60	19.3		
Challenges of using ITNs	produces heat	130	25.7	1.49	.502
	Facial and skin rashes	170	74.3		
Level of agreement in ITNs effectiveness in controlling Malaria	Agree	180	77.2	1.74	.440
	Disagree	70	15.9		
	Strongly disagree	50	6.9		

Source: Field Survey, (2022)

Table 7 displays data on the perception of participants on the use of ITNs. The questionnaire attracted mean and standard deviation scores ranging from 1.17 – 2.34 and .379 – 1.057 accordingly. As presented by table 7, the first item, ownership of ITNs had (M = 1.17, S. D = .379) indicating the possessing of ITNs by participants in the area.

The type of bed net owned by respondents scored (M = 1.89, S. D = .987) indicating the different types of bed nets owned by participants in the study area. Also, use of

bed nets by participants in rooms scored (M = 1.27, S. D = .445). This as well indicates the frequency or how often participants use bed nets in their rooms. The participants responses on frequency of sleeping under the nets scored (M = 2.05, S. D = .67) representing how frequent the bed nets are being used by the participants. Participants' ranking of the level of effectiveness of the ITNs in malaria control reported a (M = 2.34, S.D = 1.057), revealing how agreed, strongly agreed, not agreed and undecided with the level of effectiveness of the ITNs as a tool in malaria control.

Challenges faced by respondents in using ITNs attracted (M = 1.49, S.D = .502) indicating that users of ITNs face challenges. Participants indicated that sleeping under nets does not give good sleep since it produces heat especially during the warm season. This assertion agrees with the concept of behaviour intention of TRA that, an individual motivation to engage in behaviour is defined by an attitude that influences the behaviour (Ajzen & Fishbein, 1991).

Despite that fact that most respondents are aware of the benefits of using mosquito nets, it was noted that some people do not actually sleep under the nets in spite of having them, stating that mosquito nets pose breathing allergies. Others posited that their sleeping rooms which requires them to untie the nets after every night sleep gives a lot of inconvenience and so discourage frequent bed nets usage. The effectiveness in ITNs ability to control malaria attracted (M = 1.74, S.D = .440) showing the level of effectiveness of ITNs in controlling malaria.

The high ownership level of ITNs (82.8%) that was observed in this study is in agreement with the record of 72.6% reported in a study done in Ethiopia (Kateera et al., 2015). Also, the role of government in the increased coverage rate cannot be overemphasized. As revealed by a respondent from the Krachi East Health Directorate

the most of the acquired nets were supplied by the government. This is in agreement with the established report of Kateera et al. (2015) which associated increased LLINs ownership recorded in Rwanda with government contribution.

Table 8 also revealed 46.7% of respondents use ITNs, 28.3% use untreated nets and 25% use LLIN. Generally, it can be noted that almost all the participants in the area own nets. However, majority of the participants (46%) use the ITNs with other significant proportion of the population (25%) using LLIN and only 28.3% using untreated nets. This could be due to the availability or accessibility of the type of nets at a particular point in time.

On the survey of use of ITNs in bedrooms, the majority (73.1%) of the respondents use ITNs and LLIN in their bedrooms while 26.9% reported not using ITNs in their bedrooms. These findings are consistent with a study by Talipouo et al. (2019) in pregnant women, which recorded a higher level of respondents stating they sleep under ITNs in their bedrooms prevent malaria. It can be understood from table 4.3 that even though majority of respondents use the nets, some others (26.9%) do not use them despite owning ITNs through the free distribution policy. It can also be reported that those who have ITNs use it to prevent malaria but some participants revealed that, some beneficiaries of the free ITNs distribution use it for other personal purposes including carting farm products, fencing among others**.** This could be due to the inadequate sensitization on the significance of consistent ITNs use in fighting malaria menace in the municipality.

Contrary to the argument by Biadgilign et al. (2012) that the low utilization rate of ITN is due to its unavailability, the majority of the respondents (50.5%) reported using the nets sometimes, 28.3% never use it and only (21.7%) reported using it

always. The findings of the present study are consistent with previous studies by Tobin-West & Alex-Hart (2011) on the Insecticide Treated bed nets Ownership and Utilization in Rivers State, Nigeria, that reported high ownership of ITNs but low utilization.

The 24.8% who reported not using ITNs however attributed it to heat produced using ITNs and other uncomfortable adverse effects, heat and skin itches and insufficient knowledge and education in using new nets when they are distributed to them were reasons for which people do not use ITNs. This is consistent with a qualitative study of low use of Insecticide-Treated Bed Net among Expecting Mothers in Ghana's Middle Belt, which revealed discomfort, extreme heat, the odor of the net, and difficulty hanging the net as reasons for the declining use of the ITN (Manu et al., 2017). Though the study participants are different, these people are all in the same geographical location and could have been affected by the same or similar conditions that affect objectives of the free ITNs distribution policy in the municipality.

With regard to how frequent the respondents sleep in the nets, 55.2% reported sleeping in the net sometimes, 24.8% of the participants reported never sleeping in the nets whereas 20% of respondents revealed that they always sleep under the nets. It can be realized from the report that out of the majority (75.2%) who revealed using the nets, only 20% of them indicated that they sleep under the nets always. On the part of those who use ITNs sometimes and those who never use ITNs, they attributed this to difficulty in hanging the nets due to the nature of their bedrooms, heat produced by the nets especially during warm seasons and other sleeping and breathing discomforts. This is consistent with a qualitative study of low usage of Insecticide-Treated Bed Net among Expecting Mothers in Ghana's Middle Belt, which revealed discomfort,

extreme heat, the odor of the net, and difficulty hanging the net as reasons for the declining use of the ITN (Manu et al., 2017) who reported that low utilization of insecticide-treated bed net among pregnant women in the middle belt of Ghana.

Others may be using the nets for other purposes rather than sleeping under them.

Generally, misplaced intension of the ITNs, refusal to use the nets in bedrooms claiming heat, bad odors, difficulty in hanging, discomforts and other claims that the area is a fertile breeding ground for malaria are reasons for the persistence increases in malaria incidence in the area.

Rating the level of effectiveness of ITNs in controlling malaria, 35.2% of the respondents had a strong agreement that it is effective, 24.8% revealed that it very effective, 20.7% reported that ITNs are not strong in malaria control, while 19.3% were undecided. It could be that those who sleep under ITNs always all the time find it very effective means of controlling malaria.

On challenges of using ITNs, 74.3% of the respondents reported that skin and facial races are the major challenges they face when using the ITNs. It was further revealed that when the nets are new and not hanged in the sun before being used in the room, it causes skin rashes and facial rashes. Some other 25.7% also reported that heat produced when using ITNs posse a more challenging situation. According to the report, users who do not have funs in their rooms face the challenges of heat. This finding is in agreement with the findings of Manu et al. (2017) who reported that expecting Mothers in Ghana's Middle Belt, face challenges such as discomfort, extreme heat, the odor of the net, and difficulty hanging.

4.5.1 Other uses of the ITNs in the municipality

Using unstructured observation, the researcher gathered on the field of study, direct pictorial evidence of misuse of the ITNs in communities under study.

Figure 10: Other uses of INTs by respondents

Source: Field Survey, 2022

During the field survey, it was observed in some communities in the municipality that, ITNs were used as materials for backyard gardens. Some also use the nets in keeping fresh cassava dough so as to separate the starch from the fresh cassava dough, whiles others use it for carting farm products from farms to market places. One respondent made the below statement;

> *Many beneficiaries of the ITNs are not using it for the intended purposes. Some use it for their backyard gardens, keeping fresh cassava for processing and covering tricycles with loads. (Health worker no. 4)*

The response is an indication that the intended purpose of the ITNs have been misplaced for different uses. This could have contributed to the persistence of malaria incidence in the municipality despite the free ITNs distribution.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The chapter gives a summary of the research findings, draw conclusions on the findings and gives recommendations for the study. The study sought to generally examine people's attitude and knowledge towards the use of ITNs as a tool in preventing malaria in Krachi East Municipality of Oti region. To achieve this, the following objectives guided the study: to establish the incidence of malaria since the introduction of mass ITNs distribution in Krachi East Municipality: to assess the level of awareness concerning ITNs and related-interventions in Krachi East Municipality and to examine peoples attitude towards the use of ITNs as a tool in malaria control. In addressing these objectives, the following questions were raised:

i. What is the incidence of malaria in Krachi East Municipality since the introduction of mass distribution of ITNs?
ii. What is the level of awareness concerning ITNs and related interventions in Krachi East Municipality?
iii. What is the attitude of people in Krachi East Municipality towards ITNs use?

5.1 Summary of the Major Findings

The first objective of the study was to establish the incidence of malaria in Krachi East Municipality since the introduction of mass distribution of ITNs. The malaria case trend analysis results showed a fluctuation trend of 25.9% in 2014 but decreased to -2% and -6.3% in 2017 and 2018 respectively in Krachi East Municipality. It was also found out that free distribution of the bed nets reduced malaria incidence but the

prevalence rate remain high, attributable to the misuse of the ITNs for other purposes rather than sleeping under them.

The major findings on awareness revealed that majority (70%) of respondents were aware of the free ITNs distribution policy in the municipality through local radio media outlets in the municipality, community communication centers, posters at various health centers in the municipality and periodic health educational campaigns from the Municipal Health and thus received the bed nets during the distribution exercise. The findings also reported that 67% of the people benefited from the free ITNs distribution as majority revealed actually sleeping under bed nets. The findings noted 56% of respondents generally have fair knowledge of the consequences of malaria on their lives and that malaria can kill if not properly treated.

Furthermore, the findings on the attitude of the participants on the ITNs usage revealed that 82.8% of respondents owned ITNs, LLIN and untreated bed nets. However 73.1% of the respondents reveal of using the ITNs in their rooms. The gap of 9.7% of respondents who owned the bed nets but do not sleep under them attribute the non-usage to discomfort, heat, skin irritation and some of which also use the bed nests for carting farm produce, and as material for backyard gardens.

Also 77.2% of respondents agreed that ITNs effectively controls malaria by preventing mosquito bite as it provides protective cover for exposure of the body from mosquito bite. However, 15.9% disagree whereas 6.9% strongly disagreed that ITNs are effective tool in preventing malaria.

It was also found that the bed nets produce heat (25.7%), discomfort, breathing allergies, facial and skin irritations (74.3%) when new, but 77.2% agreed that the ITNs effectively controls malaria.

5.2 Limitation of the Study

This section highlights the challenges faced by the researcher in conducting this study. Major among these challenges encountered were time schedule with health workers as they work at different schedules. Also, some of the participants felt reluctant to respond to the instrument and felt it was destructive to their busy working hours especially, farmers and traders.

Furthermore, with the majority of the people in the study area engaged in agrarian activities, making time with farmers was challenging during the data collection exercise as most participants spent their time on their farms and other work places and therefore collecting the data was always scheduled in late evenings when the participants would have returned from farm and other work places.

5.3 Conclusions

i. Based on the findings of the study, the following conclusions were drawn. On the incidence of malaria in Krachi East Municipality since the introduction of mass distribution of ITNs, the malaria case trend analysis showed a fluctuating trend in recorded cases over the years. The finding also revealed that majority of the participants were aware of the free ITNs distribution policy in the municipality. The findings also reported that people benefited from the ITNs distribution as respondents confirmed receiving and sleeping under the bed nets and as a result, reduced malaria infection even though the expected level of reduction was not achieved. However, the findings noted malaria can kill if

not properly treated. It is therefore concluded that even though the education on the usage of ITNs as an effective tool in malaria control is good, there was no full coverage of the study communities in the free ITNs distribution exercise in the municipality.

ii. Drawing from the findings on the attitude of participants on the use of ITNs, it was noted that participants owned, use ITNs sometimes, agreed strongly that it is effective, produce heat, breathing allergies and skin irritations, and agreed that ITNs is effective in controlling malaria. It was then concluded that this perception made the other community members who have heard these effects difficult to use the ITNs thereby making the fight against malaria through the free distribution of ITNs not realizing the intended goal.

iii. On the awareness of the free ITNs distribution policy, it was revealed that even though campaigns by the Krachi East Municipal Health Directorate, health workers in the municipality, and other private health facilities in the municipality including individuals created high level of awareness. However, some other remote communities within the municipality were still not sensitized due to accessibility and logistical constrains by health workers.

iv. It was revealed during the study that, while residents were aware of the risks associated with suffering from malaria, they had a lax attitude towards preventing it. Most respondents indicated that, boiling of some local herbs and drinking them when one suspected malaria in the body means that myths and misconceptions held by residents on malaria still exist and hampering efforts and campaigns on the use of ITNs as the most effective tool in malaria control.

5.4 Recommendations

Based on the conclusions, the following recommendations were made:

Given that the people's perceptions inform their readiness and non-readiness to use the ITNs, there is the need to reinforce good behaviour and demystify the myths and misconceptions held by residents about malaria prevention and control measures. For example taking of local herbs for malaria treatment

On the issue of awareness of the participants on the usage of the ITNs, the study recommends that diverse educational campaigns strategies by the Krachi East Municipal Health Directorate including community Fm stations, community information stations, and other social media platforms be enhanced to sensitize the populace on the use and vitality of ITNs.

To improve the effectiveness of usage of the ITNs, both the local government and the municipal health directorate in the study area group the communities closer to the various health centers in the municipality where participants would be taken through practical steps on how to use the nets. This will prevent skin and facial irritations, breathing allergies and heat issues reported by participants in the area.

The study also revealed that some of the participants use the ITNs for other purposes such as making backyard gardens, carting farm products among others instead of the intended purpose of sleeping under them to prevent malaria. Drawing from this, it is recommended that Krachi East Municipal Assembly institute by-laws and community watchdogs to sanction offenders to deter others from such a misapplication of ITNs.

The municipal health directorate and other concerned organizations should intensify education on outdoor protection from mosquito bite before bedtime as mosquitos mostly are aggressive in feeding on humans while outdoor.

5.5 Further Area for Research

There were a number of issues that the researcher came across in the process of carrying out the study which were not captured in the current work. The researcher therefore suggests such topics for further studies. These topics include:

1. Logistical and accessibility problems of health workers in ITNs distribution and malaria incidence Krachi East Municipality.
2. Occupational uses of ITNs and malaria incidence in Krachi East Municipality.

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APPENDICES

APPENDIX A

Questionnaire

UNIVERSITY OF EDUCATION, WINNEBA

DEPARTMENT OF GEOGRAPHY EDUCATION

RESEARCH ON INSECTICIDE TREATED NETS IN KRACHI EAST MUNICIPALITY, OTI REGION. I AM SEEKING FOR YOUR ASSISTANCE TO HELP ME ACHIEVE THIS GOAL. THIS IS PURELY AN ACADEMIC WORK AND YOU ARE ASSURED OF THE CONFIDENTIALITY OF YOUR RESPONSES.

Thank you for taking part in this important survey on insecticide treated nets in Krachi East Municipality. I will be gathering your thoughts and perspectives in order to better understand how I, along with others can better understand this phenomena. This study should take a maximum of 10 -15 minutes to complete. Be assured that all answers you provide will be kept in the strictest confidentiality.

Do you have a preference for written or verbal consent? (Mark choice, signature required for written consent)

1. Written consent [ ] 2. Verbal consent [ ]

Start of interview……

End of interview…….

Name of respondent……

Date…….

Town/Area……..

Section A: ITNs distribution and malaria incidence

1. Have you heard of the free ITNs distribution policy in the municipality?

   1. Yes [ ]

   2. No [ ]

   3. Uncertain [ ]

2. Have you ever participated in free ITNs distribution exercise in the Municipality?

   1. Yes [ ]

   2. No [ ]

3. Has your household benefited from free ITNs distribution exercise?

   1. Yes [ ]

   2. No [ ]

4. Do all members in your household sleep under ITNs?

   1. Yes

   2. No

   3. Uncertain

5. Has the free distribution of ITNs reduced malaria in your household?

   1. Yes [ ]

   2. No [ ]

6. If no in Q5, state why……

7. Which vector can transmit malaria to human beings?

   1. Housefly [ ]

   2. Spider [ ]

   3. Mosquito [ ]

   4. Cockroach [ ]

5. I don't know [ ]

8. When do mosquitoes feed on humans (Tick only one).

1. Day time [ ]

2. Night time [ ]

3. Both day and night [ ]

4. I don't know [ ]

9. Do you think malaria can kill if it's untreated?

1. Yes [ ]

2. No [ ]

3. Uncertain [ ]

10. . How often do people get malaria in your family within a year?

1. Every 2 weeks [ ]

2. Every 4 weeks [ ]

3. Every 4 months [ ]

4. Every 8 months [ ]

Section B. Awareness of ITN's and related interventions in malaria control.

11. Do you think malaria is preventable?

1. Yes [ ]

2. No [ ]

3. Uncertain [ ]

12. What personal protection measures do you use to guard against malaria? (Tick all that apply)

1. Use repellents [ ]

2. Use mosquito coil [ ]

3. Burn leaves [ ]

4. Close windows and doors [ ]

5. Use mosquito nets [ ]

6. Do nothing [ ]

7. Other, specify……

13. Which of these are ways to prevent and control malaria? (Tick all that apply).

1. Sleeping in bed nets [ ]

2. Wearing long sleeved cloths [ ]

3. Making fire and smoke [ ]

4. Spraying insecticide [ ]

5. Cleaning dark corners in the house [ ]

6. Weeding bushes around the house [ ]

7. Taking malaria drug. [ ]

Section C. Attitude on ITNs use

14. Do you own an ITN?

1. Yes [ ]

2. No [ ]

15. What type of bed net do you or own?

1. ITN [ ]

2. LLIN [ ]

3. Untreated met [ ]

4. Don't know

16. Do you use bed net in your room?

1. Yes [ ]

2. No [ ]

17. How often do you sleep in a mosquito net?

    1. Always [ ]

    2. Sometimes [ ]

    3. Never [ ]

18. If you do, rank the effectiveness of bed net in the control of malaria?

    1. Very strong [ ]

    2. Strong [ ]

    3. Not Strong [ ]

    4. Undecided [ ]

19. Do you have any challenges using ITNs as a means of controlling malaria?

    1. Yes [ ]

    2. No [ ]

20. If yes in question 26 what challenge(s) do you face?

    ……

    ……

21. ITNs can effectively be used to control malaria.

    1. Agree [ ]

    2. Strongly agree [ ]

    3. Disagree [ ]

    4. Strongly disagree [ ]

22. Do you use any alternative way to control malaria?

    Specify if any……

Section D: Socio-Demographic Characteristics of Respondents.

23. Gender of respondent.

1. Male [ ]

2. Female [ ]

24. Age of respondent

1. 10-20 [ ]

2. 21-30 [ ]

3 31-40 [ ]

4. 41-50 [ ]

5. 51^{+} [ ]

25. Marital Status:

1. Married [ ]

2. Single [ ]

3. Divorced [ ]

4. Widowed [ ]

26. What is the highest level of education that you have achieved?

1. Primary [ ]

2. JHS [ ]

3. TERTIARY [ ]

4. NONE [ ]

27. Religion:

1. Christianity [ ]

2. Islam [ ]

3. Traditional [ ]

4. Other, specify…….

28. Occupation

1. Farming [ ]

2, Trading [ ]

3. Self-employed [ ]

4. Government employee [ ]

APPENDIX B

In-Depth Interview

(For health personnel)

Interviewer ……

Date: ……..

Town:…….....

Interviewee:……

1. When was the last time that ITNs were distributed to people in the municipality?

2. Who were the people who qualified for to receive the nets?

3. Has there been a reduction in malaria incidence since the free distribution of ITNs in the municipality?

4. What are some of the challenges of the free distribution of ITNs as an intervention in malaria control?

5. What in your view account for the high malaria incidence in the municipality?

6. What is the age group that is more infected by malaria?

7. What do you think can be done to encourage the use of ITNs in the municipality?

8. At what month of the year do your experience malaria frequently? Please rank them.

January	
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	

9. What other alternative policies do you think can be used to complement ITNs to help reduce malaria in the municipality?

APPENDIX C

Research Activity Timetable

Table 3

Activity/Target	**Start Date**	**Completion Date**
Chapter one	5th November, 2021	20th December, 2021
Chapter two	10th January, 2022	20th February. 2022
Chapter three	5th March, 2022	5th April, 2022
Chapter four ❖ Data collection ❖ Data analysis and presentation	 20th April, 2022 20th May, 2022	 15th May, 2022 20th August, 2022
Chapter five ❖ Summary of findings	 25th August, 2022	 5th September, 2022
Submission of final report	10th October, 2022	25th October, 2022

Source: Self construct, 2022.