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BARRIERS AND ENHANCERS TO USAGE OF LONG-LASTING INSECTICIDE NETS IN THE PREVENTION AND CONTROL OF MALARIA IN TSHOLOTSHO DISTRICT, MATABELELAND NORTH, ZIMBABWE, 2022

BY

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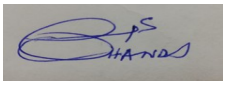
Abstract

Malaria is an infectious disease which has accompanied humankind for more than 4000 years and the first written evidence of malaria is dated more than 2000 years BC in the Chinese Medical classic. Tsholotsho District has been certified into the pre-elimination zone as of 2015-2019, with an average of 18 cases per year. A sudden rise of cases has been noted in Tsholotsho District during the 2020 and 2021 rainy seasons. 106 cases of malaria were reported 2022 as compared to 23 cases in the previous year (DHIS2, 2021). Despite the efforts made by the Ministry of health and Child Care to try and promote bed net usage, the uptake remains significantly low in Tsholotsho increasing the risk of people to suffer from malaria disease A self-administered questionnaire interrogated the availability, extend of usage of Long-Lasting insecticide nets and barriers to usage of the nets. Factors associated with the utilization of LLINs were computed using bivariate and multivariate logistic regression analysis in SPSS 22.0. Overally 318 participants were included in the study comprising 169 females (53%) and 149 males (47%). By proportion gender, age, marital status, educational levels were found to be significant factors associated with bed net usage. Though knowledge on malaria disease and the importance of bed usage were very significant factors promoting bed net usage, other factors like heat, irritation from insecticide and difficulties in hanging the nets were confounding. Variables that were associated with the use of Long-lasting insecticide nets were bed net size fitting on the sleeping facility to avoid itchiness (Odds Ratio (OR) = 4.0; 95% CI: 1.96-8.07; p =0.001, challenges hanging the bed net (OR=0.6; 95% CI: 0.35-1.01; p =0.053), education level (OR=1.6; 95% CI: 0.7—3.9; p = 0.469. This study also identifies a list of enhancers to bed net usage in homes. The researcher recommends further research on the approach and quality of health education on malaria disease and net usage to develop evidence based standard health education guidelines in all languages on malaria disease and net usage use.

Key words: Long-lasting insecticide nets; pre-elimination; usage

Declaration

I Gerald Chandakabata, student number 086180, do hereby declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a degree.



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Dedication

I dedicate this study to all the people in Tsholotsho District who suffered from Malaria in 2021

Acronyms and Abbreviations

ANC	Antenatal Care
WHO	World Health Organization
WOCBA	Women of Child Bearing Age
ZDHS	Zimbabwe Demographic Health surveys
IRS	Indoor Residual Spraying
LLIN	Long-Lasting Insecticidal Net
MIS	Malaria Indicator Survey
MoHCC	Ministry of Health and Child Care
MPR	Malaria Programme Review
NGO	Non-Governmental Organization
SBCC	Social and Behaviour Change Communication
USAID	United States Agency for International Development
UNICEF	United Nations Children's Emergency Fund

Definition of key terms

Anopheles infected: Female Anopheles mosquitoes with detectable malaria parasites

Case, confirmed : Malaria case (or infection) in which the parasite has been detected

Diagnostic test : a rapid diagnostic test or a molecular diagnostic test

Case, imported : Malaria case or infection in which the infection was acquired outside the area in which it is diagnosed

Index case : is also used to designate the case identified as the origin of infection of one or a number of introduced cases.

Case detection : One of the activities of surveillance operations, involving a search for malaria cases in a community

Epidemic : Occurrence of a number of malaria cases highly in excess of that expected in a given place and time

Household : The ecosystem, including people and animals occupying the same house and the accompanying vectors

Incidence: malaria Number of newly diagnosed malaria cases during a defined period in a specified population

Long-lasting insecticidal net: A factory -treated mosquito net made of material into which insecticide is incorporated or bound around the fibres

Proper net usage: the ability of a user to properly hang an insecticidal treated net at every sleeping space and consistently sleep under the net creating a full barrier from any mosquito bite.

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CHAPTER 1 INTRODUCTION

1.0 Introduction

According to W.H.O (2021), Malaria remains the main threat to public health despite decades of control efforts made especially in developing countries. Malaria remains a devastating disease that threatens productivity and economy of most endemic countries. The same W.H.O report shows that in 2020, there were an estimated 241 million cases of malaria worldwide. The estimated number of malaria deaths stood at 627 000 in the same year.

The African region carries a disproportionately high share of the global malaria burden. In 2020, the Africa region was home to 95% of malaria cases and 96% of malaria deaths. Children under 5 accounted for an estimated 80% of all malaria deaths in the region (WHO, 2020). Egbuche (2013) stated that malaria constitutes over 10 % of Africa's overall disease burden, accounting for 40 % of public health expenditure, 30–50 % of in-patient hospital admissions and up to 50 % of out-patient visits in endemic areas.

Malaria continues to be a major public health problem in many endemic countries and is one of the major causes of morbidity and mortality worldwide but most specifically in the developing countries. It is a parasitic disease that is transmitted between humans through the bite of the female anopheles mosquito. Once a person is bitten by a P. falciparum-carrying mosquito, the parasite grows, multiplies, and undergoes a series of complex life cycle changes that allow it to evade the immune system and infect the liver and red blood cells which may result in death within hours or a few days of infection

especially in the vulnerable population with low immunity such as children, pregnant women, people living with HIV/AIDS, people living with Tuberculosis and travelers from areas with little or no malaria (WHO Malaria Report 2008).

The disease can result in miscarriage in pregnant women, low birth-weight infants, developmental disabilities, anaemia and other complications. Today an estimated of over 40% of the world's population is at risk of malaria and the vast majority of this population, live in the world's poorest countries. The disease is found throughout the tropical and subtropical regions of the world. Malaria affect the household's savings of the communities living in these regions whereby, almost a quarter of their incomes are being spends over malaria treatment (Taylor et al, 1986).

According to the 2018 WHO Malaria report, it is from these everyday deaths in the world in general and in the African region in particular, that the World Health Organization (WHO) decided in connection with the African head of States to fight against malaria. The action of fighting against malaria could not be possible without setting up goals and strategies to enable all the public and private sectors to be focused on one common goal of reducing the incidence of the disease to a certain level.

World Health Organization in 1998 started the Roll Back Malaria (RBM) program with one goal of controlling malaria to the level where it is no longer one of the major contributors to mortality and morbidity in the African region. The RBM objectives were set in such a way that malaria mortality and morbidity be reduced at 50% by year 2010, with further reduction of morbidity and mortality at 75% respectively by 2015 (WHO, 2016). In line with various global health institutes, these levels are also to be further

reduced by 80% by the year 2025, and by the year 2030, malaria will no longer be a major public health problem in the African region (WHO, 2005).

1.2 Background to the Study

Malaria is an infectious disease which has accompanied humankind for more than 4000 years and the first written evidence of malaria is dated more than 2000 years BC in the Chinese Medical classic (Carter, 2002). Vector control measures have also been shown to be effective in reducing mortality and morbidity to vulnerable population for centuries and this was used earlier on before the malaria transmission was discovered. Along with measures of preventing insects including mosquitoes from biting was the use of bed nets, curtains and application of powdered dried flower of a Dalmatian pyrethrum to destroy the vector. Besides the above-mentioned measures, indoor residual spraying has been also in use since the late 1940s for total elimination of vectors (Manguin, 2018).

In Sub-Saharan Africa region, malaria is responsible for 80 to 90% of clinical cases and it is causing approximately 1 million deaths occurring among vulnerable group whereby 90% of these deaths are among under five children (Beier, 2020). The disease kills an African child every 30 seconds and those who survive an episode of severe malaria may suffer from a range of physical and mental disabilities. In 2020, Zimbabwe had an incidence rate of 99 cases per 1000 population (World Bank, 2020). The African governments through their Ministries of Health are aware that malaria is a preventable and treatable disease. Consequently, measures and strategies such as indoor residual spraying, distribution of insecticide treated nets in different communities of the region have been put in place to control and prevent malaria.

In April 2000, African Heads of State held a summit in Abuja Nigeria on Roll Back Malaria in which they re-stated their commitments to controlling malaria and reviewed targets for tracking progress. Zimbabwe was signatory to the Abuja declaration and the set targets are already incorporated in the Ministry of Health and Child Welfare Strategic Plan. Zimbabwe derived its goal of fighting against malaria from the World's Health Organization main goal and objectives. However, Zimbabwe's target differs from the WHO target on quantification. Zimbabwe's target is to reduce malaria morbidity and mortality to 80% by the year 2010, with further reduction of mortality and morbidity to 85% by the year 2015.

The Roll Back Malaria (RBM) movement has already attained the highest political commitment and support in Zimbabwe and the Head of State monitors RBM activities and participates in the promotion of technologies for malaria control. Malaria transmission in Zimbabwe is largely unstable in nature (WHO, 2006). Approximately 50% of the population lives in malaria transmission areas.

Most of the provinces in Zimbabwe have conditions conducive to malaria transmission especially during the rainy season (November to April). Malaria transmission is prevalent in low lying areas (altitude 600-900m above sea level). Out of the 59 rural districts, 51 are classified as having malaria transmission. Of these 30 are classified as heavy malaria burden districts and Tsholotsho North and its neighboring Lupane district are among them. Therefore, the Zimbabwe public health system hopes that their efforts of implementing strategies and measures on the control and prevention of malaria will

help the country to reduce the malaria burden, without losing more vulnerable group and young lives due to this preventable and curable disease (Gombakomba, 2007).

The National Malaria Strategic Plan for 2016-2020 emphasized the need for the universal coverage of core malaria interventions for all population at risk and underscores the importance of using high quality surveillance data for prevention strategy formulation and decision making. According to the National Malaria Control Program Unit (2017), the foci guidelines are meant to standardize operations across the pre-elimination districts to put in place well designed malaria prevention programs that include insecticidal long lasting net distribution and proper usage.

Mosquito nets are one of the most important ways to protect against malaria and other diseases spread by mosquitoes. The most effective nets are treated with long-lasting insecticide. These nets are effective for three to five years. To be effective, nets must be used properly. According to the 2017 Red Cross action tool, proper nets usage is the ability of a user to properly hang an insecticidal treated net at every sleeping space and consistently sleep under the net creating a full barrier from any mosquito bite.

Zimbabwe has a history of good quality management of indoor residual spraying and insecticide treated nets programs. The application of indoor residual spraying in Zimbabwe continued until 1970 when it was interrupted due to the war of liberation. Program was re-initiated in 1981 whereby DDT was sprayed covering all malaria vector infested areas (WHO, 2007). In recent years, the combination of long-lasting insecticide

treated nets and the indoor residual spraying are shown to be the most powerful tools in the prevention and control of malaria.

The long-lasting insecticide treated nets have been proven by various studies to be a very effective and are a sustainable tool in reducing malaria morbidity and mortality to vulnerable population of the malaria prone areas. In Zimbabwe the insecticide treated nets coverage target is to attain 85% by distributing at least 2 to 3 nets per household while also spraying the malaria prone areas for the total elimination of the vector (MoHCC, 2015).

Tsholotsho catchment is one of those areas in the country with vast forests surrounding communal lands with poor drainage that creates swamp areas which in turn creates mosquitoes breeding site due stagnant waters. The indoor residual spraying program was initiated in 2015 focusing on households in Tsholotsho. Unfortunately, the native populations in Tsholotsho are farmers and cattle herders who are exposed to mosquitoes' bite even during the day. So, preventing malaria by only using the insecticide treated nets has been considered insufficient since people are infected before sleeping under the nets. Hence the need for a systematic indoor residual spraying program combined with effective coverage on the distribution of insecticide treated nets in the area.

Tsholotsho District has been certified into a pre-elimination zone in 2017 with a slide positivity rate of less than 5% and as from 2016 to 2019, the district had an average of 18 cases per year. But a sudden rise in cases has been noted in 2020 and 2021 malaria season. According to the DHIS2 (2022), they were 23 cases in 2020 and 106 cases in 2021 respectively. Tsholotsho district mass net distribution program was conducted in

2015 and 2021. Tsholotsho district have joined the Roll Back Malaria program in Zimbabwe to create the community malaria committees (CMCs) in different wards with the major role of educating the community on the risk of malaria, how to prevent and control the disease. So far, the CMCs have been working tremendously in spreading the news on malaria and helping in identifying the needy families and those who should receive the insecticides treated nets (Plan, 2020).

The Roll Back Malaria program of Zimbabwe together with partners has joined efforts to really reduce malaria. The Zimbabwe Ministry of Health and Child Care logistics department has made available resources to increase the coverage in the insecticide treated nets and indoor residual spraying programs since these two are now believed to be the most important intervention in reducing malaria burden. Beside all the efforts put in place, Tsholotsho catchment still has a high incidence rate of malaria. There is need for more effort to be put in place disease surveillance systems and controls to monitor the impact of the intervention on vector control to reduce efficiently the burden of malaria in the district.

Until 2007, the World Health Organization has directed the distribution of long-lasting insecticide nets to children, pregnant women and those living with HIV and AIDS. According to WHO (2015), indoor residual spraying and LLINs distribution remains the recommended main vector control strategies. According to Sande (2017), indoor residual spraying was used in malaria control until the first mass long lasting insecticide campaign in 2010. In Tsholotsho, the first mass insecticide nets distribution campaign was conducted in 2013, trying to achieve a target of one long lasting insecticide net per

sleeping space and the distribution has been set to be repeated every three years (WHO, 2015)

The aim of this study was to identify barriers and enhancers to usage of Long-Lasting Insecticide Nets in preventing malaria disease in Tsholotsho District in Matabeleland North and find possible recommendations.

1.2 Statement of the Problem

Despite the efforts made by the Ministry of Health and Child Care to try and promote bed net proper usage, the uptake remains significantly low in Tsholotsho, with an estimate of 65% net usage during rainy and hot season and 35% usage during dry and cool season (Plan survey, 2020). Malaria is on the increase in Zimbabwe both in terms of spatial distribution and intensity. Malaria transmission occurs in 45 of 62 rural districts in Zimbabwe (National Malaria Survey 2019). Tsholotsho district health promotion department is experiencing an increase on reports from Environmental Health Officers and Village Health Workers of improper, mishandling and misuse of nets by community members

Currently, Matabeleland North province in general and Tsholotsho district in particular is receiving a sudden onset of high malaria transmission. Tsholotsho district was certified as a malaria preelimination district in 2016 as it had recorded very low malaria cases for three consecutive years and the district started employing different measures and interventions to contain malaria, among them active case finding, reinforcement of surveillance, case investigation and distribution of LLINs. However, a high prevalence of malaria burden has been reported in Tsholotsho district predominantly in the Northern

catchment area, with cases rises from 23 in 2020/2021 cycle to 106 cases in 2022 respectively (MoHCC DHIS2, 2022). This occurrence reversed the progress of wards that were moving towards malaria elimination as the district had an average of 18 cases per year from 2016 to 2019.

The Global Fund malaria grant through the Zimbabwe National Malaria Control program put in place indoor residual spraying and then later combined it with long lasting insecticide nets distribution program in 2013, targeting the distribution of at least a net per sleeping space per households in Tsholotsho. However, despite the many achievements and efforts put in place in the past decade placing the district into a malaria pre-elimination zone, cases of Malaria in Tsholotsho North are in excess of normal expectancy, hence the need to investigate on proper net usage in the district.

1.3 Research Objectives

1.3.1 Broad Objective

The purpose of this study was to identify barriers and enhancers to usage of long-lasting Insecticide nets in preventing malaria disease in Tsholotsho District in Matabeleland North in 2022

1.3.2 Specific Objectives

The study sought specifically to:

- Determine demographic factors associated with the use of long-lasting insecticide nets among Tsholotsho North residents in 2022
- Establish the relationship between knowledge levels and the use of long lasting insecticide nets among Tsholotsho North residents in 2022

- Determine the barriers and enhancers to usage of long-lasting insecticide nets among Tsholotsho North residents in 2022

1.4 Research Questions

- What are the demographic factors associated with use of long lasting insecticide nets among Tsholotsho district residents in 2022?
- What is the relationship between knowledge level and proper LLINs usage among Tsholotsho residents in 2022?
- What are the barriers and enhancers to effective usage of long lasting insecticide nets among Tsholotsho District residents in 2022?

1.5 Assumptions/ Hypotheses

- The researcher assumes that people who received nets will be locally available and accessible to participate in the study.
- The researcher assumes that there is poor adherence to user guidelines on usage of long-lasting insecticide nets by people in Tsholotsho North district.

1.6 Significance of the Study

This study investigated the barriers and enhancers to proper usage of long-lasting insecticide nets in Tsholotsho. The study findings suggested possible solutions to the existing challenges on usage of long-lasting Insecticide nets a as a method of reducing Malaria incidence in Tsholotsho. The study subsequently contributes to the decline of malaria cases in Tsholotsho District, with health workers, public health officers, researchers, stakeholders and malaria elimination funding partners step up evidence-

based measures on how to improve net usage in preventing and controlling malaria in Tsholotsho District.

1.6 Delimitation of the Study

The study was geographically limited to Tsholotsho hence forth study findings cannot be generalized. Study population was only composed of residents who received long-lasting insecticide net. Only residents in a ward with the highest number of cases were selected for the study and the researcher used only researcher used questionnaires and interview guides for data collection

1.7 Summary

This chapter reviewed related literature by various authors. The chapter discussed an overview on the importance of net usage, barriers when using long lasting insecticide nets and enhancers to improve net usage in both well-structured and dilapidated homesteads. An overview of how technical and environmental barriers to usage of nets were discussed, with introspection on the geography and demographic factors of the study site in relation to similar areas around the world. The chapter ended up with a summary.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.0 Introduction

This chapter reviews related literature on the barriers and enhancers to utilization of long-lasting insecticide nets. Literature review establishes a link between the area of study and the accumulated knowledge in the field of interest, that is, the link between net utilization and the reduction in malaria cases. Literature review helped the researcher to familiarize with prior research and theory pertinent to the research topic. The views of various authorities assisted the researcher in evaluating various ideas pertaining to the barriers and enhancers to full utilization of long-lasting insecticide nets. This gave direction to the researcher.

2.1 Overview of malaria disease and insecticide net distribution program

Each year, malaria accounts for up to 1 million deaths worldwide, mostly in children under five (Breman, 2004). In 2015, there were as many as 500 million episodes of clinical *Plasmodium falciparum* malaria infection, and more than two thirds of these cases were in Africa (WHO, 2016). More recently, malaria related morbidity and mortality have been significantly worsened by the emergence of widespread drug resistance. During the past decade, numerous large-scale initiatives have been undertaken with the goal of reducing or eradicating the burden of malaria in the developing world. These include among others the Global Fund for AIDS, Tuberculosis, and Malaria (GFATM), the Roll Back Malaria Partnership (RBM), and the Medicines for Malaria Venture (MMV).

The three primary interventions which includes long lasting insecticide nets, indoor residual spraying and early diagnosis and treatment form the core approach to malaria

control in Zimbabwe, where malaria transmission is unstable and seasonal, characterized by frequent and widespread focal epidemics. Malaria transmission in Zimbabwe mainly occurs in areas below 2,000 meters above sea level, which account for sixty five percent of the country's total landmass and in which approximately fifty percent of the population reside. Recognizing the low coverage and use of long lasting insecticide nets in the country, the Government of Zimbabwe developed the National Malaria Strategy in 2008 (MOHCC handbook, 2008) . One year later, the Zimbabwe, Ministry of Health set national goal of full population coverage in malarious areas with a mean of a bed net per household sleeping space.

In addition, indoor residual spraying as vector control tool was also to be scaled-up, particularly in epidemic-prone districts throughout the country. This effort also included the rapid scale-up of provision of bed nets to newly established community health posts. These health posts are staffed by village-based health workers. According to the MOHCC Village Health Workers training manual (2018), the community workers received basic but intensive training in the provision of health promotion and prevention-oriented interventions, including malaria prevention and control strategies. The major partners in the procurement and distribution and scaling up of training on usage of Long Lasting Insecticide Nets since 2013 in Zimbabwe included the Global Fund to Fight AIDS and UNICEF.

To contribute to the rapid scale-up of malaria control interventions in Zimbabwe, The Ministry of Health Procurement Management Unit assisted in procurement and distribution of more than five million LLINs in selected areas of the regions of Zimbabwe, mostly: Manicaland, Matabeleland North and Mashonaland Central. The

distribution of these nets was carried out by Ministry of health and its local administrative staff, with the assistance of village health workers. Precisely, net distribution activities were carried out in the months preceding major transmission seasons, with earlier waves of distribution targeting the most at risk areas and the later waves targeting less at risk areas. According to CDC Zimbabwe (2015), baseline and follow-up surveys have been conducted in the malarious areas in Zimbabwe and changes in coverage of key malaria control interventions could be measured, particularly with regards to household net ownership and use, coverage with IRS and malaria parasite prevalence.

2.2 Conceptual Framework

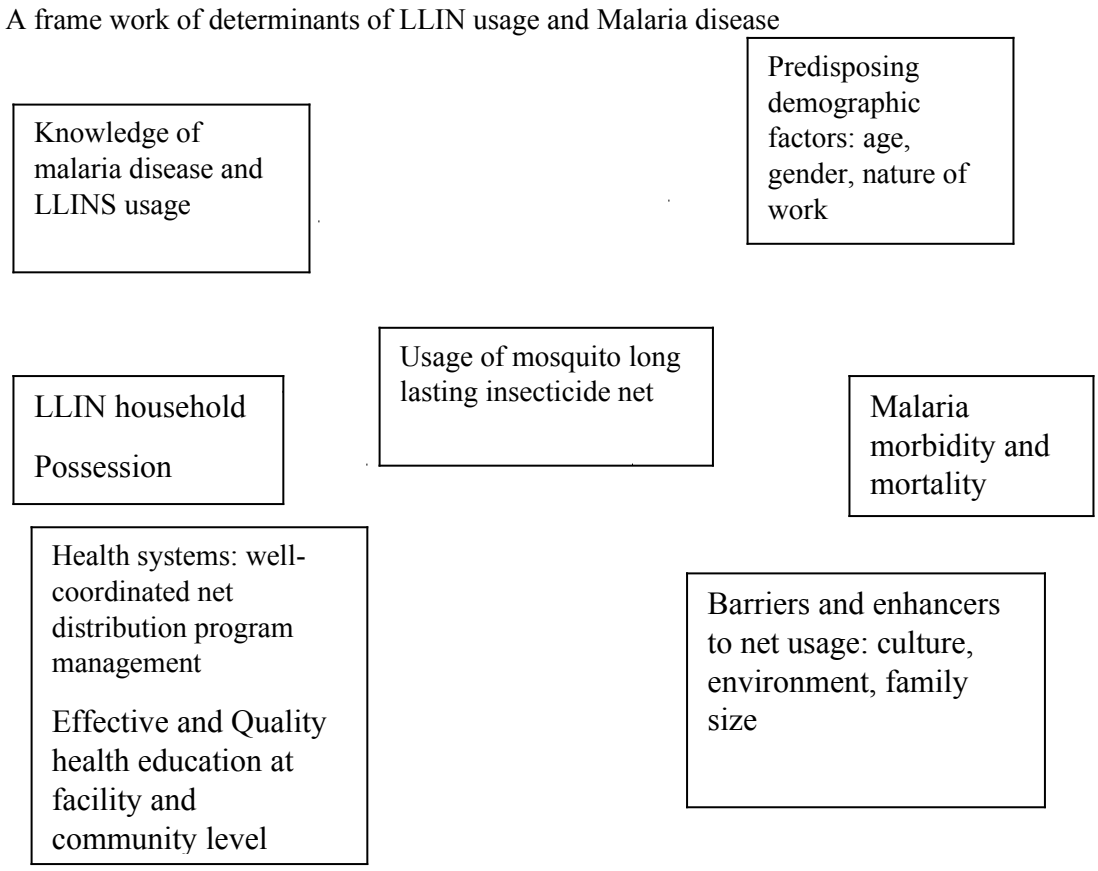

Figure 1: Area of common interest between proper usage of nets and malaria disease

Source: Biomedical Central (2018)

The diagram implies that by addressing the predisposing factors that prevent usage of bed nets, the more effective will be the long-lasting insecticide nets in the prevention and control of malaria disease in malaria burdened areas.

2.3 Relevance of the Conceptual Framework to the Study

The model is relevant as it explains different factors that affect the use of LLINs at household level. The framework will guide the researcher on structuring data collection tools and final presentation of research findings on barriers and enhancers to net usage.

The conceptual framework supports the underlying principle of the research, its purpose, research question and problem statement. The following are the dependent and independent variables supported by the conceptual framework:

Dependent variable

- utilization of long-lasting insecticide nets

Independent variables

- sociodemographic factors
- Knowledge of malaria disease and net usage
- Health systems that support malaria prevention
- Malaria morbidity and mortality
- Barriers and enhancers to full utilization: culture, environment, family size
- LLIN household possession

2.4 Usage of long-lasting Insecticide nets in preventing mosquito bites

Malaria remains the main threat to public health despite decades of control efforts made. It is a devastating disease that threatens productivity and economy of endemic countries (Lengeler, 2004). According to Egbuche (2013), the disease constitutes over 10 % of Africa's overall disease burden, accounting for 40 % of public health expenditure, 30–50 % of in-patient hospital admissions and up to 50 % of out-patient visits in endemic areas. Over the last century, efforts have been made to control malaria.

Among the new advances in the control of malaria is the use of insecticide-treated nets (ITNs), now mostly long-lasting insecticide-treated nets (LLINs). LLINS are known to kill mosquitoes and have proven repellent properties that reduce the number of

mosquitoes that bite household occupants. According to studies long lasting insecticide nets are estimated to be twice as effective as untreated nets and offer greater than 70 % protection compared with no nets (Bachou, 2006).

In the past decade, malaria incidence has fallen by at least 50 percent in one-third of the countries where the disease is endemic (WHO, 2020). These gains have been made through a combination of interventions, including timely diagnosis and treatment, use of reliable tests and anti-malarial drugs; indoor spraying with safe insecticides; and the use of LLINS to protect people from mosquito bites at night especially during the rainy season.

Mosquito net ownership is far from universal use despite the aforementioned gains. Ownership rates remain high in many malarious regions or amongst particular groups in malarious regions. Furthermore, mosquito net ownership in itself is not synonymous with usage. Also, ownership is not the only barrier to achieving the reduction in malaria morbidity and mortality associated with LLINs usage. Rather, individuals who own (or who have available) mosquito nets must use them in order for the potential health impact to be fully realized (Pulford, 2011).

The main strategies for malaria prevention in Zimbabwe are intermittent preventive treatment (IPT) for pregnant women and vector control through the use of LLINs especially for pregnant women and under-five children (Keating, 2012). According to MoHCC handbook (2004), LLINs distributed free-of-charge has been in existence in households in Zimbabwe since 2003 following the Abuja Declaration in 2000.

According to WHO (2015) long lasting insecticide nets are also being distributed in the country free-of-charge to pregnant women during antenatal clinics while the rest of the community members obtain their own LLINs from the regional treatment units and community treatment units where LLINs are re-impregnated with insecticides after regular intervals of 6 months by community relay agents (CRA), who have been trained to carry out this exercise. While challenges to increasing LLINs ownership may diminish as a result of the expansion of large-scale distribution efforts in Zimbabwe, LLINs impact on reducing disease transmission will be minimized if they are not properly and consistently used, especially among populations vulnerable to increased malaria morbidity and mortality, such as children and pregnant women.

Long-lasting insecticidal nets (LLINs) are the most widely deployed vector control intervention in sub-Saharan Africa to prevent malaria. Recent reports indicate selection of pyrethroid insecticide resistance is widespread in mosquito vectors. Population-based household surveys remain an important data source for national or sub-national estimates of reported long lasting insecticide net and intermittent preventive treatment in pregnancy (IPTp) coverage and access to health services. According to Pryce, Richardson, Lengeler (2018), Malaria is an important cause of illness and death in many parts of the world, especially in sub-Saharan Africa. There has been a renewed emphasis on preventive measures at community and individual levels. Insecticide-treated nets are the most prominent malaria preventive measure for large-scale deployment in highly endemic areas.

Strengthening long-lasting insecticidal nets effectiveness monitoring using retrospective analysis of cross-sectional, population-based surveys across sub-Saharan Africa enhance and guide current entomological monitoring amid concerns of insecticide resistance and bed net durability, and be used with locally-collected data to support decisions on LLIN redistribution campaign timing which insecticide to use. According to the Duke Global Health Institute (2015), investment in malaria control has greatly reduced transmission. An estimated 663 million cases have been averted worldwide between 200 and 2015, with 68% of them attributed to insecticide-treated nets. Long-lasting insecticidal nets (LLINs) protect against malaria by acting as a physical barrier between mosquitos and humans, and by the insecticide repelling or killing susceptible mosquitoes. The insecticide enhances public health impact by reducing mosquito density and helping maintain the net's effectiveness after holes develop

2.5 Demographic factors associated with use of long-lasting insecticide nets

According to W.H.O. (2020), the odds of malaria infection increase with age, with older population group being the most at risk among exposed groups. Children living in improved housing structure usually have lower odds of malaria infection compared to those who were living in unimproved housing. Individuals living in houses with open eaves have a strong association with malaria infection compared to those who were living in houses with closed eave gaps (Boldwin, 2014)

According to a study done in North West Tanzania, individuals who were living in households with adequate net access per sleeping place were better protected from malaria. Age of LLINs is considered significant, with only LLINs less than two years of

age showing evidence of protection (Mango, 2020). According to the same study, LLINs' usage was associated with malaria prevalence in the multivariate analysis. Factors that include gender, wealth, livestock, household head education, indoor residual spraying earlier, household owning at least one LLIN, and usage of LLINs of different physical conditions were associated with malaria infection once adjusted for the other factors in the model.

Long lasting Insecticide-treated net use is crucial for preventing malaria infection. Despite significant improvements in net access and use over the past two decades, many malaria-endemic countries in sub-Saharan Africa have not yet reached global targets for universal coverage of long-lasting insecticide nets. To reduce the gaps in ITN use, it is important to understand the factors associated with ITN use. According to Malar (2021), findings from an analysis done in Manica Mozambique, highlighted the need for behavior change communication strategies targeting young people and nets distribution campaigns targeting larger households to increase nets ownership, thereby improving net use.

According to Lengeler (2004), the use of insecticide-treated nets (ITNs) is one of the core vector control methods for malaria prevention and has been shown to reduce malaria incidence by 50% in several malaria-endemic countries. The effects of malaria are especially strong among pregnant women, for whom malaria may cause maternal anemia, preterm delivery, and low birth weight. High ITN coverage in sub-Saharan Africa has been reported; however, discrepancies in ITN use in the region remain problematic (Bhatt, 2015). In Malawi, LLINs are at the centre of malaria-control

initiatives. A nationwide mass LLINs-distribution campaign took place in 2012 and LLIN policy recommends that free LLINs be given to women and children during antenatal care (ANC) and expanded program on immunization (EPI) visits (CDC, 2017). These efforts led to a rise in LLINs use among pregnant women from 35% in 2010 to 62% in 2014 (CDC, 2017). However, a 2015 Malawian study revealed a drop in LLINs use to 53% among women of childbearing age (WOCBA) who had visited ANC.

A large body of research has demonstrated that factors such as women's age, parity, education status, employment status, household wealth, and religion have significant effects on utilization. For instance, in Kenya, women who had received a higher level of education were twice as likely to use ITNs as women with no formal education (Choonara, Odimegwu, Elwange et al., 2015). In Cameroon, 45% of multiparous women reported having slept under an ITN the night before the survey, as compared with 21% of primigravida women (Fokam, 2016). However, inconsistent results have been obtained, with some studies indicating that age, parity, and education may have no significant associations with LLINs use among pregnant women. The discrepancies in these findings may be accounted for by community characteristics, which have been shown to exert a strong influence on health outcomes and health care utilization across Africa

According to WHO (2016), the health behaviors of Women of Child Bearing Age, including their adoption of malaria-prevention strategies, may be affected by their maternal status (i.e., pregnant, non-pregnant, with or without children aged under 5 years). In addition, the relationships between LLINs use and other factors such as

women's autonomy in health care decisions and women's health behaviors have not been investigated. These factors among WOCBA groups, along with both individual- and community-level factors, should be investigated to ensure that future interventions, such as mass campaigns and health education messages, can be designed to reach vulnerable communities and groups of women

2.6 Barriers and enhancers associated with long lasting Insecticide nets usage

Evidence over several decades has confirmed the effectiveness of long-lasting insecticide net in reducing levels of infection and incidence of malaria. Studies conducted in tropical Asia, Latin America and Southern America showed that the malaria incidence was reduced by 90% in these areas during the eradication programme through a combination of indoor residual spraying and other measures (Tobin-West, 2016). While forms of vector control such as residual spraying and larviciding can be applied leaving communities and individual families in a largely passive role, long lasting insecticide net programs depend to a much greater extent on the acceptance and active involvement of individuals and communities.

Much of the early work focused on technical aspects such as vector behavior, insecticide dosage and dipping techniques. While these are important and should not be ignored, the success or failure of long lasting insecticide programs may in many cases be related to human behavioral factors that affect coverage and proper usage. According to Stewart (2016), no doubt there exists a lot of knowledge and experience about the human behavior aspects among malaria program staff in the different countries, but this

knowledge is not always systematically reported and therefore not easily reviewed or shared.

Many of the programmatic, technical and operational issues related to long lasting insecticide net application also have human and social dimensions and therefore the two aspects cannot be separated. In short there are epidemiological, biological, environmental, economic, operational and social factors that affect utilization of nets and determine success of the nets distribution program. The health promotion component of LLINs program as well as the organization of distribution and (re-)treatment requires trained and motivated local health staff or volunteers. According to WHO (2019), it is believed that LLINs introduction in the community may need to be postponed until the health system is sufficiently strengthened, while in the meantime environmental health mobile teams can perform residual spraying activities.

Tests to monitor population physiological resistance may not show whether behavioral changes are induced by LLINs usage. Similar as in the case with residual spraying in the past, behavior changes might be induced that cause the insects to avoid contact with insecticides, notably towards exophagy and shifts in the time of biting. Although this might make LLINs less effective, it would certainly not make them useless, as these behavior changes are likely to come with a loss of fitness (WHO, 2013)

2.6.1 Operational and technical barriers

Accurate long lasting insecticide usage rates are required to determine what proportion of a population needs to use nets to reduce malaria transmission, and to evaluate the

effectiveness of promotional programs over time. Usage of long-lasting insecticide nets, if it is to be determined, must by observation be assessed. Reported coverage and even reported usage may exaggerate the real situation (Sande, 2016). Direct observations, rather than self-reported behaviour, may be essential to accurately gauge bed net usage rates. Use of both observational and survey methodologies to identify human behavioral factors which may have contributed to the poor results in an earlier bed net study (Leake, 1989). Villagers reported a significantly higher net usage rate than that observed directly, confirming that self-reports need to be validated in some way. According to CDC (2019), observed net usage coverage remains as the most directly relevant operational indicator in any long lasting insecticide net program.

2.6.2 Health education on the importance of long-lasting insecticide nets

A strong health education and promotion component is extremely important in net distribution programs where nets are introduced for the first time. This costs an amount of time and human resources that is often not compatible with large-scale net distribution expansion programs of limited duration. Douglas (2011), emphasize that translation of IEC material in ethnic language and adaptation of pictures to the particular cultural situation is necessary, though it may not be enough. As in other health programmes that aim at behavior change, health promotion works most effectively by face-to-face communication at locally and culturally appropriate times and occasions, by people who are accepted and respected by the community for example specially trained village health volunteers (Douglas, 2011)

2.6.3 Community needs are important

Programs that take community requirements into account have a better chance of success. For example, net design (size, colour and shape) may be an important factor in achieving high net usage rates. According to WHO (2016), community perceptions relating to re-treatment of nets are very important. Such issues can be identified through community consultation and social research.

Combining health education and social research is essential in the development and strengthening of long-lasting insecticide nets programs. A range of participatory and qualitative methods, such as observation, structured interviews and focus group discussions can yield valuable, in-depth data on behaviour related to bed nets, and other day and night-time activities that increase malaria risk, such as television viewing that keeps people awake and out of bed-nets. The information gathered provides a means to strengthen programs. Roland (1999), states that participatory social research puts the community and their perceived needs at the centre of the activity. The participatory process of the research can lead to a strengthening of outcomes, as communities discuss and obtain a better understanding of the health issues.

2.6.4 Public and private sector and target group

The design of effective net distribution and usage programs has to be based on good knowledge of local perceptions and customs. Wherever possible the communities need to be involved in the activities as this helps to make them aware of what they can do themselves to improve their health situation. These requirements point to capacities and

skills (skills for social research and a participatory attitude) that may still have to be developed in the preventive health service. Strategic partnerships with NGOs or other local organizations (Red Cross for instance) and sectors have proved helpful.

The relative simplicity and safety of LLIN use and insecticide re-treatment makes it in principle possible to be maintained by the target communities and individuals themselves. Although this is an advantage over residual spraying, which needs to be done by experienced staff in every house, and may save program manpower at the implementing level including those assisting with distribution, community mobilization and dipping activities.

2.6.5 Long lasting Insecticide net absorption capacity

After the realization that long lasting insecticide nets form an effective contribution to malaria control, ambitious malaria prevention program managers have often been tempted to design quick and large-scale introduction programs for long lasting insecticide distribution and usage. It is a scientific expression that there are several pitfalls with this approach. In many cases the local human resources who have to implement such massive projects are very limited.

According to Nahlen (2003), considerable time and resources would be needed to first increase and train human resources. This applies to program managers as well as local health staff. Quick massive bed net distributions can be expected to fail in setting up a system to ensure proper usage and awareness about the purpose under the target

populations. If a limited workforce of program managers and implementers' needs to initiate the activities over a wide area, they cannot pay attention to local and regional adaptations, which suffocates both effectiveness and sustainability.

2.7 Summary

This chapter reviewed related literature by various authors on the effectiveness of using long lasting insecticide net in reducing malaria disease. The chapter discussed an overview of the barriers and enhancers to proper usage of long-lasting insecticide nets. The next chapter deals with the research methodology used in this study

CHAPTER 3 METHODOLOGY

3.0 Introduction

This chapter discusses the research methodology that were undertaken to collect data and information for this research. The chapter discusses the research design, population, sample and sampling procedures, the research instruments used to collect data, data collection, presentation and analysis procedures. The chapter ends up with a summary

3.1 The Research Design

A research design is "a plan and structure of an investigation so conceived as to obtain answers to research questions" (Cooper and Schindler, 2003; Proctor and Stone, 1992). The research designs are evolved to enable researchers to answer questions objectively, accurately and economically. Nachmias et al (1981) define a research design as, "a programme that guides the investigation in the process of collecting, analyzing and interpreting data". It contains a set of logical steps that are used in order to answer research questions (Saunders et al, 2007). It is recipe, pattern or blue print for the study. It highlights the methods used by the investigator to obtain, collect and analyze data.

The researcher used an analytic cross-sectional study, using quantitative methods, for the research. Quantitative data can be obtained from closed-ended type of research questions. Quantitative data portrays the variables in numbers, making the analytic study rich.

3.2 Study Setting

The study was conducted in ward one situated in Tsholotsho district which is in Matabeleland North Province of Zimbabwe. The district has a total of 22 wards and 11 of them in Tsholotsho North are currently recording an increase in number of malaria

cases. Ward one has a total of 6 villages and all of them had at least one case The district has a total of 22 health care facilities which provide primary health care services and a referral district hospital of which Sodaka clinic in Ward one is among them . Ward one has one health facility, Sodaka Clinic which offers free long lasting insecticide nets to pregnant women during the first visit at the antenatal clinic. This is in line with the national guideline under the National Malaria Control Program (MoHCC, 2008). The study included ward one community members and staff members at Sodaka health facilities in ward one as they form LLINs usage information base when evaluating usage of long-lasting insecticide nets in the wards. .

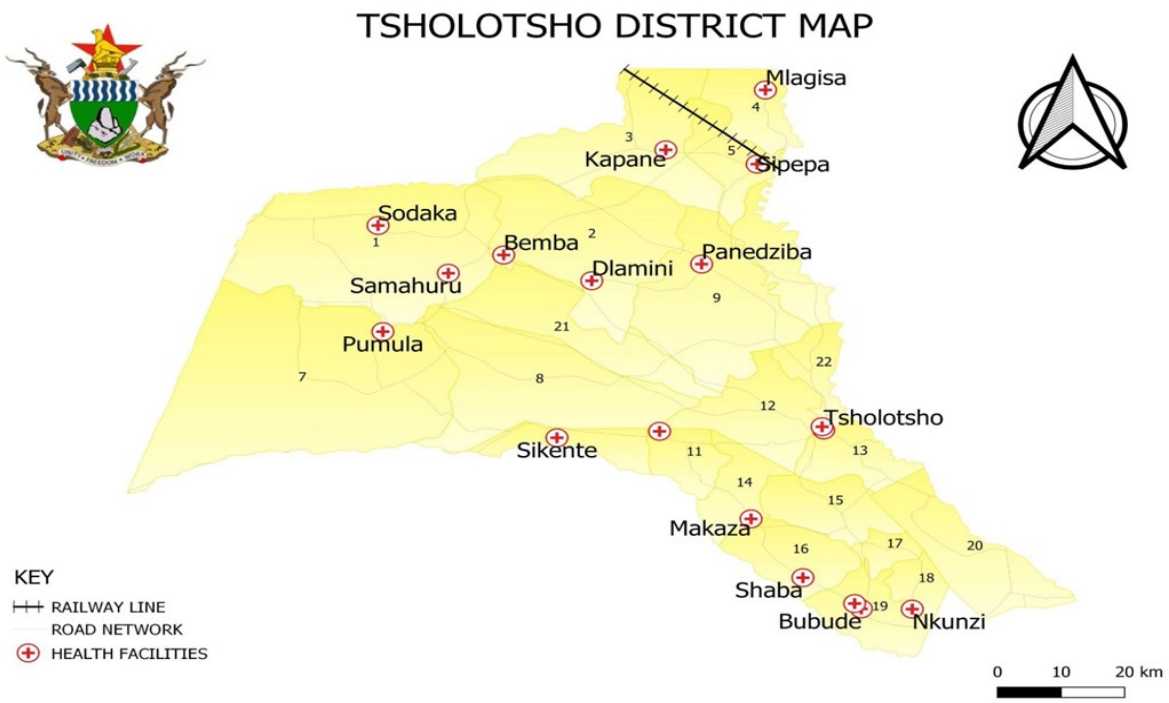

Figure 2: Map of Tsholotsho showing wards distribution

3.3 Study Population

The study population consisted of Tsholotsho Ward One residents who received long-lasting insecticide mosquito nets including pregnant women during continuous distribution, first and second mass distribution exercises which took place between 2015 and 2021. Respondents residing in 6 villages, who gave their consent to participate in the study, were enrolled. Pregnant women included those given nets (LLINS) during mass distribution and those given during continuous distribution at the health facility. Furthermore, three staff members at the health facility in ward one were randomly selected to participate in the study.

3.3.1 Inclusion and Exclusion criteria

3.3.1.1 Inclusion criteria

- Tsholotsho Ward One beneficiaries of long-lasting insecticide nets
- Nursing staff serving at Sodaka Health Facility in ward one.
- Pregnant mothers benefiting insecticide nets during ANC visits and in the first and second cycles of mass distribution exercises in Ward One

3.3.1.2 Exclusion

- All Tsholotsho Ward one residents who did not receive nets during the mass and continuous distribution exercises.
- Visitors and non-consenting participants due to very ill condition

3.4 Sample Size

Yamane's formula is going to be used to come up with sample size for the study.

$$= \frac{N}{1+Ne^2}$$

- Where n is the sample size,
- N is the known population size (overall number of people of who received nets in ward one = 1558)
- e is the precision which will be set at 0.05

$n = 1558/1+1558\ (0.05^2)$

n = 318

n= Minimum sample size

Table 1: Showing proportions of sample size distribution per village in ward one

Village	Male	Female	Total	Proportion	Minimum Sample
1	102	176	278	0.17843388	57
2	112	144	256	0.16431322	52
3	25	34	59	0.03786906	12
4	117	133	250	0.16046213	51
5	302	246	548	0.35173299	112
6	75	92	167	0.15502144	34
	733	825	1558		318

3.5 Sampling Procedure

A Multi-stage sampling technique was utilized for this study. This started from selection of wards up to selection of respondents within selected wards.

Stage 1: Selection of wards

The researcher selected ward one as the study site using purposive sampling based on highest number of confirmed cases recorded in the ward, and increased reports by Village Health Workers of abuse of LLINs by the community in the same ward from 30 in 2020 to 162 reports in 2021

Stage 2: Selection of the villages in one ward

A census of all the villages (six) in ward one was done. A total of six villages were selected, whereby each village was utilized as a stratum for stratified sampling of respondents within each village.

Stage 3: Selection of respondents within villages

The six villages were divided into stratums within which respondents were selected through use of systematic random sampling. Population proportionate sampling was utilized in determining number of respondents within each stratum (village) as shown in table 1 above. A list of villagers was adopted from the 2015 to 2021 LLIN mass distribution and continuous distribution lists and a k^{th} value was calculated within each stratum. A total of 318 respondents were selected across six villages

Stage 4: Selection of Healthcare workers in ward 1

Since health facilities in the district have an establishment of 6 health workers, simple random sampling using a random number generator (dice) was used to select 3 health workers. The three workers selected were interviewed guided by a structured questionnaire.

3.6 Data Collection Instruments

Research instruments as "devices used to collect data such as, questionnaires, tests, interview schedules and checklists" (Seaman, 1991:42). The researcher used published external sources, interviewer administered questionnaires, interview and observation to gather data from the respondents. The questions on the questionnaires were used as a guide for the interviews.

3.6.1 ` Published external sources

The researcher used academic books and journal articles, research and professional body reports on malaria net usage. These external sources helped the researcher in knowing more information about malaria diseases, barriers and enhancers to net usage in other regions, and see how this is relevant to the study. The researcher made use of the internet gateways on malaria elimination strategies.

3.6.2 Questionnaire

A questionnaire is a widely used technique in collecting data responses from a large sample. A questionnaire is a data collection tool in which written questions are presented that are to be answered by the respondents in written form (Vockevisser et al, 1993). It is a printed list of questions used by a researcher to make the respondents give information to the researcher.

A questionnaire was used because "it is one of the most popular methods to obtain information appropriate for analysis of a research of this kind" (Behr, 1973). There researcher avoided using a self-administered questionnaire. According to Muchengetwa (2005), the response rate can be generally low; sometimes less than 50%. There is no control over who actually answers the questions. It leaves no room to probe for further information. There is also a possibility of misinterpreting questions, resulting in some questions being left out unanswered.

To avoid the above negative factors, the researcher asked simple questions using an interviewer administered questionnaire. The respondents were persuaded to answer

questions freely, without any fear. The questionnaire did not ask for the respondent's name, hence confidentiality was guaranteed.

3.6.3 Interview

An interview is a purposeful discussion between two or more people that can help one to gather valid and reliable data that is relevant to one's research objective (Kahn and Carmel, 1970, as cited in http//web.viu.ca). The respondent is asked questions by the interviewer who records the responses on the questionnaire (Muchengetwa, 2005:47)

A guided interview using the questionnaire was conducted with all participants. For those who could not comprehend English, Ndebele was used as a form of communication. This ensured that, the same general information was collected from each interviewer. The illiterate got the opportunity to get clarification on issues on issues they do not understand. This allowed room for further probing. Verbal and non-verbal responses such as, facial expressions, were noted. The interview was conducted with facility health workers.

The major disadvantages of the interview are that, it is time consuming, and respondents may give biased answers, so as to please the researcher. In order to manage time, the researcher made appointments with respondents ahead of the interviews. The researcher assured respondents of the value of their honest answers. To avoid biased answers, the researcher assured respondents of the confidentially of their responses.

3.6.4 Observation

Key (2004) defines observation as, a measuring instrument used to measure traits of self-control, cooperativeness, truthfulness and honesty. It is "a full range of monitoring

behavioral and non-behavioral activities and conditions" (Cooper and Schindler, 2003:402). The researcher used an observation guide to observe respondents and noted their facial expressions, posture, eye contact, for indications of honesty and truthfulness. The instruments were translated into vernacular language by the investigator and a Ndebele language expert.

3.6.5 Variables

The following are the variables collected by each tool:

- Usage of long-lasting insecticide nets
- sociodemographic factors
- Knowledge of malaria disease and net usage
- Health systems that support malaria prevention
- Barriers and enhancers to proper usage: culture, environment, family size
- LLIN household possession

3.7 Pre-Testing

A pilot test of the tools was done in Makhaza community on 10% of the final sample size to identify any problems with the data collection instrument and find possible solutions

3.8 Data Collection Procedure

Data collection is a term used to describe a process of preparing and collecting data (Wikipedia.org). Data collection procedures are the" steps taken in preparing, distribution, administering and collection back the data collecting instruments from subjects under study" (Mouly, 1963).

The researcher managed to seek permission from the Provincial Medical Directorate and District Medical Officer to carry out the research. A standard structured questionnaire was administered by interviewing heads of household and or legal guardian who received long lasting insecticide net during the mass and continuous distribution exercises carried out between in 2015 and 2021. Health workers at the health facility situated in ward one had an equal chance of being selected to participate in the study.

A list of all the six health workers from the health facility was obtained and each one of their names was attached with sequential numbers and three staff participant were drawn from the facility using a random number generator. The researcher gave his cell phone number to all respondents in order to answer all queries and clarification that could arise. Interviews and observations were done at household level using an interviewer administered questionnaire.

3.9 Analysis and Organization of Data

All data was collected and entered into SPSS (Statistical Package for the Social Sciences) version 22 (SPSS, Inc) for analyses. The frequency of malaria attacks were log transformed before analysis. Associations between the use of LLINs, condition of LLINs, age, how often the nets were washed, education on the use of LLINs, level of education of users, and malaria prevalence was evaluated using Pearson Chi Square (χ^2) test. Differences in group means was compared using ANOVA, Mann–Whitney U or Kruskal–Wallis test. Bivariate and multivariate logistic regression model was used to determine factors associated with use of LLINs and risk of developing malaria. Statistical significance was set at $P < 0.05$.

3.10 Data Dissemination

Findings were communicated to the health centre where the research study was done and a constructive discussion on implementation of interventions was done. Research findings were shared to the following stakeholders in meetings and workshops:

-Ministry of Health District Executive and Provincial Medical Directorate offices

-District Development Offices, ward Councilors and Village Heads

-Global Fund Nets distribution implementing partners: Plan International

3.11 Ethical Consideration

The researcher placed all ethical issues into consideration when carrying out this research. It was not possible for the researcher to be in direct contact with all different levels of the respondents. The researcher made use of trained research assistants to dispatch the questionnaires to identify participants and to receive them the same, as well as conducting same interviews.

An ethical clearance for this study was obtained from the Africa University Research Ethical Committee. In addition, an administrative authorization was obtained in December 2021 from the Ministry of Health and Child Welfare through the District Medical Officer (DMO). Documented informed consent were also sought from all participants. All data were treated confidentially. Personal interviews were carried out after prior booking. The traditional chiefs of the various communities were also contacted and their authorizations obtained before entry into the communities. Potential respondents gave verbal consent after they had been given an explicit explanation of the study and an opportunity to ask and respond to any questions.

3.12 Summary

This chapter dealt with the research methodology. The chapter discussed the research design, the population, sample and sampling procedures, data collection instruments, data collection, presentation and analysis procedures. Some ethical considerations were pointed out. The chapter ends up with a summary.

CHAPTER 4 DATA PRESANTATION, ANALYSIS AND INTERPRETATION

4.0 Introduction

This chapter focuses on data analysis and the presentation of the study findings. The study uses frequency and percentages, chi-square to measure association of dependent and independent variables and logistic regression analysis to draw conclusions.

4.1 Availability of the long-lasting bed nets to cover residential sleeping spaces

Almost 95% (300/318) of the households in the study participants still owned the LLINs that were received from the two mass distributions and continuous distribution exercises. The median number of nets in the household was 4 (IQR=3-5). However, a large majority (72%) had at least one bed net before from mass distribution exercise and not continuous distribution exercises. Majority of the households (183 or 53.6%) received square shaped blue and white bed nets. Majority of the participants, 304 (95.5%), reported that the size of bed nets which were received from the mass distribution fitted their sleeping facility. Over 94% (300 of 318) respondents reported that all members in their households had nets available in stock but sleeping under a mosquito bed net during the night had challenging factors heavily attached to it. **F**igure 4.1 below shows availability of bed nets in residential places

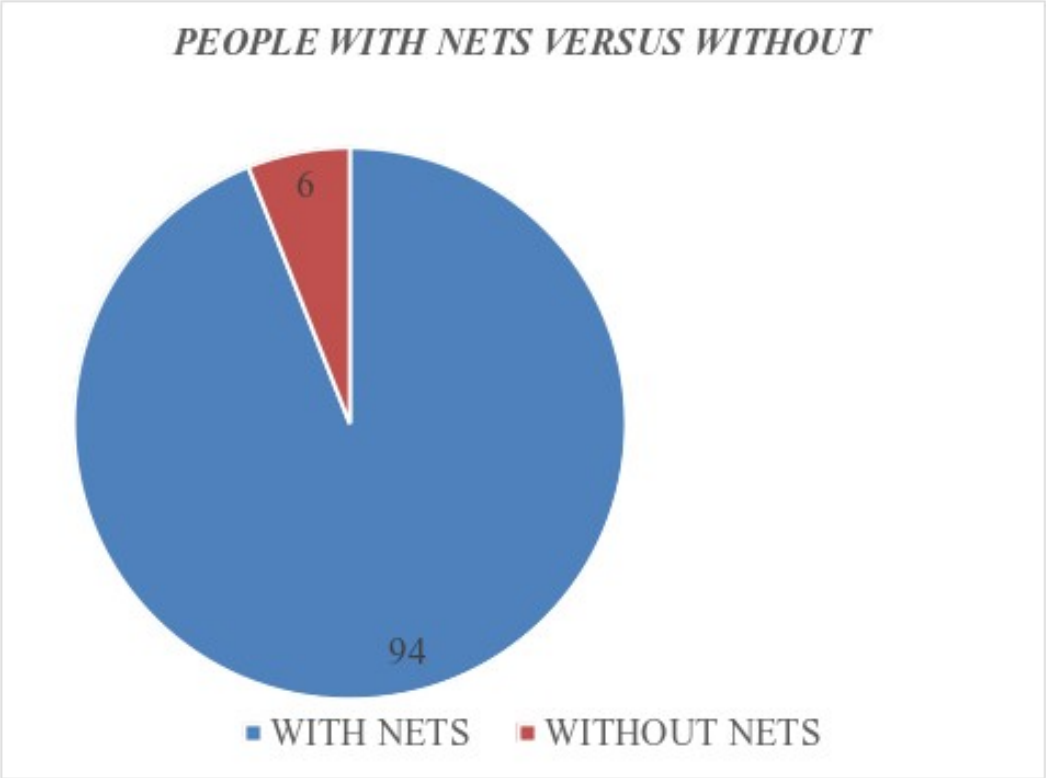

Figure 2: Showing the number of residents with at least a bed net in the house

4.2 Socio demographic characteristics and factors associated with net usage

The researcher enrolled 318 study participants who had received LLINs in the two consecutive mass distribution exercise done in Tsholotsho district. Majority of respondents were female (53%), with the mean age in years of 29 (standard deviation=8.1). 33% had attained primary level of education and 14% did not have formal education. The median size of the household was 6 (IQR=5-7). Additional social demographic and economic characteristics of respondents are shown in Table 1 below:

Table 2: Sociodemographic characteristics of the respondents (n=318).

Characteristics	n (%)
Gender of the respondents	
Male	149(47.0)
Female	169 (53.0)
Age of the respondent	
<25	55 (17.3)
25-34	165 (52.0)
35-55	57 (17.9)
55 <	41 (12.8)
Marital status	
Single	193 (61.0)
Married	70 (22.0)
Widowed	55 (17.2)
Occupation of the respondents	
Unemployed	33 (10.4)
Domestic services	76 (23.9)
Peasant	198 (62.4)
Other	11 (3.4)
Owned a bed net from continuous and mass distribution	
Yes	300 (94.3)
No	18 (5.6)

4.3 Challenges with use of nets in sleeping spaces

Participants were asked whether they had experienced any challenges in hanging the nets, the following were mentioned: allergy like reactions (n=88), not balancing (n=66), lack of sufficient space (n=1), no hook to attach (n=16), no bed (n=63), and net not fitting (n=36) and being too rough (n=18). Among the children, the reasons for care givers not placing children under the net included forgetting to put up the net (n=74), too hot weather (n=136), lack of enough space (n=40), net being too rough (n=52), and having inadequate knowledge on precision in fitting the square shaped net (101).

Furthermore, the researcher found that there was a relationship between parenting and bed net usage. Although they could not be ingested, parents perceived that insecticide bed nets may pose as a choke hazard as they restricted adequate air flow. Table 4.3 below showing an association between parentage and use of bed net:

Table 3: ***Showing a Chi-square test on parentage and use of bed net***

	Value	D.f.	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.478[a]	6	0.612
Likelihood Ratio	4.922	6	0.554
N of Valid Cases	318		

3 Cells (21.4%) have an expected count less than 5 and the minimum expected count is 3.97. Given the following hypothesis at alpha = 0.05 (Kotz et al., 2006).

Since p = 0.612 > 0.05, we fail to reject the null hypothesis. This means the study results shows no relationship between having children in the homestead and the consistent use of long lasting insecticide bed nets.

4.4 Bivariate analysis of factors associated with usage of LLINs

The odds of using an LLIN among females were 2.6 times more than among the males **(**OR = 2.6, 95% CI 1.10-7.09, p=0.02). Marital status was significantly related to non-use of long lasting insecticide net. The single respondents were 10.1 times more likely to use bed nets OR=10.1 (95% CI 1.64, 65.46) compared to the married ones. Also, using the married respondents as a referent category, those who were divorced or separated were 3.3 times more likely to use bed nets (OR=3.3 % CI: 1.43, 20.06).

Having a net that fits on the sleeping space in the household was associated with a 4.0 increase in the odds of using it compared to the respondents whose nets were not fitting on the sleeping facility (OR=4.0 95% CI: 1.96, 8.07, p= <0.001). Respondents who had challenges in hanging were less likely to use the LLIN compared to those who did not experience technical challenges while hanging bed nets, but this association was slightly significant (OR=0.6 95% CI: 0.35, 1.01, p=0.053). The results are shown in table 4.4 below:

Table 4.4 Bivariate analysis of factors associated with usage of LLINs

Variable	Use a bed net n (%)	Do not use bed net n (%)	OR (95%) CI	p-value
Gender				
Males	108 (71.1)	44 (28.9)	1.00	**0.026***
Females	92 (56)	74 (44.3)	2.6 (1.1-7.1)	
Age of respondents				
<25	48 (66.6)	24 (33.3)	1.00	**0.428**
25-34	89 (54.2)	75 (45.7)	0.8 (0.5	1.4)
35 or +	51 (62.9)	30 (37.0)	1.2(0.7-2.2)	
Marital Status				
Married	167 (57.2)	122 (42.2)	1.00	**0.008***
Single	20 (76.9)	6 (23)	10.3	(1.6-65.4)
Widowed	2(18.1)	9 (81.8)	5.0 (1.0-25.16)	
Separated/ Divorced	9 (47.3	10 (52.6)	3.1 (1.5-20.0))	
Education Level				
No formal education	14 (30.0)	33 (70.2)	1.00	**0.469**
Primary	91 (54.5)	76 (45.5)	1.2 (0.5-2.7)	
Seco	dary 65 (62.5)	39 (37.50)	1.6 (0.7-3.9)	
Number of LLINs in the household/ sleeping space				
3 or less	39 (31.4)	85 (68.5)	1	00 **<0.001**
More than 3	132 (68.0)	62 (31.9)	2.7(1.8-4.3)	
Bed net size fitting on the sleeping facility				
No	13 (39.3)	20 (60.7)	1.00	**<0.001**
Yes	169 (61.4)	106(38.6)	4. 0(1.9-8.0)	
Challenges hanging the bed net				

No	138 (55.6)	110 (44.4)	1.00	**0.0532**
Yes	33 (47.1)	37 (52.9)	0.5 (0.4-1.0)	
Has a member in the household suffered from malaria in the last 12 months				
No	298(95.2)	15(4.8)	1.00	**0.011**
Yes	1 (20)	4(80)	1.8(1.6-3.0)	

Furthermore, households that had a member who suffered from malaria in the last 12 months were 1.9 times more likely to use bed nets compared to respondents who did not report any member suffering from malaria in the last 12 months (OR= 1.9 95% CI: 1.15, 2.99 p= 0.011).

4.5 Multivariable Analysis for Factors Independently Associated with Bed Net Use

Factors independently linked with bed net use included marital status of the respondents especially if the respondent was single (aOR = 10.1 95% CI: 1.64, 65.46 p= 0.013) or widowed (aOR = 5.0 95% CI: 1.03-25.16; p = 0.047) compared to the married ones. Gender of the respondents was associated with net usage with females having a higher tendency of use than males (aOR=2.6 95% CI: 0.99, 7.07; p = 0.051). In addition the fitting size of the bed net in the house was associated with a higher chance of using that net (aOR = 3.6 95% CI: 1.71, 7.59; p= 0.001). Again the number of bed nets in the household increased the chances of individuals using the insecticide nets (aOR = 2.5 95% CI: 1.56, 3.99; p = <0.001).

Table 4.5 Multivariable Analysis for Factors Independently Associated with Bed Net Use

Variable	aOR (95 CI)	p-value
Gender		
Males	1.00	**0.051**
Females	2.6 (1.0-7.1)	
Marital status		
Married	1.00	
Single	10.1 (0.6-65.5)	**0.047***
Widowed	5.1 (1.0-25.2)	
Divorced/ separated	3.1 (1.5-20.0)	
Bed net size fitting on the sleeping facility		
No	1.00	
Yes	3.6 (1.7-7.6)	**0.001***
Number of Bed nets in the Household		
3 or less	1.0	**<0.001***
More than	2.5 (1.6-4.0)	
Has anyone in the house suffered from malaria in the past 12 months		
No	1.0	**0.043***
Yes	1.7 (1.0-2.8)	

Significant at 0.05 level

4.6 Chapter summary

The majority of the participants owned a long-lasting insecticide net but proper and consistent usage was significantly low. Out of all the demographic factors of the study participants, being female and single had a significant impact on usage of bed nets. The independent variables were tested using multivariate regression analysis and only three

variables namely marriage status, gender and the features on the net shape and size to fit on the sleeping space were found to be associated with the usage of long-lasting insecticide net and these were further assessed for the magnitude of association using logistic regression. All of them exhibited significant contribution to the use of bed nets and showed increasing odds to exhibit the use of these nets in the prevention of malaria diseases.

CHAPTER 5 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter gives a summary of the study findings and discusses whether the research met its objectives then gives conclusions on the hypothesized phenomena. The researcher will also give recommendations to the policy makers and suggest areas of further investigate barriers around net usage.

5.2 Ownership of long-lasting insecticides nets

The study reports a near universal LLIN ownership of long-lasting insecticide nets in households after the 2017 and 2021 mass bed net distribution exercise in Tsholotsho district. The findings also show higher ownership of bed nets than in other similar study done by Jorge Alexandre et al (2014) in Mozambique, Tete province. However, the high levels of ownership and usage are not unique in our study and are comparable to those seen in other African countries where similar mass distribution and continuous distribution exercises were conducted include Tanzania and Ethiopia, Mclean et al (2014). The study findings in these two countries show a very high proportion of ownership and low usage rate of LLINs due to many factors that include physical misuse and discomfort caused by sleeping inside the insecticide net.

Many malaria control programs in sub-Saharan Africa including Zimbabwe distribute LLINs to household considering sleeping spaces available, but the issue of valuing the importance of bed nets by beneficiaries has been of great concern. These findings concur with two studies by (Kateera et al., 2015), carried out in Ghana and Rwanda respectively. There was a high level of LLIN ownership but lower levels of percentage usage following a net mass distribution exercise. The Rwandan study concurs with the recent research done in Tsholotsho as rural area based males were found to be less likely to use the LLINs due to their socio-economic daily tasks that prevent them from using bed nets, exposing them to mosquito bites during night work shifts that's includes timber processing, fishing and horticulture gardens safeguarding.

According to the Rwandan study, a small proportion of the households (6%) did not have even a single net from those that were received during mass long lasting insecticide nets distribution exercise. These households reported they had given the nets to some of their visiting relatives. This may have been done because some respondents believed that they would receive new replacement nets free-of-charge through a similar mass distribution campaign to be conducted in mid-year 2022. According to a recent study in western Uganda by (Strachan et al., 2016), the high proportion of bed net use may be attributed to appreciation of the benefits of long-lasting insecticide net usage and perceived threat from malaria as a major health problem in Africa. Continuous sensitization has been found effective in Malaria control programs as it informs beneficiaries on the benefits of sleeping under a bed net.

5.2 Socio demographic factors associated with long lasting insecticide net usage

There were several factors that were significantly associated with usage of long-lasting insecticide nets. Data gathered from the research showed that Tsholotsho households that reported consistent and proper usage of bed were also less likely to report in-house malaria cases in the past six months. The aforestated positive outcomes may strengthen and reinforce the behavior to sleep under a net. However, the cross-sectional design was not sufficiently strong to demonstrate a cause-effect relationship between net usage and reports of a malaria case in the homestead. From the research, study respondents who were single were more likely to use LLINs compared to those who were married.

Marital status is important in promoting bed net usage because from the research results being single was associated with a 10.1-fold increase in the odds of using a bed net compared to being married. The findings of the relationship between marital status and LLIN use are in agreement with a report from a study conducted in Cameroon by (Kimbi et al., 2014). It is difficult to explain these findings as there are many other confounding variables, and hence further examination is necessary especially in study designs using qualitative methodology to understand the ramifications of these findings to gain in-depth about bed net usage.

5.3 Technical and environmental factors associated with long lasting insecticide net usage

Most households that owned bed nets which had a precision fit on the sleeping facility were more likely to use bed nets compared to their counterparts. This is a very important

observation in all future distribution exercises as the bed net shape and size distributed should conform to the nature of the houses in the distribution area. Seventy five (75%) percent of the study participants live in smaller round hutted bedrooms, and hence the size and shape of the nets matter when trying to hang them during the night. Majority of the participants received rectangular shaped bed nets and reported that these were traditionally unacceptable and very difficult to hang hence low usage rates. From the interviewing discussions, the size of the household including bedroom size had a strong association with bed net usage. Home steads with increased sleeping spaces had more room to properly hang the nets in the various designated sleeping spaces.

Studies have revealed that sleeping in a poorly constructed house were significantly associated with contracting malaria as net hanging process was proven difficult under these circumstances. According to (Kirby, Bottomley, Green, Jawara, Milligan, et al., 2009), a similar study in Gambia reported that closing eaves halved the prevalence of malaria caused malaria in children. A systematic study of five case–control studies and two cohort studies showed that both living in houses made of brick walls increased the odds of net usage and hence a reduction in malaria infections by twenty five percent (Tusting, 2015).

Well-constructed houses promote proper hanging of long lasting insecticide nets and hence encouraged the inhabitants on consistent use of nets, preventing them from malaria through barrier methods from the malaria vectors. The study found out that brick

walled homesteads and roofs increased the drive to use a bed as they provided large space for precise net hanging as compared to the traditional mud/pole and thatch houses.

Although the use of long lasting insecticide nets and indoor residual spraying are equally important, improper and underdeveloped housing have significantly contribution to a decline in the use of mosquito nets resulting in increased malaria cases and elimination of the disease in Tsholotsho district. Three studies on malaria outbreak in Zimbabwe also cited non-usage of nets associated with that the presence of dilapidated home structures, hence an increase in the likelihood of contracting malaria by inhabitants. According to the study, the majority of the remote ward one residents lived in poorly constructed houses and these similar settings of widened rural dominance were found to be risky with regards to contracting malaria.

5.4 Limitation of the Study

Among the participants in this study were women who had delivered in the past 12 month who had to respond to questions on LLINs use during their pregnancy. Therefore, recall bias might affect their responses. Due to limited resources, study communities which have larger numbers of potential respondents will be conveniently selected for the study and therefore the results may have limited generalizability. The researcher had serious time constrains to cover the study population as the households were scattered.

5.5 Conclusion

From the outcomes of this study, it can be concluded that there is an association between knowledge on malaria disease, important of net usage and the actual use of the long-lasting insecticide net. The stakeholders meetings and mass education exercise by Environmental Health Technicians and village Health Workers must be used to extensively educate community members before mass LLINs distribution. Higher level of education prompted proper and consistent net usage as compared to those with limited and no education, hence the need to design health education messages that is inclusive of every member of the community.

Being male and informally employed in the rural areas has a significant association with less likelihood of use of bed net. The gender and nature of economic activity variables exhibit significant contribution to the non-usage of bed nets. To increase the odds of proper usage of long lasting insecticide nets, all barriers to usage must be addressed. Future follow-ups on usage of nets to be done by health care workers to determine durability of ownership.

5.6 Recommendations

The researcher recommends the Ministry of Health and Child Care to facilitate scientific investigation around body conduct itching discomfort as a result of long lasting insecticide nets . Lack of knowledge, or awareness about the purpose and proper way of using the nets was reported by most informants. These were either due to some individuals' own deficiency or to low level of training and education, hence education by Health Promotion Officers on LLIN usage should target all age groups to improve

program ownership through social behaviour change communication. Importance of bed net usage should target early the school going age through school malaria clubs.

Ministry of Health and Child Care Procurement Management Unit must prioritize round shaped nets as hanging problems; myths and misconception around square shaped nets continue to hinder progress on net usage among many households especially in rural areas. These constructive suggestions should have policy makers as audience, recommending that routine mass bed net distribution campaigns should continue. A survey on the sleeping facilities, shape of the bed net and size of the bed net should be prioritized before the long lasting insecticide net mass distribution exercise. This match the bed nets shape to precise location of usage.

Health workers should do home visits, coaching household guardians on proper net usage. The researcher also recommends that sensitization of community on the importance of sleeping under the net to be done prior to every mass and continuous LLINs distribution exercises by the community health workers. Net hanging demonstrations to be done during community health talks. The researcher recommends further research on the approach and quality of health education on malaria disease and net usage, to develop evidence based standard education guidelines in all languages on malaria disease and net usage use. In addition, a further study on factors associated with net usage in unmarried individuals to be done.

REFERENCES

A. C. Michalos (2014), *Quality of Life and Well-Being Research*, Springer Netherlands, Dordrecht Press

Lengeler C (2004). *Insecticide-treated bed nets and curtains for preventing malaria*, Bradford, Cochrane Press

WHO (2015), *World Malaria Report* 2015, Geneva: World Health Organization

Egbuche CM, Eneanya CI, Aribodo DN, Eneaya OA, Ogbuagu CN, Ezugbo-Nwobi IK (2013), Malaria prevalence and use of insecticide-treated net among communities in Anambra State, Nigeria. *Journal on Insecticides Bio scientist 4(1):*60–68

WHO (2014), *Malaria Fact Sheet No 94. Geneva*: World Health Organization;

Sande S (2016), A review of new challenges and prospects for malaria elimination in Mutare and Mutasa districts, Zimbabwe, *Journal on Malaria Prevention, 2*, 84-92

Pulford J, Hetzel MW, Bryant M, Siba PM, Mueller I (2011), Reported reasons for not using a mosquito net when one is available: a review of the published literature, *Malar Journal on bed nets, 14(3),* 230-243

Keating J, Hutchinson P, Miller JM, Bennett A, Larsen DA, Hamainza B (2012), A quasi-experimental evaluation of an interpersonal communication intervention to increase insecticide-treated net use among children in Zambia, *, Journal on Malaria, 7(2)*, 25-32

Cheesbrough M (2006). *Public health practice in tropical countries*, 2nd edition: Cambridge, Cambridge University Press

Sohail M, Shakeel S, Kumari S, Bharti A, Zahid F, Shadab A (2015). Prevalence of malaria infection and risk factors associated with anaemia among pregnant women in semiurban community of Hazaribag, Jharkhand, India. *Biomedical Resources, 2(1),* 35-38

Manguin RGF, Bigoga JD, Zhou J, Fouda GG, Leke RJI, Tchinda V (2018). Longitudinal studies of Plasmodium falciparum malaria in pregnant women living in a rural Cameroonian village with high perennial transmission.Journal on *Tropical Medicine and Hygiene*,*5*(3), 663-686

Mbu RE, Takang WA, Fouedjio HJ, Fouelifack FY, Tumasang FN, Tonye R (2019). *Clinical malaria among pregnant women on combined insecticide-treated nets (ITNs) and intermittent preventive treatment (IPTp) with sulphadoxine-pyrimethamine*: London, Livingstone Press

WHO (2018), *Global technical strategy for malaria 2016–2030*, Geneva: World Health Organization

Choonara S, Odimegwu CO, Elwange BC (2015). Factors influencing the usage of different types of malaria prevention methods during pregnancy in Kenya, *Journal on Africa Health Science, 1(3),*112-118

Tobin-West C, Kanu E (2016), Factors influencing the use of malaria prevention methods among women of reproductive age in peri-urban communities of Port Harcourt city, Nigeria. *Niger Postgrad Med Journal vol. 2*-225

WHO (2017), *A framework for malaria elimination*, Geneva: World Health Organization

Carter R (2002), *Clinical Microbiology reviews.* New York: American Society of Micro biology Publishers

F. Kateera, C.M. Ingabire, E. Hakizimana (2015), "Long-lasting insecticidal net source, ownership and use in the context of universal coverage: A household survey in eastern Rwanda," *Malaria Journal on Tropical Medicine and Behavioral Sciences*, *14(1),* 390-396.

C. E. Strachan, A. Nuwa, D. Muhangi, A. P. Okui, M. E. H. Helinski, and J. K. Tibenderana (2016) "What drives the consistent use of long-lasting insecticidal nets over time? A multi-method qualitative study in mid-western Uganda, "*Malaria Journal, 15(1),* 1101

D. Jima, A. Getachew,H. Bilak (2010), "Malaria indicator survey 2007, Ethiopia: Coverage and use of major malaria prevention and control interventions,*"* *Malaria Journal, vol. 9(1),*58-62

L. Garc´ıa-Basteiro, C. Schwabe, C. Aragon(2011), "Determinants of bed net use in children under five and household bed net ownership on Bioko Island, Equatorial Guinea," *Malaria Journal*, *17*, 1475-2875

Tassew A, R.Hopkins, andW.Deressa (2017), "Factors influencing the ownership and utilization of long-lasting insecticidal nets for malaria prevention in Ethiopia," *Malaria Journal,* 16(1), 262-268

J. L. VandenEng, J.Thwing, A.Wolkon (2010), "Assessing bed net use and non-use after long-lasting insecticidal net distribution: A simple framework to guide programmatic strategies," *African Journal on malaria prevention*, *69(2),* 242-246.

E.O. Ugwu, P. C. Ezechukwu, S. N. Obi, A. O. Ugwu, and T. C. Okeke (2013), "Utilization of insecticide treated nets among pregnant women in enugu, South Eastern Nigeria," *Nigerian Journal of Clinical Practice,16(3),* 292–296

F. E. Gebresilassie and D. H. Mariam (2011), "Factors influencing people's willingness-to-buy insecticide-treated bednets in Arbaminch Zuria district, southern Ethiopia," *Journal of Health, Population and Nutrition*, 29(3), 200–206

Ministry of Health and Child Welfare (2007), The *Zimbabwe National maternal and neonatal health road map 2007-2015,* retrieved from https://www.who.int/pmnch/countries/zimbabwe_roadmap_web.pdf

APPENDICES

Annex A: Questionnaire

My name is Gerald Chandakabata I am a 3rd year student doing a Masters' degree in Public Health at Africa University. I want to conduct a public health research on identifying barriers and enhancers to usage of long-lasting insecticide nets in the prevention and control of malaria in Tsholotsho north, Matabeleland north. I kindly ask for your voluntary participation in this research and at any time when you feel like withdrawing from the research you are free to do so. I promise to hold all the findings from this survey in utmost confidence. May you kindly be as objective as possible so that the results are valid and can be used to improve the malaria programs not only in Tsholotsho North but also in other provinces throughout the country. Thank you.

Instructions:

a) Please do not write your name or any form of identification on this questionnaire
b) Information provided here is strictly confidential and it is for academic purpose. Feel free to attempt all the questions
c) Put a tick or an X in the boxes below and write on the spaces provided.

Section A: Demographic information

1. Sex: Male ☐ Female ☐
2. Age: 15-20 ☐ 20-25 ☐ 25-30 ☐ 30-35 ☐ 40 and above ☐
3. Marital status : Married ☐ Single ☐ Divorced ☐ Widowed ☐
4. Profession: Employed ☐ Unemployed ☐
   Others……
5. Level of education: Primary…….. Secondary……..Tertiary…….

Section B: Knowledge on the disease by a patient with history of malaria

6. Have you heard of Malaria in the past? Yes ☐ No ☐

7. Can you tell me any signs or symptoms of malaria?

   ……

8. What do you think can be the cause of

   Malaria? .....

9. What do you think can be done to fight

   Malaria? .....

10. What are the malaria disease prevention methods that you

    know? .....

    .....

Section C: Knowledge on the Disease by Caregivers

11. How do you treat malaria in the

    family? .....

12. Have you or any member of the family ever suffered from malaria?

    Yes ☐ No ☐

    If yes, was it a local infection or imported case ……

13. Have you or any member of the family suffered from anemia? Yes ☐ No ☐

14. Who is most at risk of contracting malaria in your

    family? .....

15. How many children under five year do you have in the house? .....

16. How many people sleep under this net? .....

Section C: Availability and usage of nets

17. How many nets do you have in your home? .....

18. Can you show me how do you use your nets?

Net attached in the house Yes ☐ No ☐

Nets properly attached in the houses Yes ☐ No ☐

19. When did you receive your last long lasting insecticide net? .....

20. For what purpose do you need a net in your home? .....

21. How many people sleep under this net and are there problems you encounter when using the net? .....

22. Do you consistently sleep under the net on daily basis? Yes ☐ No ☐

23. Did you ever receive any guidelines on net usage at the health facility?

Yes ☐ No ☐

Section D: Residence status

24. Has anyone sprayed the interior walls of your dwelling against mosquitoes at any time in the past 12 months? Yes ☐ No ☐

25. How many months ago was the house sprayed? .....

26. Have you renovated your house since last spraying program? .....

27. How often do people sleep outside the houses? .....

Section E: Demand of Health Service by the Community (answered by Health Workers)

28. How many patients do you receive with malaria signs and symptoms per week? .....

29. What are the complications of malaria? .....

30. What are the reasons for people not to sleep under the bed net? .....

31. Who is most at risk of contracting the disease? .....

32. Do you have a register that document those that suffered from malaria but benefited a LLI Net from the mass and continuous distribution program…….

33. As a facility, do you have LLINs in stock to continue distributing to pregnant mothers coming for ANC services new residents and those that need replacements…….

34. Have you received training on LLIN usage and Community mobilization in the past 6 months…….

35. Are you offering health education on the importance and proper usage of nets to patients……

.

Appendix B: Checklist for data collection

- Age
- Sex
- Level of education
- Suffering from malaria and any treatment given (type of drugs)
- Prevention methods (use of any protection, spraying)
- Availability of nets in households
- Proper usage of nets in the household

- Quality and state of LLINs available in the house

- Type of job

Annex C: Indlela yokudingisisa

Ibizo lami ngingu Gerald Chandakabata.Ngingumfundi owenza ibanga lesithathu seMasters' degree kuPublic Health eAfrica University. Ngidingisisa ngodaba lwezempilakahle, ngicwayisisa ngemvimbela lokungenza abantu bathakazelele ukusetshenziswa kwamambule ekwenqabeleni lokuvimba umkhuhlane weMalaria esigabeni seTsholotsho, esabelweni seMatabeleland North. Ngithanda ukucela usekelo lwenu, lizizwe likhululekile.Impendulo zenu zizagcinakala ngendlela encomekayo.Ngiyethemba imicijo yenu izaba ingeyokwakha ukuze sithuthukise isigaba sethu kanye lakweziye indawo.

Umlayezelo

a) Lingabhali amabizo enu kuleliphepha.
b) Imbiko elizayibhala kuleliphepha izagcinekala ngendlela efihlekileyo njalo ngeyokufunda, lizizwe likhululekile ekuphenduleni.
c) Bhala ukhwetshu loba uX ezikhenxeni, beselibhala ezikhaleni eliziphiweyo.

Isibanga sakuqala: Imbuzo emayelana lobuzwayo

1. Ubulili: Isilisa ☐ Isifazane ☐
2. Umnyaka 15-20 ☐ 20-25 ☐ 25-30 ☐ 30-35 ☐ 40kusiya phezulu ☐
3. Isimo Utshadile ☐ Awutshadanga ☐ Liyehlukene Umfelwa ☐
4. Umsebenzi: Uqhatshiwe ☐ Awuqhatshwanga ☐
   Okunye……

5. Isigaba sokufunda: Primary…….. Secondary……..Tertiary…….

Isigaba sesibili: Ulwazi ngomkhuhlane weMalaria kusigulane esake sawugula.

6. Wake wezwa ngeMalaria kudala? Yebo ☐ Hatshi ☐

7. Ngichazela izibonakaliso zeMalaria?

   ……

8. Ucabanga ukuthi imbangela yeMalaria

   kuyini? .....

9. Yiziphi indlela ocabangela ukuthi zingasetshenziswa ukwenqabela iMalaria?

10. Yiziphi indlela ezokuvikela iMalaria

    ozaziyo? .....

Isigaba sesithathu: Ulwazi lwabagcina izigulane

11. IMalaria iyelatshwa njani

    ezimulini? .....

12. Wake waba lomkhuhlane weMalaria, loba omunye emulini? Yebo ☐ Hatshi ☐

    Nxa kungu yebo, umkhuhlane uyabe wawuthola eduzane loba kwezinye indawo elingabe lazivakatshela kumbe kulomunye ongabe weza lawo elivakatshele? .....

13. Wake wabalomkhuhlane wokubalegazi elilutshwane loba omunye emulini

    Yebo ☐ Hatshi ☐

14. Ngubani osengozini eyokuwuthola umkhuhlane

    emulini? .....

15. Bangaki abantwana abaleminyaka engaphansi

    kwemihlanu? .....

16. Bangaki abalala befake

    amambule? .....

Isigaba sesine: Ukutholakala lokusetshenziswa kwamambule

17. Lilamambule amangaki ngekhaya? .....

18. Akusitshengise ukuba uyisebenzisa kanjani?

    Amambule afakiwe endlini Yebo ☐ Hatshi ☐

    Amambule afakwe ngendlela eqondileyo Yebo ☐ Hatshi ☐

19. Wacina nini ukuthola amambule?.....

20. Liwadingelani amambule?.....

21. Bangaki abalala phakathi kwamambule?.....

22. Lilala phansi kwamambule yini nsukuzonke? Yebo ☐ Hatshi ☐

23. Lake lathola isiboniso sokuthi amambule asetshenziswa njani?

Isigaba sesihlanu: Indaba zokuhlala

24. Indlu yake yafafazwa yini ngomuthi wokuvikela iMalaria enyangeni ezingamatshumi lambili? ☐ Yebo ☐ Hatshi

25. Yacina nini ukufafazwa indlu? .....

26. Indlu yake yalungiswa ngemva kokufafazwa? .....

27. Lilala kangaki phandle? .....

Isigaba sesihlanu: Ukudingeka kwezempilakahle yisigaba(kuphendulwa ngabazempilakahle)

28. Lithola izigulane ezingaki ngeviki ezilelezitshengiselo zeMalaria? .....

29. Okunzima ngeMalaria kuyini? .....

30. Yiphi imithi eliyisebenzisayo ukwelapha iMalaria? .....

31. Osengozini eyokuthola iMalaria ngubani? .....

32. Lilogwalo olulabantu abakebagula umkhuhlane weMalaria kodwa bathola usizo lokuthola amambule…….

33. Njengesibhedlela, lilawo yini amambule eliwagcinileyo ukunika omama abazithweleyo,labaqala ukuhlala labadinga ukutshintsha …….

34. Selike lathola ukufundiswa ngokusetshenziswa kwamambule ngabazempilakahle ngezinyanga eziyisithupha ezedlulileyo?……

35. Liyafundisa yini izigulane indlela zokusebenzisa amambule ngendlela eqondileyo? .....

Appendix D: Imicijo eyokudingisisa ngendaba yeMalaria

- Iminyaka
- Ubulili
- Imithi ephiwayo
- Indlela zokwevikela (izinto ezokwevikelwa, ukufafazwa)
- Ukutholakala kwamambule ezindlini
- Izibonakaliso zezigulane ezilomkhuhlane zeMalaria
- Umsebenzi
- Indawo ezihlala isigulane

Appendix E: Informed consent for the questionnaire

My name is Gerald Chandakabata a final year MPH student at Africa University. I am carrying out a study on utilization of long lasting insecticide nets in the prevention and control of malaria in Tsholotsho north, Matabeleland north. Purpose of the study is to identify barriers and enhancers to proper usage of long lasting Insecticide nets in preventing malaria disease in Tsholotsho District in Matabeleland North and come up with recommendations which will be useful in proper and consistent use of LLINs hence militating against this public health problem. You were selected for the study as you are a beneficiary of LLINs during the previous mass and continuous distribution exercises. Should you decide to participate you will take about twenty minutes to answer questions asked by the interviewer.

The researcher will address the sensitive questions in a respectable manner and maintain the information obtained confidential. The participant is also free to divulge the information voluntarily. It is essential to note that there are no material benefits attached to the study. The participants will only get health benefits. All the information obtained would be kept confidential, no names or any other identification will appear on questionnaires. However coding of questionnaires will be done using serial numbers.

Privacy will also be maintained. Participation in this study is on voluntary basis. Should the participant feel unable to participate, the action will not affect their relationship with the participant organization or any authority. If they chose to participate they are free to withdraw their consent and discontinue participation without penalty. Please feel free to ask any questions pertaining to the study. You may take as much time as necessary to

make a decision. If you have decided to participate in this study kindly sign the form in the spaces provided below as an indication that you have read the information and have agreed to participate.

Name of Research Participant

Please print Date …….

Signature of Research Participant _____

or

Legally authorized representative _____

If you have any queries, questions or concerns beyond those addressed by the researcher or anything to with the research, like your rights as a research participant. If you feel you have been treated unfairly, and would like to talk to someone other than the researcher feel free to contact, the Africa University Research Ethics Committee on telephone. (020) 60075 or 60026 extension 1156 or email aurec@africa.edu.

Name of researcher----------

Annex F: Isivumelwano

Ibizo lami ngingu Gerald Chandakabata .Ngifunda isigaba sokucina se MPH eAfrica University. Ngidingisisa ngodaba lokusetshenziswa kwamambule ekwevikeleni lokwenqabeleni umkhuhlane wemalaria eTsholotsho, esigabeni seMatabeleland north.Injongo yalelophenyo ngeyokudingisisa okuvimbayo lokuncedisayo ekusetshenzisweni kwamambule ahlala isikhathi eside okwenqabeleni komkhuhlane.Lokhu kuzanceda ekutholeni imbono ezayenza kusetshenziswe amambule ngendlela eqondileyo. Likhethiwe kuloluphenyo njengoba liwathola amambule. Nxa ukhethe ukuphatheka kuloluphenyo, thatha imizuzo engamatshumi amabili ekuphenduleni imibuzo.Lizabuzwa ngendlela encomekayo njalo kuzakuba yimfihlo.Likhululekile ukuphendula ngendlela eliyifunayo lokungenzelela lapho eliyabe libona kufanele.Kuqakathekile ukuba lazi ukuthi ophenyayo kalanzuzo ayitholayo ngaphandle kokufunda ngezempilakahle.Amabizo enu kafunakali emaphepheni elizaphendula kuwo, zonke impendulo zizakuba yimfihlo.Ngokunjalo,inombolo zizasetshenziswa ekwahlukanisweni kwamaphepha.Alibanjwa ngamandla ekuphenduleni imibuzo njalo ongelasifiso akutsho ukuthi ubudlelwano buzatshintsha. Oyabe ephendulile wakhetha ukutshintsha inqgondo, uvunyeliwe nxa elesifiso kungelacala. Likhululeke libuze imbuzo elingazwisisi khona.Thatha isikhathi sakho ekuphenduleni imibuzo. Nxa ukhethe ukuphendula imibuzo, bhala ibizo lakho phansi njengendlela eyokwamukela ukuzwisisa kwakho.

Ibizo lobuzwayo ……..

Bhala okukhanyayo Ilanga ……. …….

Signature yobuzwayo

Omeleyo okusemthethweni _____

Nxa lilombuzo loba elingakuzwisiyo,lizizwe likhululekile ukubuza loba ukungezelela lapho elibona kufanele.Nxa lizizwa liphatheke kubi njalo lifisa ukukhuluma longayisuye ophenyayo,lingasebenzisa inombolo ezibhaliweyo Africa University Research Ethics Committee on telephone. (020) 60075 or 60026 extension 1156 or email aurec@africa.edu.

Ibizo lobuzayo----------

Approval letter to carry out research in Tsholotsho District

AFRICA UNIVERSITY
A United Methodist-Related Institution
Investing in Africa's future

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 website: www.africau.edu

Ref: AU2360/22 28 January, 2022

GERALD CHANDAKABATA
C/O CHANS
Africa University
Box 1320
MUTARE

RE: **Use of long-lasting insecticide nets in the prevention and control of malaria: a case of Tsholotsho District, Matebeleland North, 2021**

Thank you for the above titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.
a) Research proposal
b) Data collection instruments
c) Informed consent guide

- **APPROVAL NUMBER** AUREC 2360/22
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** January 28, 2022
- **EXPIRATION DATE** January 28, 2023
- **TYPE OF MEETING** Expedited
  After the expiration date this research may only continue upon renewal. For purposes of renewal, a progress report on a standard AUREC form should be submitted a month before expiration date.
- **SERIOUS ADVERSE EVENTS** All serious problems having to do with subject safety must be reported to AUREC within 3 working days on standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)
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Yours Faithfully

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