REPORT ON THE PROJECT

Assessing the Knowledge, Attitudes, and Practices of Pregnant Women towards ITN Use and Malaria Prevention in Agona East District, Central Region, Ghana

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ABSTRACT

Malaria remains a significant public health challenge, particularly among pregnant women in sub-Saharan Africa. Despite the widespread distribution of insecticide-treated nets (ITNs) as a key malaria prevention strategy, utilization among pregnant women remains suboptimal. This study assesses the knowledge, attitudes, and practices (KAP) of pregnant women in Agona East District, Ghana, regarding ITN use and malaria prevention. A community-based cross-sectional study design was employed, utilizing structured questionnaires to collect data on socio-demographic characteristics, malaria knowledge, attitudes toward ITN use, and preventive practices. Recent studies highlight that although ITN ownership is increasing, barriers such as discomfort, misconceptions, and socio-cultural beliefs persist (Owusu & Mensah, 2023). Findings from the Ghana Malaria Indicator Survey (2023) indicate that only 55% of households with ITNs have all members consistently sleeping under them (GHS, 2023). Additionally, adherence to intermittent preventive treatment in pregnancy (IPTp) remains a challenge, with some pregnant women failing to complete the recommended five doses due to limited ANC visits (PMI, 2024). The study identifies critical gaps in knowledge and utilization and underscores the need for targeted community health education, improved ITN distribution strategies, and enhanced antenatal care interventions. Addressing these challenges is essential for improving malaria prevention among pregnant women and reducing adverse maternal and neonatal health outcomes.

CHAPTER ONE

INTRODUCTION

1.0 Background

Pregnancy set the pace for the building of generational family, bringing into existence new members (newborn babies) of the family. Whereas pregnancy in most instances create joy, memorable memories for people, it can be the beginning of difficult times for others. Several factors or reasons by people could account for the different moment people encounter in life. Pregnancy is a period of conception and carrying of a baby which affect a woman's life and "potentially life-changing phenomenon opening up new responsibilities, joys and concerns for women" (Bagherzadeh et al., 2021, pp.1). Ahinkorah et al., (2021) note that an estimated 810 women die from maternal mortality daily which is a major pregnancy-related public health concern. Duodu et al, (2022) point that the World Health Organisation recorded pregnancy-related maternal deaths of 295,000 in 2017 alone.

A disturbing global health issue is the prevalence of teenage pregnancy (World Health Organisation, 2020) and associated pregnancy-related complications. Prevalence of teenage pregnancy among adolescent aged 15-19 years (Tetteh et al., 2020) is a critical health, social and economic concerns in Ghana. Many people by public perception, had attributed teenage pregnancy to economic issues such as poverty and youth unemployment. Other major factors

including rural residence, child marriage, lack of parental education on sexual and reproductive health (Bain et al., 2020; Tetteh, 2022) and in some cases physical violence is noted to also lead to teenage pregnancy among adolescents aged 15-19 years (Tetteh et al, 2020). Focus on settlement areas is considered also to influence the prevalence of teenage pregnancy. Whereas poverty is a common phenomenon in rural areas, it is likely that teenage pregnancy among adolescent would surge. Bain et al., (2020) had found that teenage pregnancy in Ghana is endemic mostly in rural areas. A public phenomenon on adolescent or teenage pregnancy had been the growing concern of teenage or adolescent cohabiting with their partner for various reasons. In most instances, this is believed to be attributed to financial support that the adolescent girls' parents cannot provide for them. Studies have pointed increased risk of abortion, neonatal and maternal mortality, education drop out and low self-esteem (Unicef, 2021; Kyei-Arthur, Kyei-Gyamfi, Agyekum, Afrifa-Anane, and Dickson, 2025; Marwin-Dowle and Soltani, 2020) as adverse consequences of teenage pregnancy in Ghana.

Pregnancy is associated with several health-related issues that surfaces in different period of the pregnancy journey. Health related conditions such as malaria, neonatal and maternal mortality and gestational diabetes, stress, mental health among others affect pregnancy. In the work of Bagherzadeh et al., (2021), pregnancy is studied to be associated with risk of maternal and neonatal problems such as preterm birth, gestational diabetes, stillbirth, miscarriage neonatal mortality, fetal development issues, and malaria is attributed to poor diet and poor environment during pregnancy. Science, medical examination and research agrees that "prenatal period is a time of rapid development, when a multitude of psychological and physiological changes occur for both mother and fetus" (Davis and Narayan, 2020, pp.1). Several changes occur in the body of a woman in the period of pregnancy for which the changes impact on the development of the woman and unborn baby. Lifestyle activities could have linkage to pregnancy experiences and the associated challenges that one goes through during the pregnancy period. Prenatal stress and mental health problems such as depression, generalised anxiety and post-traumatic stress disorder poses adverse pregnancy-related health issues and development to human body (Davis and Narayan, 2020.). Ghana, as part of its effort and responsibility as per subscribed and to meet the target of the Sustainable Development Goal 3, is focused to reducing the maternal mortality. Pregnancy present changes in the health and lifestyle of pregnant woman which throughout the pregnancy period may influence the health of the unborn baby as well. The changes in pregnant

woman's health and lifestyle could be linked to pregnancy problems such as maternal mortality. Bagherzadeh et al., (2021) agrees that the physical, mental health, health behaviours and lifestyle changes in mothers is influenced by pregnancy. It is therefore imperative to keep improving knowledge and understanding on the different experiences and changes mothers and baby go through during pregnancy and associated health related problems such as malaria as well as the use of insecticide treated net.

Budu et al (2022) assert that malaria is a life-threatening disease caused by the bite of an anopheles mosquito that releases parasite into the human body. Malaria is a critical health concerns that poses threat to human health and wellbeing and pregnancy is not an exception. Both pregnant women and unborn baby are at high risk of the adverse effect of malaria to their health, well-being and development. Although malaria is a preventable ailment with some treatment options, it results in high risk of morbidity and mortality rates (Abdul-Manan and Tieriyaga, 2022). Pregnant women infected with malaria suffer adverse health outcomes notably among them include premature labour, low birth and neonatal mortality (Abu-Bonsra et al., 2025). Global data indicates high estimate of 249 million malaria cases accounting for 608,000 deaths of which 94 percent of malaria cases and 95 percent of deaths were traced to Africa where in sub-Saharan Africa, malaria is considered a major public health issue causing critical health outcomes to people particularly in children and pregnant women (Abu-Bonsra et al., 2025). Malaria situation in Ghana cannot be overlooked with the environment that people find themselves is a contributory factor to the increasing rate of malaria infection particularly in pregnant women. Studies conducted on malaria infection point to a prevalence rate of 14.1 percent among pregnant women in Northern Ghana and another 8.9 percent prevalence rate in middle and Southern Ghana (Dwumfour, et al. 2023). Manifestation of malaria in people vary as some people may experience one or more symptoms of the ailment. Common manifestation of malaria includes headache, fever, nausea, and flu-like symptoms which depends on the Plasmodium species and infected person (Bardoe et al., 2024). Administering anti-malaria drugs is common treatment option relied on to treat malaria ailment. Whereas this is applicable following contracting malaria, preventive measures are sought to keep pregnant women and pregnancy healthy.

Insecticide-treated nets (ITNs) offer significantly proactive strategies to prevent malaria among pregnant women (Negasa, Huluka, Yebassa and Waqkene, 2024). Budu et al., (2022) state that ITNs provides reliable intervention to reduces and further prevent malaria infection and related health complications. ITNs could present to be a more effective and proactive intervention to preventing malaria infection compared to anti-malaria drugs that present a curative intervention to malaria infection. Access to ITNs and the usage is an important part of ensuring the reduction and possible prevention of malaria infection. Data on some Ghanaian household reveals that access to ITNs resulted in 7.1 percentage reduction in malaria reported cases among women (Alhassan, et al. 2022). Accessing ITNs in Ghana is another problem for concern as it is met with several other challenges. Production, distribution and usage of ITNs present an aspect of the initiative to undertake and disseminating relevant information on ITNs and its usage is another initiative to consider. Whereas production and distribution of ITNs would normally be the responsibility of policy makers and the healthcare sector, the usage of ITNs relies on the individual given the product and their understanding of the benefit of using it. Budu et al., (2022) believes that inequalities and disparity of ITNs use in Ghana falls on policy makers to redesign strategies focused on increasing usage of ITNs and reducing malaria infection with adequate knowledge available to pregnant women. In Ghana, constant effort is made by stakeholders to distribute ITNs on attendance to antenatal care as a strategy to reduce malaria among pregnant women (Abdul-Manan and Tieriyaga, 2022). Lack of usage of ITNs by some pregnant women is due to some humanly factors and according to (Tesfaye et al, 2022; Anikwe et al, 2020; Tariku, 2021) includes residence, family size, education, income, attitudes and other conditions. The aim of this study is to assess the knowledge, attitude and practice of Pregnant Women towards ITN use and Malaria Prevention in Agona East District as its usage remain low in the area and requires a study into it.

1.1 Statement of the Problem

Malaria in pregnancy is among major health problems recorded in health facilities across the country. A survey study conducted on ITNs usage in some communities in Ghana shows that although more pregnant women slept under ITNs, there are still pregnant women who prefer not to use it. Data from the study report that 74% of pregnant women did not sleep under ITNs (Ampofo, Ahiakpa and Osarfo, 2023) given them during the period of their pregnancy. Certain

reasons are given for the decision to not sleep under ITNs either been uncomfortable under it or just didn't want to use it and not being able to hang it for use (Ampofo et al., 2023) which is also concerns for recognising the misconception about ITNs among some people. Although some studies have reported low interest in sleeping under ITNs, people hold wide knowledge on the access of ITNs from various outlets. Studies conducted by Abdul-Manan and Tieriyaga, (2022) found that 46.7 percent of pregnant women are aware to obtain ITNs from health facilities and 17 percent believed ITNs can be purchased at a pharmacy. Pregnant women do not have trouble in accessing ITNs for use except that they do not use it for its intended purpose to prevent malaria infected pregnancy. In Agona East District, malaria prevalence remains a leading cause of maternal morbidity and neonatal complications. Though ITNs are distributed, usage remains inconsistent for various factors which are unclear for which this is happening. Malaria remains a major public health challenge in Agona East District, with 525 OPD malaria cases reported among pregnant women in 2023. This represents a significant proportion of the vulnerable population and highlight the need for targeted interventions to foresee the use of ITNs and prevent malaria in pregnancy. The expected pregnancy in 2023 was 4112, yet 12.8% of these pregnancies resulted in malaria cases at the health facilities (District Health Information Management System-DHIMS 2, 2023). It remains unclear the factors attributing to the high rate of malaria infected pregnancy in the district and for that matter in Agona Makrong the focus area of the study. Less information is known on the outcomes of high malaria infected pregnancy which prompt ascertaining the amount of knowledge and understanding on the usage of ITNs. Such data is relevant to drive the course to increase the usage of preventive interventions such as ITNs among pregnant women to reduce and eliminate maternal mortality, and other pregnancy-related complications. Whereas this is significant for healthy pregnancy, it provides grounds to identify greater burdens that requires implementation of intensified control interventions (Osarfo, Ampofo and Tagbor, 2022). Much as malaria in pregnancy is a global and local problem resulting in maternal mortality, it is recognized in global strategies such as the Sustainable Development Goal (SDG) three, which is targeted to reduce global maternal mortality by 2030 (UNICEF, 2021; Duodo, 2022).

1.2 Justification

This research aims to bridge knowledge gaps, evaluate intervention effectiveness, and inform proper educational campaigns, contributing to maternal and neonatal health improvement. In some areas, cultural believes and values is linked to the provision of education and information to promote ITNs usage. The high rate of OPD malaria cases reported at the Agona East District support grounds for interventions to drive education on ITNs usage where important information can be disseminated. It is expected that the outcome the study will inform policy direction to increase knowledge on ITNs usage and prevention of malaria in pregnancy.

1.3 Objectives

1.3.1 General Objective

To evaluate the level of knowledge among pregnant women about the use of insecticide-treated nets (ITNs) for malaria prevention during pregnancy.

1.3.2 Specific Objectives:

1. To assess pregnant women's attitudes and perceptions towards ITNs use.
2. To analyse their ITNs utilization and adherence to malaria prevention measures.
3. To identify barriers and factors affecting consistent ITN use.

1.4 Research Questions

1. What is the level of knowledge among pregnant women in Agona East District regarding malaria transmission and prevention?
2. What are the attitudes and perceptions of pregnant women towards the use of insecticide-treated nets (ITNs) for malaria prevention?
3. What extent do pregnant women utilize ITNs and adhere to malaria prevention practices?
4. What are the barriers and factors that hinder the effective use of ITNs among pregnant women?

CHAPTER TWO

LITERATURE REVIEW

2.1 introduction

In sub-Saharan Africa, the burden of malaria persists and remains unbearable high and still a serious health challenge (Marchesini & Crawley, 2004).

Ghana is among the countries in West Africa with the highest burden of malaria (Ghana Health Service [GHS], 2023). Malaria is highly prevalent and consistently widespread in Ghana; thus, every region is susceptible to infection (Desai et al., 2022; Tako et al., 2004). The most vulnerable populations are children under 5 years and pregnant women, with malaria accounting for 40.0% of all outpatient attendance (GHS, 2023).

One of the seven strategic component developed by WHO Strategic Advisory Group on Malaria Eradication (SAGme) is community engagement for the elimination and eradication of malaria (Global Partnership to Roll Back Malaria, 2000). Therefore, it is crucial to prioritize inclusive collaboration in the fight against malaria, ensuring that the affected communities remain central to all eradication efforts. The willingness of each community member to

participate and act is greatly influenced by their attitudes toward the disease and the use of any existing control measures if a malaria control program is to succeed in reducing both morbidity and mortality in that community (Mueller et al., 2008). These behaviours are shaped by the extent of their knowledge, comprehension, and perception (Abekah-Nkrumah et al., 2022; Oladipo et al., 2023). For instance, choices made when initial symptoms of suspected malaria appear, such as staying at home, using herbal remedies, purchasing over-the-counter medications for self-treatment, or seeking care at a health facility can significantly influence treatment outcomes. 'Fever,' often regarded as synonymous with malaria in many communities, is also a symptom of several other tropical diseases prevalent in malaria-endemic regions.
It thus is important that individuals experiencing a fever seek medical attention as soon as possible to rule out malaria or other possible causes of their illness (Oladipo et al., 2023). Any decision that leads to a delay in diagnosis and treatment especially in children can result in life-threatening outcomes (Ahorlu et al., 2006; Bauserman et al., 2019).

Knowledge, Attitudes, and Practices (KAP) surveys are commonly employed to collect essential information that guides the development of effective malaria control and prevention strategies, fostering community engagement, acceptance, and compliance. Numerous malaria KAP surveys have been carried out across various African countries, including. Cape Verde, Cameroon, Ethiopia, Nigeria, and Senegal (Tako et al., 2004). Similar studies have also been conducted in some regions in Ghana (Bukari, 2015; Abekah-Nkrumah et al., 2022; Owusu et al., 2023).

2.2 Burden of Malaria in Pregnant Women

Malaria continues to be a major public health issue, particularly in sub-Saharan Africa, where an estimated 25 million pregnancies are exposed to the disease each year. Pregnant women face elevated health risks, as physiological changes during pregnancy increase their vulnerability to malaria (World Health Organization [WHO], 2023). Insecticide-treated nets (ITNs) are among the most effective preventive measures. However, despite efforts to promote ITN use, adoption remains suboptimal in many regions, including Ghana. Ghana continues its efforts to attain universal ITN coverage defined as usage by at least 80% of the population in malaria-endemic areas to ensure optimal protection. As a result, continuous monitoring and assessment of access to and use of treated bed nets are required to guide malaria control policy and practice,

particularly in high-risk parts of the nation. Although numerous studies have explored the use of insecticide-treated nets (ITNs) in Ghana, the majority have focused primarily on urban areas. (Owusu et al., 2023; Abekah-Nkrumah et al., 2022), with limited studies in deprived areas (Oladipo et al., 2023). Malaria prevention, particularly among pregnant women and children under five, remains a high priority for the Ghanaian government. Therefore, nationwide studies are essential to guide evidence-based policy decisions aimed at reducing or eliminating malaria. The Agona East District, which is predominantly rural, has yet to be the focus of any research on ITN utilization. To bridge this gap, this study aims to assess the utilization of Insecticides Treated Mosquito Nets (ITNs) among pregnant women in Agona East. This review compiles and analyses recent studies published between 2021 and 2024, with a focus on the knowledge, attitudes, and practices (KAP) related to ITN usage and malaria prevention among pregnant women.

2.3 Malaria in Pregnancy

Malaria in pregnancy contributes to severe maternal and neonatal health risks, including maternal anaemia, low birth weight, and increased neonatal mortality (Ghana Health Service [GHS], 2024). Recent data from the Ghana Malaria Elimination Programme indicate that malaria accounts for over 30% of outpatient department (OPD) cases among pregnant women in endemic areas (GHS, 2023). The WHO recommends preventive strategies such as ITNs and intermittent preventive treatment in pregnancy (IPTp) to mitigate these risks (WHO, 2022)

2.4 Knowledge of Malaria Transmission and Prevention in Pregnancy

Assessment of knowledge, attitudes, and practices related to malaria and ITN usage often begins with evaluating individuals' understanding. This typically involves questions about how malaria is transmitted and the preventive measures available.

Recent studies highlight varying levels of knowledge regarding malaria transmission and prevention. A multi-country analysis of sub-Saharan Africa found that while 80% of pregnant women recognized mosquitoes as malaria vectors, only 50% demonstrated adequate knowledge of ITN benefits (Boadu et al., 2023). In Ghana, antenatal care (ANC) clinics serve as primary education sources, but disparities persist, particularly in rural areas (Amekudzi et al., 2022).

While knowledge levels about malaria among pregnant women are generally fair, misconceptions persist.

A study in Shashogo District, Ethiopia, found that although 74.3% of pregnant women had good knowledge of malaria prevention methods, only 15.6% correctly identified mosquito bites as the mode of transmission. Misconceptions such as associating malaria with poor hygiene and environmental sanitation were prevalent, highlighting the need for targeted educational campaigns.

In Ghana, it is reported that the prevalence of the malaria parasite is between 60% and 72% among pregnant women (Desai et al., 2022; Tako et al., 2004). Malaria in pregnancy is responsible for an estimated 10,000 maternal deaths each year and is a major contributor to maternal morbidity, including conditions such as fever and severe anaemia particularly among first-time mothers, Low Birth Weight (LBW) and placental parasitaemia and 75,000 to 200,000 infant deaths per annum, are attributable to malaria and infection in pregnancy.

2.5 Intermittent Preventive Treatment in Pregnancy (IPTp)

Intermittent Preventive Treatment in pregnancy (IPTp) is a vital part of Ghana's malaria control strategy, with Sulfadoxine-Pyrimethamine (SP) being the drug of choice World Health Organization (2022). IPT involves giving a therapeutic dose of an effective antimalarial drug at least twice during the second and third trimesters, aligned with routine antenatal clinic visits. IPTp with sulfadoxine-pyrimethamine (SP) is a critical malaria prevention strategy. The WHO updated its ANC guidelines in 2022, recommending at least five IPTp doses for optimal protection (WHO, 2022). However, adherence remains suboptimal due to misinformation and inconsistent ANC attendance (GHS, 2024).

2.6 ANC Accessibility and Practice of IPT by Pregnant Women

Although the IPT strategy has been introduced in many health facilities across Sub-Saharan Africa, it is estimated that fewer than 5% of pregnant women benefit from effective malaria interventions, with access being even more limited in rural communities (Oladipo et al., 2023). It has been estimated from a survey in four African countries that less than 20% of women use a

prophylactic regimen close to the WHO recommendations United Nations (2023). A study conducted by Falade et al. (2015) in Ibadan, Southwest Nigeria, demonstrated that IPT-SP is highly effective in preventing both maternal and placental malaria, while also contributing to improved pregnancy outcomes, including higher birth weights, reduced rates of preterm deliveries, and decreased incidence of maternal anaemia. To date, limited research has been conducted on the factors influencing adherence to IPT in many African countries, including Ghana.

The identified barriers to IPT use are related to concerns about SP safety and understanding of the protocol among health care providers and the community (Ahorlu et al., 2006). In a study in Tanzania (Bauserman,et al 2019), found that majority of respondents linked low compliance with IPT to poor acceptance of SP because of perceived side effects associated with SP. Launiala and Honkasalo [16] observed that some pregnant women discard medications after leaving the clinic. Factors affecting compliance include delayed initiation of antenatal care, intermittent drug shortages, and suboptimal performance by healthcare providers. Majority of the late first ANC attendants by pregnant women that is, those who first attended ANC in the third trimester of pregnancy, attributed it to the fact that they had no problems during the pregnancy. Other reasons given included lack of money for transportation to the ANC, long distance to the ANC. Few women also gave reasons such as wanting the pregnancy to show first, not being able to leave farm work, attending an herbalist or a spiritualist clinic or being seen by a TBA. Similarly, an exploratory study in Mukono district, Uganda by Mbonye, Neema and Magnussen [2] found that an initial step towards a review of the policy aimed at improving access and use of SP in pregnancy is currently low. The results showed that SP is perceived to be an effective drug that cures malaria quickly. However, there are negative perceptions related to its use in pregnancy. SP is believed to be strong and weakens pregnant women, causes abortions and foetal abnormalities**.**

2.7 Knowledge on IPT Use

Intermittent Preventive Treatment involves administering antimalarial drugs in full treatment doses at scheduled intervals after quickening, aiming to eliminate any potential parasite load. Asymptomatic pregnant women receive routine doses of Sulfadoxine-Pyrimethamine (SP) during the second and third trimesters, while those exhibiting malaria symptoms are promptly

treated in accordance with national treatment protocols. The IPT with SP is provided as part of a comprehensive antenatal package with other drugs like haematinics and anti-helminthics to control maternal anaemia that is highly prevalent during pregnancy in the country (Desai et al., 2022; Tako et al., 2004). Study conducted in Ghana by (Antwi, 2022) shows that the knowledge of the pregnant women on IPT was significantly associated with the number of doses of SP received. The pregnant woman's knowledge about the purpose of taking SP at the ANC, the number of doses of SP to be taken during pregnancy, the timing of taking the SP as well as the effects of malaria on the mother and the baby influenced women to return for subsequent doses of SP. Perhaps, if a larger proportion are aware of the total number of doses of SP to be received during pregnancy, this would have increased the percentage that received all the three doses. (Nganda *et* al. 2023) showed that in Tanzania, attendance at health education sessions at the Maternal Child Health (MCH) clinic was the only determining factor for IPT-SP use among pregnant women. Although, there were no structured health education plans for IPT at the ANCs when they were visited, this did not greatly affect the health education talks that were given by the health workers as not less than 70% of the respondents received their knowledge about IPT from the staff of the ANC. This proposed that
education about IPT went on somehow during the ANC visits and this helped to increase coverage.

2.8 Why IPT

IPT of malaria during pregnancy assumes that pregnant woman living in areas of high malaria transmission has malaria parasites in her blood or placenta, whether she has symptoms of malaria. Malaria infection in the mother, therefore, increases the risk of Spontaneous abortion, Stillbirth, Pre-term birth Low birth weight and maternal anaemia. These effects are caused by malaria parasites being present in the placenta. These parasites are at the placenta sites, impairing passage of nutrients and oxygen from passing from the mother to the foetus. The use of the anti-malarial drugs given in treatment doses clears the sites of these parasites, allowing the free passage of nutrients and oxygen to the foetus. The free movement of nutrients and oxygen enables the foetus to develop normally, reducing the chances that a foetus will suffer the effects of malaria. IPT is important because many pregnant women can have malaria parasites without symptoms Global Fund Training Manual. (2005). IPT is given to all asymptomatic pregnant

women who report at the antenatal clinic in the second or third trimester but more especially; those of low gravidity (i.e. primigravida and secundigravida), those infected with HIV, adolescents and youth (10- 24 years) and those with unexplained anaemia. The drug of choice for IPT in Ghana is Sulfadoxine Pyrimethamine. It is important to achieve an uninterrupted supply of SP for IPT use. The institutional management and midwife should check stock levels frequently, estimate for stock and dispense SP using the general principles for stock management and control. *Dosage:* Sulfadoxine-Pyrimethamine (SP) or Fansidar is given as single adult dose (3 tablets) at regularly scheduled antenatal care visits during the second and third trimesters. Up to a maximum of 3 doses is recommended by the Ministry of Health. The first dose is given after quickening or
after 16 weeks. The second dose is given at least one month after the first dose and the third dose is given at least one month after the second dose. Sulphadoxine-Pyrimethamine should be given at the ANC clinic or at where there is

2.9 Attitudes Toward ITN Use

The World Health Organization (WHO) recommends the use of insecticide-treated nets (ITNs) as a measure to reduce the mentioned adverse effects during pregnancy. Similarly, one of the goals of the National Malaria Strategy in Ethiopia is to ensure that vulnerable individuals such as pregnant women benefit from preventative measures, such as ITNs. Even though, the Abuja declaration targets agreed upon by African heads of state in 2000 aims to provide at least 80% of pregnant women with ITNs by the year 2005, only 63% of pregnant women presently make use of an ITN in Ethiopia which hampered the effectiveness of ITNs. This is mainly due to issues related to replacement of nets, seasonality of malaria, and poor knowledge regarding the link between mosquitoes and malaria as well as proper utilization of ITNs [9–11]. Therefore, assessment of knowledge, attitudes and practices about malaria and the effective use of ITNs in this vulnerable group contribute immensely to sustainable control of the disease.

Perceptions toward ITNs significantly Influence utilization. A study conducted in Ghana's Central Region reported that 70% of pregnant women owned ITNs, only 45% constantly used them (Owusu & Mensah, 2023). Common barriers include discomfort due to heat, concerns about chemical exposure, and cultural beliefs that alternative methods, such as herbal remedies, are more effective (Asante et al., 2024).

2.10 ITN Ownership and Utilization

A recent data from national malaria control programmes has also shown that levels of utilization of ITN by pregnant women in many other sub-Saharan African countries remain far below national and global strategic targets. Baume and Marin (2008). Studies has also proven that awareness creation through targeted community engagement improves adherence (Nyarko & Addai, 2023). Although ITN distribution campaigns by government and donors, gaps in usage persist. Ghana Malaria Survey (2023) shows that only 55% of households with ITNs hardly sleep under them (GHS, 2023). Effectiveness of ITNs, usage remains low among pregnant women. In Shashogo District, only 15.8% of participated client owned ITNs, and many did not use them consistently due to poor condition. There have been recent efforts to increase access to ITNs through mass distribution programmes but there are concerns that ITN utilization may still lag access as has been severally reported. Higher education levels affect positively in association with ITN usage. Equipping women through higher education could improve malaria prevention efforts.

2.11 Barriers to Effective ITN Use

Heat and discomfort under the ITN are ranked as top barriers to consistent use across sites, while lack of malaria knowledge and lack of motivation to hang and use the ITN are also reported from the Central and Northern Regions Muench et al. (2016)

2.12 Attitudes Toward Malaria Prevention

Attitudes toward malaria and ITNs vary among pregnant women. A study reported that 10.1% of the households sometimes used mosquito repellent. In the same study, only 51.1% of respondents had a positive attitude toward ITNs usage. Factors influencing attitudes included demographical factors like education level, age and urban/rural residence. For prevention like Draining stagnant water (29.1%) and clearing/cutting bushes (54.1%) made up the two main parts of the environmental management activities used to control the malaria vectors around the household. Younger women were more likely to have a positive attitude, which underscores the need for tailored interventions. (Adusei-Poku et al., 2023).

2.13 Relevance to Agona East District

The findings from Ethiopia and other studies resonate with the situation in Agona East District, were malaria remains a leading cause of morbidity among pregnant women. Assessing the knowledge, attitudes, and practices of pregnant women in this context is essential for designing effective interventions that can reduce the burden of malaria.

CHAPTER THREE

METHODOLOGY

3.1 Introduction.

This chapter described the study design and rationale, the study area, study population, selection criteria, sample size determination, sampling procedures, definition of study variables, independent variables, dependent variable, research instruments, data collection procedure, data management, data processing and analysis, ethical considerations.

3.2 Study design and Rationale.

A cross-sectional descriptive study using quantitative methods was employed to assess the ITN usage and Ownership among pregnant women visiting ***facilities in Agona East***. This design was used because it was able to collect data at one point in time.

3.3 Study area.

The study was carried out at all Health centres, polyclinics and the salvation Army hospital in Agona East District. The Agona East District (AEDA) was carved out of the Agona District now the Agona West Municipality in 2008. It is one of the 22 Districts in the Central Region. It is situated in the eastern corner of the Central Region. The district capital is Agona Nsaba, which is approximately 35 kilometres North of Winneba and 20 kilometres from Agona Swedru. The district has one constituency and five Town/Area Councils. These are: Nsaba, Duakwa, Asafo, Kwanyako and Mankrong Area Councils. The people in the district are predominantly farmers.

3.3.1 Location and size

Agona East District is situated within latitudes 5030□and 5050□N and longitudes 0035□ and 0055□W. It is bounded to the south by the Agona West Municipality and the Gomoa East District Assembly, to the north by the Birim South District and to the northeast by the West Akim District, both in the eastern region. The eastern part of the district is bounded by the Awutu Senya District and to the West by Asikuma-Odoben-Brakwa and Ajumako-Enyan-Essiam Districts

3.4 Study population.

The study had involved all the pregnant mothers attending ANC at all facilities in Agona East district during the time of the study. This population was chosen for Knowledge, Attitude and Practices of Malaria Prevention Among Pregnant Mothers.

3.5 Study Variables

3.5.0 Definition of study variables

The independent variables considered were demographic characteristics that can influence pregnant mothers' knowledge, attitude and practice on ITNs utilization and malaria prevention. The dependent variable was the levels of adherence to malaria preventive measure.

3.5.1 Independent Variables

The research variables were selected based on literature, as factors capable of affecting knowledge attitude and practice on malarial preventive measures. Demographic factors (age, experience, level of education and urban/rural residence) were considered as the most distal determinants, which could affect knowledge distribution, attitude and practices of malaria preventive measures and ITNs usage.

3.5.2 Dependent Variable

The dependent variable under study was the pregnant mother's situation, in line with WHO guide of preventing malaria in maternal child clinic/health.

3.6 Inclusion Criteria

All pregnant mothers residing in Agona East for at least six months and attending ANC at all facilities in Agona East District who were willing and consented to participate in the study. They were physically and mentally capable of making an informed consent.

3.7 Exclusion Criteria

Pregnant mothers who were sick, mothers in labour or those who could not make informed consent to participate in the study, because it could interfere with the accuracy of data as much interference.

3.8 Sample Size Determination

Sample size determination. Estimation of sample size was determined statistically using Cochran's formula (1986) statistical method below:

$n = Z^2 \times p\ (1 - p)\ /e^2$

Where n = to desired sample size. Z = number of standard deviations usually set at 1.96 which corresponds to 95% level of confidence. P = population of the target population estimated to have a particular characteristic. In absence of a known estimate, the researcher will use p = 0.5 since it gives the most conservative sample size. e= margin of error which is mostly 0.05. but in this study 0.0613 was used to arrive at sample size of 255 due to financial constraints

$n = (1.96)^2 \times 0.5\ (1 - 0.5)/\ (0.0613)^2$

therefore n = 255 participant

3.9 Sampling Technique

Purposive sampling was used to select pregnant mothers among the mothers where Random sampling technique was later used to involve all pregnant mothers who came to ANC that day to be selected; it helps by giving opportunity for all the mothers to participate in the research study.

3.10 Data Collection Tools and Procedures

Data was collected using structured, pre-tested questionnaires administered through face-to-face interviews using **Kobo Collect**. Sections include socio-demographics, knowledge, attitudes, and ITN practices. ITN availability and condition were also asked.

3.11 Data Analysis

Data was analysed using **Python programming** in the **Google Collab environment**. Link to the programme language environment will be shared for referencing. Descriptive statistics will summarize demographics and KAP levels. Logistic regression will identify factors associated with ITN use.

3.12 Ethical Considerations

Ethical approval will be obtained from the University Ethics Review Board. Written consent will be secured from participants. Confidentiality and the right to withdraw will be ensured.

CHAPTER FOUR

RESULTS FROM THE ABOVE STUDY

4.0 Introduction

Under this chapter, the study shows presentation, analysis and interpretation of the data collected. The collected data was organized and tabulated for presentations, analysis and interpreted to come up reasonable information. visualizations, and inferential statistical tests were used to derive meaningful insights., Relevant tables and figures were created from the data to allow for easy analysis and interpretation.

4.1 Data Collection Process

The Kobo Collect tool was used to design and administer a structured questionnaire. Responses were captured electronically, ensuring real-time data entry and reducing errors associated with manual processes. After collection, the dataset was exported in Excel format for analysis.

4.2 Data Analysis Platform

The analysis was conducted using Python in Google Collab, a cloud-based programming platform. Link to the cloud will be shared for the actual codes of the analysis. Python libraries such as:

- **Pandas**: For data cleaning and organization.
- **Seaborn and Matplotlib**: For data visualization.
- **Scikit-learn**: For inferential and predictive analysis.

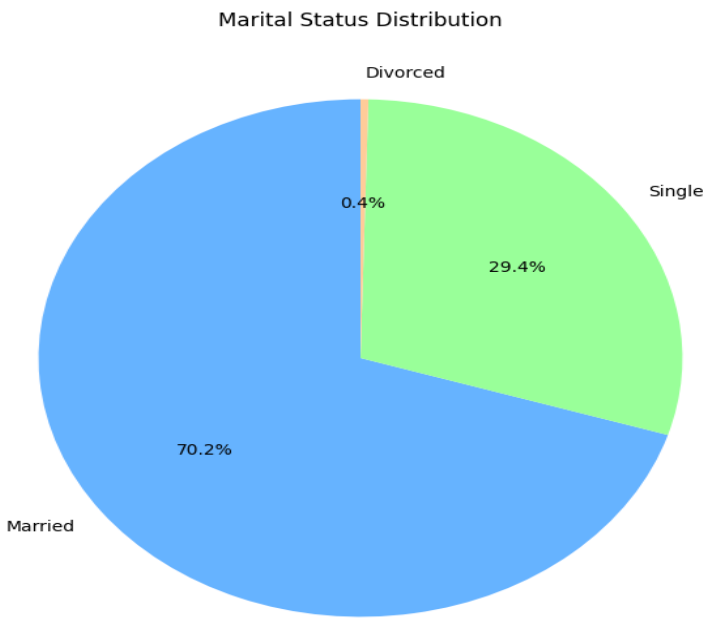
4.3 Socio-Demographic Characteristics

Description of the sample. A total of 255 mothers were observed, baseline Demographic characteristics of the sample were used to describe the sample. These include age category, level of education qualification, marital status and urban/Rural residence.

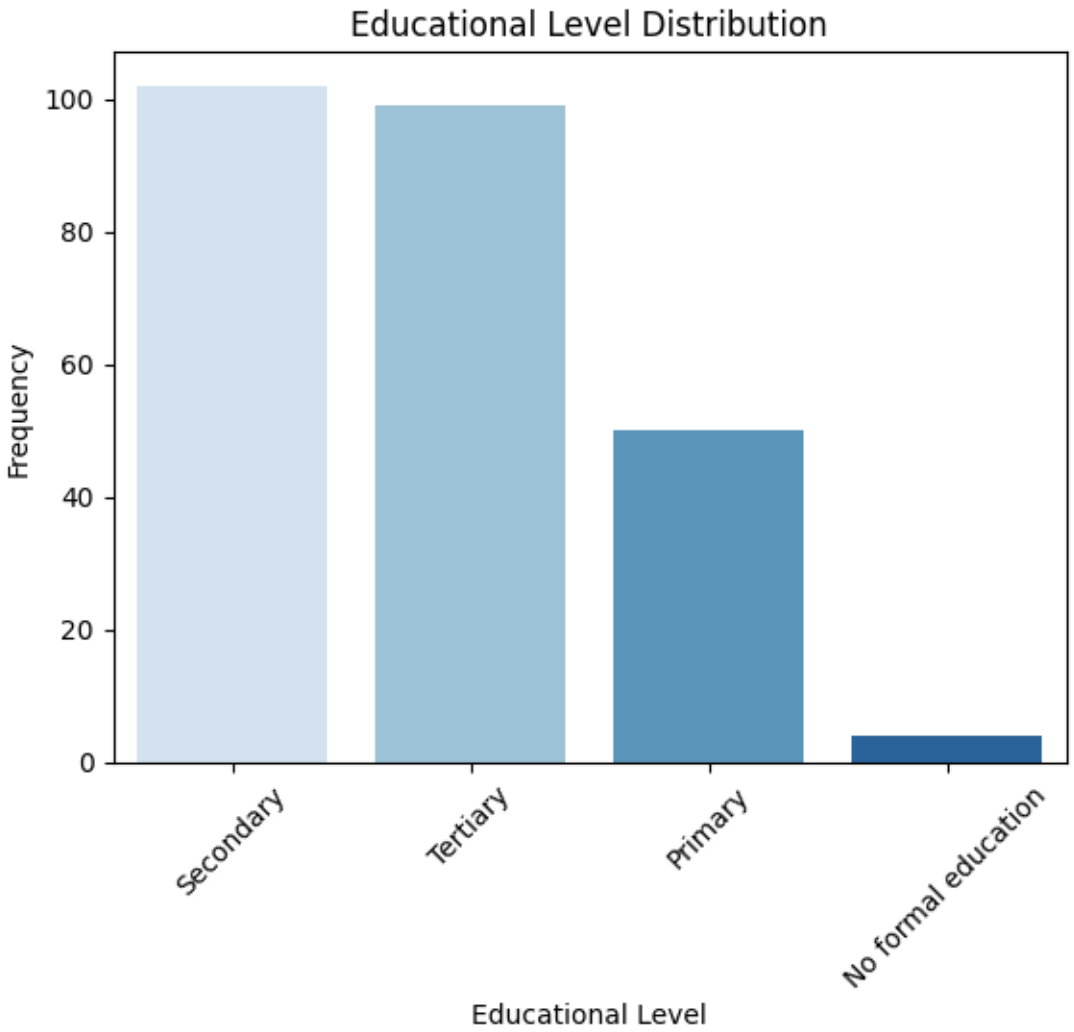
4.4 Age category

Variable	*Category*	*Frequency*	*Percentage*
Age (years)	<18	1	0.39%
	18-25	20	7.84%
	26-35	171	67.06%
	36-45	62	24.32%
	45+	1	0.39%

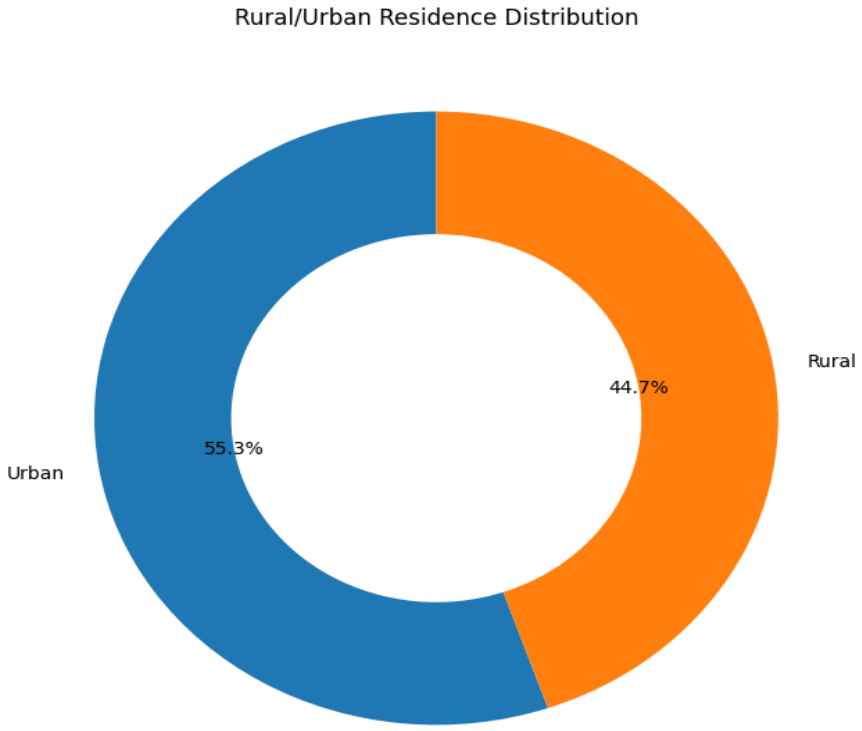
4.5 Marital Status



4.6 Educational Level



4.7 Rural/Urban Residence Summary

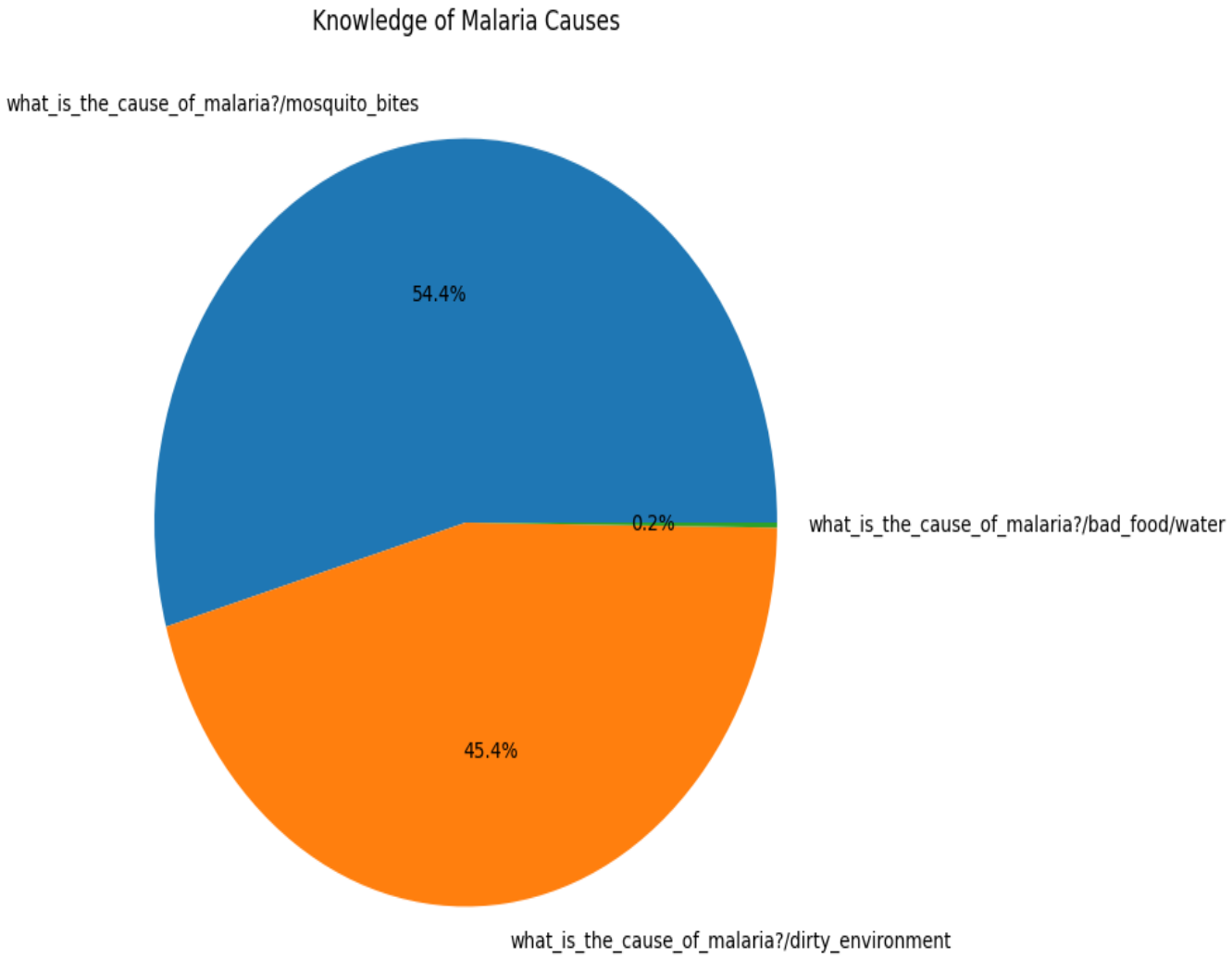


4.8 Awareness:

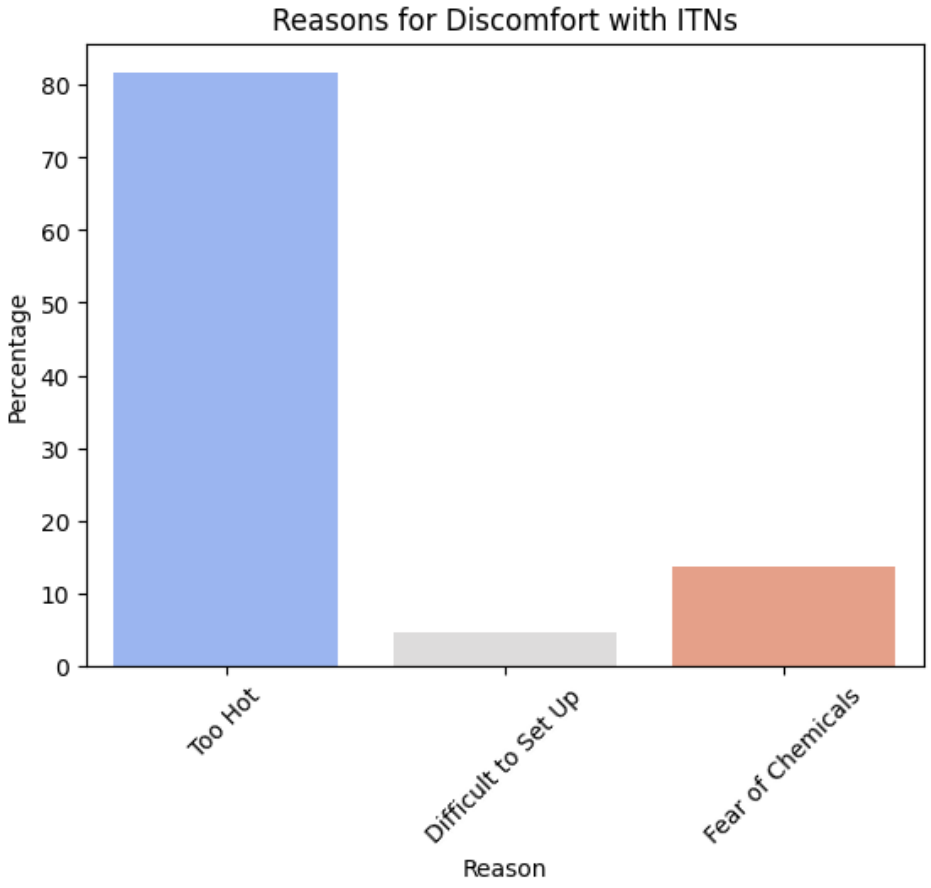
100% of respondents had heard about ITNs. Whiles 99.2% identified ITNs as effective in preventing malaria, whiles 0.78% were identified that ITNs are not effective in preventing malaria

Knowledge Area	*Response*	*Frequency*	*Percentage*
Awareness of ITNs	Yes	255	100%
Knowledge of Benefits	Yes	253	99.20%

4.9 Knowledge of Malaria Cause


Knowledge of Malaria Causes
what_is_the_cause_of_malaria?/mosquito_bites
54.4%
0.2%
what_is_the_cause_of_malaria?/bad_food/water
45.4%
what_is_the_cause_of_malaria?/dirty_environment

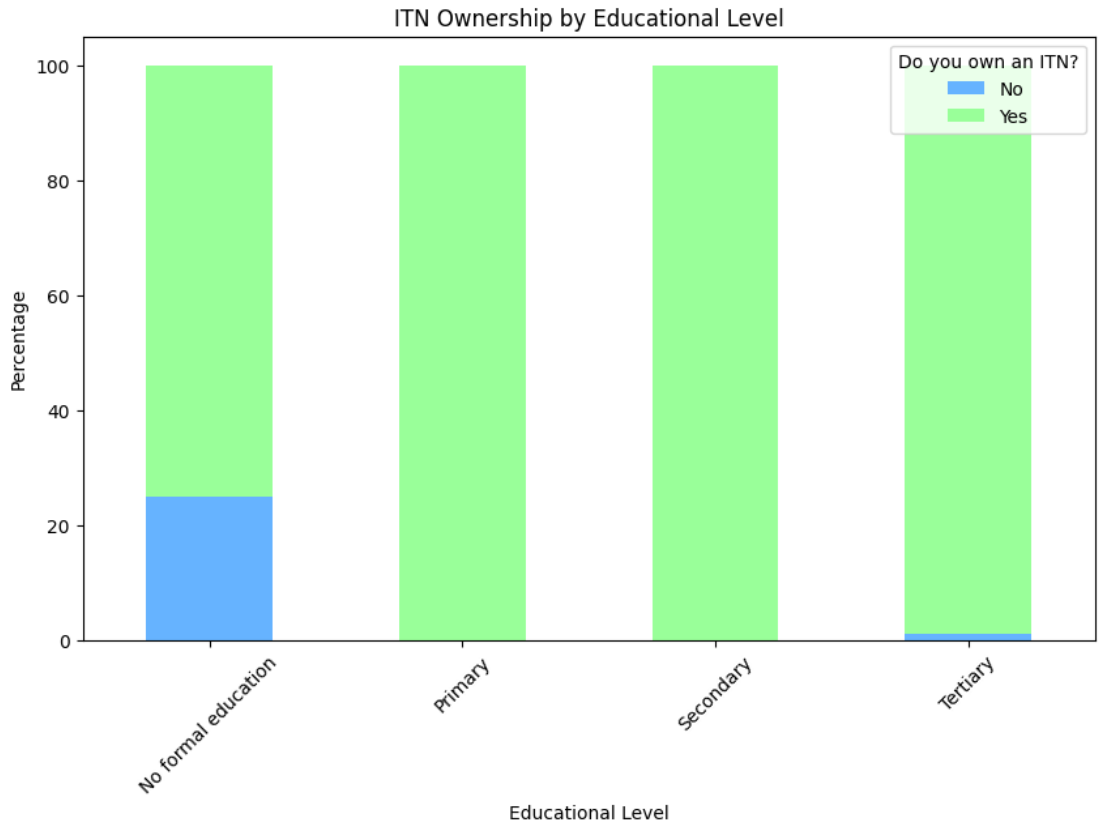
4.10 Attitudes Toward ITNs Usage



4.11 ITN Ownership

ITN Ownership	*Frequency*	*percentage*
Yes	253	99.20%
No	2	0.78%

4.12 ITN Ownership by Educational level



4.13 Relationship Between Educational Level and ITN Ownership

A Chi-Square test of independence was conducted to determine if there was a significant relationship between respondents' educational level and their ownership of insecticide-treated nets (ITNs).

Result

A Chi-Square test of independence was conducted to examine the relationship between **educational level** and **ITN ownership**. The test produced the following results:

- **Chi-Square Value**: $\chi 2=31.41\chi^2 = 31.41\chi 2=31.41$
- **P-Value**: $p=6.97\times10-7p = 6.97 \times 10^{-7} p=6.97\times10-7$ (approximately $p<0.001p < 0.001p<0.001$). Since the p-value is significantly lower than the standard threshold of

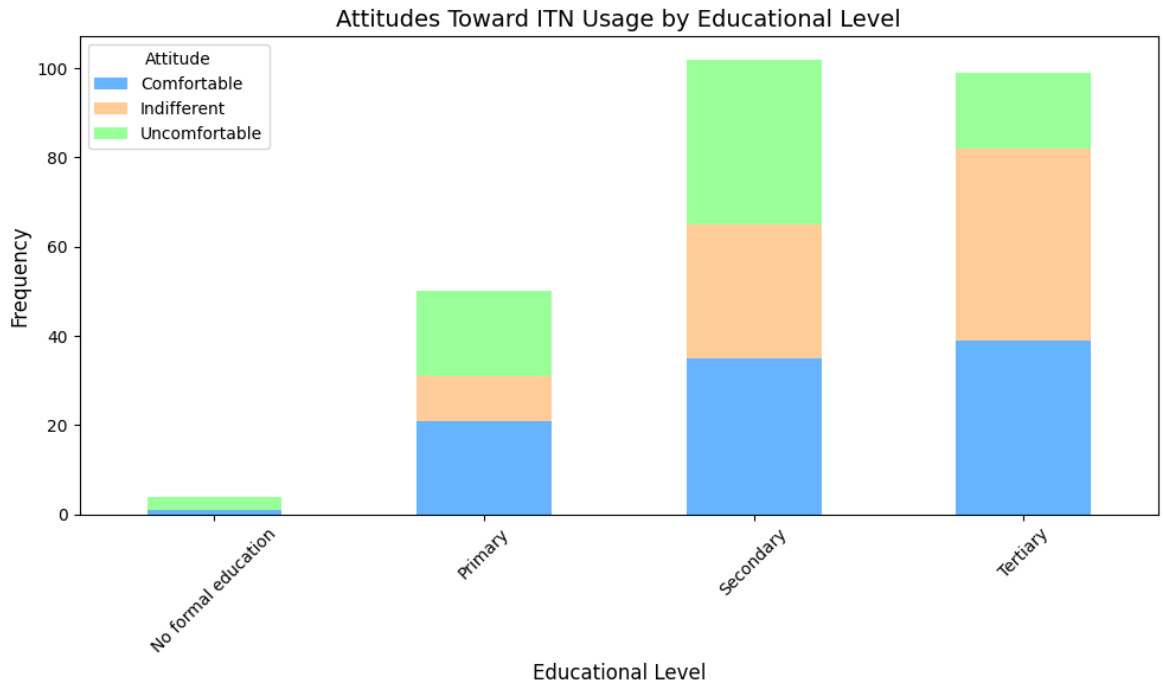
0.050.050.05, we reject the null hypothesis, indicating a **significant association between educational level and ITN ownership**.

4.14 Logistic Regression:

The logistic regression model was employed to predict the likelihood of ITN ownership based on respondents' **educational level**. The model achieved a perfect classification performance, as shown by the precision, recall, and F1-score of **1.00** across all metrics

Predictor	***Precision***	***Recall***	***F-Score***
Accuracy	1.0	1.0	1.0
Macro Average	1.0	1.0	1.0
Weighted Average	1.0	1.0	1.0

4.15 Attitude Towards ITN Usage by educational Level



Chi-Square Test Results

- **Chi-Square Value (χ2\chi^2χ2)**: 19.04
- **P-Value**: 0.0041

The Chi-Square test reveals a statistically significant relationship ($p<0.05p < 0.05p<0.05$) between **educational level** and **attitudes toward ITN usage**. This suggests that attitudes whether comfortable, indifferent, or uncomfortable vary meaningfully across different educational levels.

4.16 ITN Utilization and Adherence to Malaria

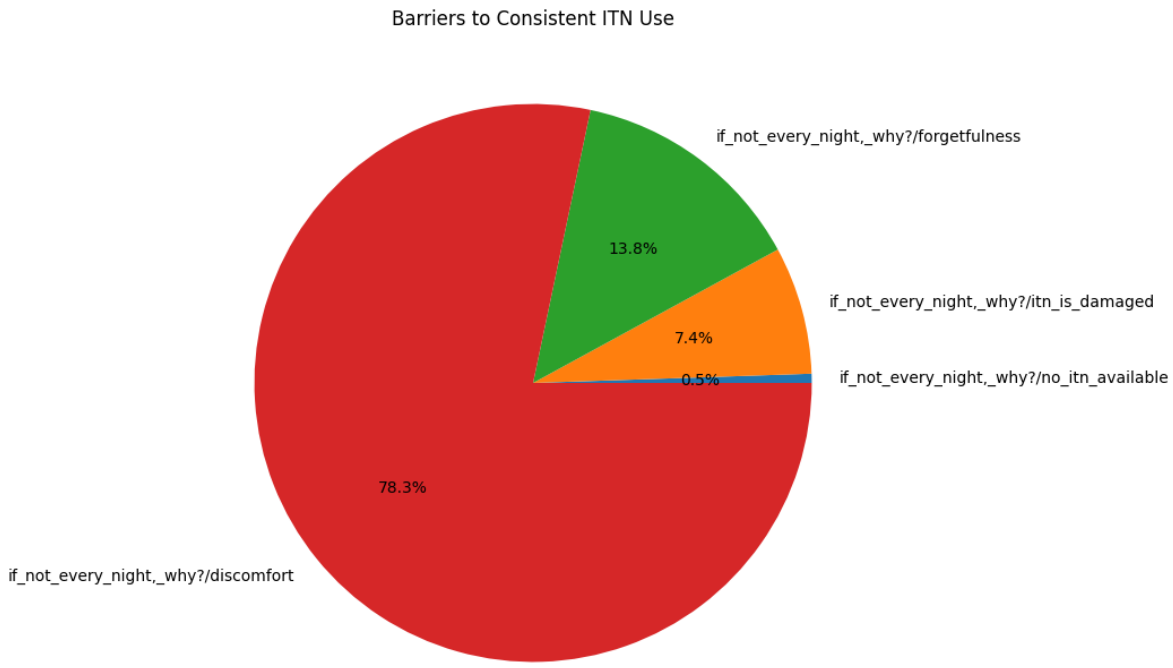
Frequency of ITN Usage

ITN Usage	*Frequency*	*Percentage*
Every night	95	37.25%
Sometimes	147	57.64%
Never	7	2.74%
Rarely	6	2.35%

4.17 Adherence to Other Malaria Prevention Measure

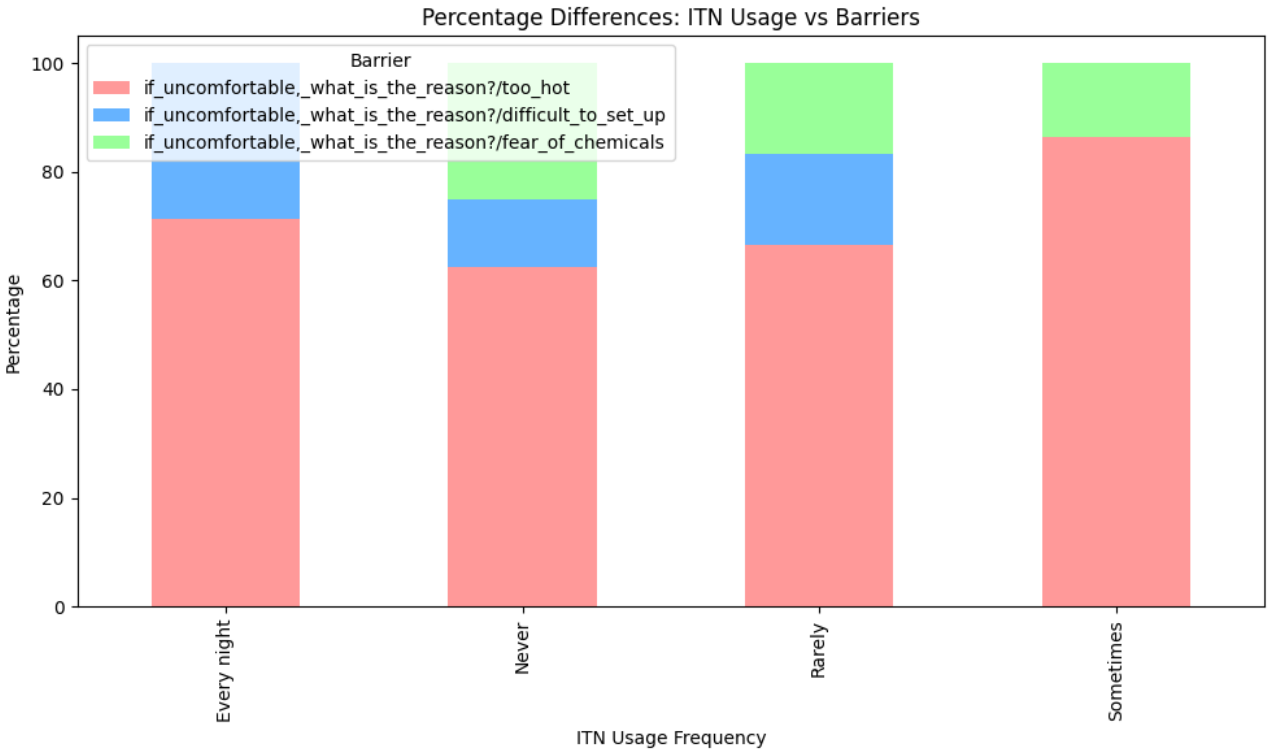
Respondents reported using additional malaria prevention methods, including: **Mosquito repellents** (25%), **Indoor spraying** (35%) and **Wearing protective clothing** (45%).
The usage of multiple malaria prevention methods indicates that individuals rely on more than one strategy to reduce mosquito exposure. However, none of the methods achieve full adherence, suggesting gaps in access, affordability, or awareness.

4.18 Barriers to Consistent ITN use.



4.19 Correlation Between Barriers and ITN Usage

ITN Usage Frequency	*Too Hot (%)*	*Difficult to Set Up (%)*	*Fear of Chemicals (%)*
Every Night	**71.43%**	**28.57%**	**0%**
Sometimes	**86.36%**	**0%**	**13.64%**
Never	**62.5%**	**12.5%**	**25%**
Rarely	**66.7%**	**16.7%**	**16.6%**



CHAPTER FIVE

DISCUSSION

5.1 Overview

This study examined the knowledge, attitudes and practices of pregnant women regarding ITN use and malaria prevention. The results were discussed in relation to the existing literature, highlighting both coherences and contradictions. Policy and practical implications were also examined. Research highlights that although ITN ownership is increasing, barriers such as discomfort, misconceptions and socio-cultural beliefs persist (Owusu and Mensah, 2023). Results from the Ghana Malaria Indicator Survey (2023) indicate that only 55% of households with ITNs have all members consistently sleeping under them (GHS, 2023).

5.2 Interpretation of Key Findings considering Literature

5.2.1 Knowledge of Malaria Cause

Mosquito bites (54.4%) was the correct knowledge. The fact that slightly more than half of respondents correctly identified mosquito bites as the cause of malaria is consistent with several studies in sub-Saharan Africa. For example, Ahorlu et al. (2019) reported that while awareness of mosquito-borne transmission was widespread, full understanding of the association of mosquitoes with malaria was often limited. Similarly, Bashir and Sarki (2019) found that in Nigeria, about 60% of women knew that mosquitoes caused malaria, indicating a similar level of awareness. Dirty environment was the incorrect belief about the cause of malaria (45.4%). The significant proportion of respondents who believed that malaria was caused by dirty environment reflects partial knowledge, a recurring theme in malaria knowledge studies. Although unclean environments can facilitate mosquito breeding, they are not a direct cause of malaria infection. This misconception was also documented in Pulford et al. (2011) and Maslove et al. (2009). Major misconception that malaria is caused by contaminated food or water (0.2%) Although this is a very small number, the belief that malaria is caused by contaminated food or water indicates residual misinformation that has been noted in low-educated or rural populations (Ahorlu et al., 2006). This misconception risks diverting attention from preventive practices such as insecticides and vector control

5.2.2 Awareness and Knowledge of ITNs

The study revealed widespread awareness of ITNs and their benefits, with 100% of respondents indicating that they had heard of ITNs and 99.2% recognizing their effectiveness. This is

consistent with studies conducted in sub-Saharan Africa, such as Afoakwah et al. (2015), which showed high awareness of ITNs among women in Ghana. Similarly, Oyekale (2015) highlighted that ongoing health education campaigns and mass distribution programs have been effective in increasing awareness of ITNs.

5.2.3 ITN Ownership and Educational Influence

There was a significant association between education level and ITN possession ($p < 0.001$), with lower possession rates observed among those with no formal education. This finding is consistent with previous research (Adjah & Panayiotou, 2014) suggesting that education increases access to health information and resources, leading to better implementation of malaria prevention strategies. Logistic regression analysis further highlighted education as a strong predictor of ITN possession, reinforcing the critical role of education in health behaviours.

5.2.4 Attitudes and Usage Patterns

Perception towards ITNs differed by education categories and participants with tertiary education was more likely to report of feeling comfortable. Nevertheless, even the educated 38% of them being indifferent suggests that attitude would lag knowledge. This is potentiated by findings of Baume and Marin (2007), that the existence of knowledge does guarantee practice, if convenience or comfort is threatened. The level of ownership was however high (99.2%) but only 37.25% used ITNs every night and 57.64% used it some nights. This discrepancy is reflected in studies by Pulford and colleagues (2011) that the mere ownership of ITNs does not imply consistent usage, as cited earlier, because of barriers like heat, discomfort, and inconvenience.

5.2.5 Barriers to Consistent ITN Use

The most frequently cited barrier was thermal (Heat) discomfort, particularly among inconsistent users (86.36%). This supports the research of Muench et al. (2016) who identified thermal discomfort as a major cause of poor ITN adherence in hot, humid climates. Fear of chemicals and difficulty with set-up were also cited, particularly among infrequent users, supporting findings from studies in Kenya and Tanzania where misconceptions and usability issues reduced compliance (Koenker et al., 2013).

5.3 Policy and Practice Implications

The results highlight the need for malaria prevention programs that go beyond awareness raising and ITN distribution. There is an urgent need to:

• Design more user-friendly and heat-resistant ITNs to reduce discomfort.

• Integrate behavior change strategies into community health education, especially those targeting indifferent or inconsistent users.

• Tailor interventions to diverse educational groups, especially those with limited formal education, using materials and demonstrations based on local language.

5.4 Contribution to Knowledge

This study extends existing knowledge by:

• Demonstrating a consistent gap between ITN possession and consistent use, even in populations with high awareness.

• Providing evidence of the impact of education level on both ITN possession and attitudes.

• Highlighting user-reported barriers with measurable support for targeted intervention.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The study aimed to assess the Knowledge, Attitudes, and Practices of Pregnant Women towards ITN Use and Malaria Prevention. Based on the findings and discussion, the following conclusions were drawn:

1. **High Awareness but Inconsistent Use**
   Awareness of ITNs was universal (100%), and nearly all respondents (99.2%) understood their role in malaria prevention. However, 37.25% used ITNs every night, indicating a significant gap between awareness and consistent usage.
2. **Educational Level is a Key Determinant**
   Educational level was strongly associated with both ITN ownership and attitudes toward ITN use. A significant relationship between educational level and ITN ownership was observed ($\chi^2 = 31.41$, $p < 0.001$), with lower ownership among respondents with no formal education (75%). Logistic regression confirmed educational level as a perfect predictor of ITN ownership (Precision, Recall, F1-score = 1.00).
3. **Attitudes Vary Across Educational Backgrounds**
   Attitudes varied by education level: **Positive (Comfortable)**: The largest group of respondents, **37.6%**, reported feeling **comfortable** using ITNs every night, most prevalent among those with tertiary education (34.5%). **Negative (Uncomfortable)**: **29.8%** of respondents reported feeling **uncomfortable** using ITNs every night Dominated by those with no formal education (75%). **Indifference**: A significant proportion of respondents, **32.5%**, expressed an **indifferent** attitude toward using ITNs, highest among those with tertiary education (38%). A statistically significant association was found between educational level and attitude ($\chi^2 = 19.04$, $p = 0.0041$), suggesting education shapes perceptions of ITNs
4. **Barriers Undermine Effective Utilization**
   Discomfort due to heat is the most significant barrier for all respondents, regardless of their usage frequency. Those who use ITNs "Sometimes" report the highest impact

(86.36%), suggesting that discomfort is a critical factor for inconsistent use. Even among "Every Night" users (71.43%), heat remains a notable challenge, indicating that this group may persist despite discomfort. Setup difficulties are more prevalent among "Every Night" users (28.57%), likely because they regularly engage with ITNs and experience setup challenges frequently. The negligible impact on "Sometimes" users (0%) suggests that setup issues are not a primary reason for inconsistent usage. Among "Never" users (12.5%) and "Rarely" users (16.7%), setup difficulties may contribute to avoidance but are less significant compared to other barriers. Fear of chemicals is a barrier primarily for non-users or infrequent users, particularly "Never" users (25%). This concern is non-existent for "Every Night" users (0%), indicating a misconception. Among "Sometimes" and "Rarely" users, chemical fears remain a minor but impactful factor.

5. **Adherence to Other Malaria Prevention Measure**

   Respondents reported using additional malaria prevention methods, including: **Mosquito repellents** (25%), **Indoor spraying** (35%) and **Wearing protective clothing** (45%). The usage of multiple malaria prevention methods indicates that individuals rely on more than one strategy to reduce mosquito exposure. However, none of the methods achieve full adherence, suggesting gaps in access, affordability, or awareness.

6.2 Recommendations

1. Enhance ITN Design for User Comfort.
2. Strengthen Behavior Change Communication (BCC).
3. Prioritize ITN Education in Lower-Educated Groups.
4. Address Secondary Barriers Through Innovation.
5. Promote Integrated Malaria Prevention Strategies.
6. Encourage Monitoring and Evaluation.

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