THE FACTORS ASSOCIATED WITH THE UPTAKE OF INTERMITTENT PREVENTIVE TREATMENT OF MALARIA IN PREGNANCY IN NAMBALE SUB-COUNTY HOSPITAL, KENYA.

BY

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A THESIS SUBMITTED TO THE SCHOOL OF PUBLIC HEALTH, COLLEGE OF HEALTH SCIENCES, DEPARTMENT OF EPIDEMIOLOGY AND MEDICAL STATISTICS IN PARTIAL FULFILLMENT OF THE AWARD OF MASTERS IN SCIENCE IN FIELD EPIDEMIOLOGY AND LABORATORY TRAINING PROGRAM 2026

DECLARATION

Declaration by Candidate

This thesis is my original work and has never been presented at any other university for the award of a degree. No part of this work may be reproduced without the prior written permission of the author and/or Moi University

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DEDICATION

I am pleased to dedicate this work to my beloved wife Susan Halako Rhigho and our children Mitchelle Atieno Collins, Mickel Ochieng Omondi, Nickel Omondi Angute, and Nicole Akinyi Omondi for their encouragement, understanding, support and prayers during the long periods of time I was away from home.

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ABSTRACT

Background: Malaria remains a significant public health problem globally, with highest morbidity and mortality reported in sub Saharan Africa. In 2022, there were 12.7 million (36%) cases of Malaria in Pregnancy (MiP) in Sub Saharan Africa and 27% were reported from East Africa. In Kenya, there were a total of 4,080,441 malaria cases and 5% MiP cases. Busia County in Western Kenya reported 341,886 malaria cases and 22% MiP cases. WHO recommends administering intermittent preventive treatment of malaria in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP) as preventive treatment for malaria in pregnancy (MIP) in malaria-endemic zones to prevent MiP.

Objectives: To determine proportion of pregnant women of nine months' pregnancy utilizing IPTp-SP 3 and to describe sociodemographic, health facility and individual factors influencing utilization of IPTp-SP 3 among pregnant women of nine months' pregnancy attending antenatal care at Nambale Sub-County Hospital in Busia County.

Methods: This was a cross-sectional study that employed consecutive sampling whereby, pregnant women of nine months, aged between 14-49 years were interviewed, using the interviewer- administered questionnaires on Kobo-collect. The dependent variable was the uptake of three doses of IPTp-SP, with sociodemographic, health facility and individual factors as the independent variables. A Descriptive of factors was done, Chi square test was used in bivariate analysis to determine association between independent variables and dependable variables, variable with *p value* of ≤0.2, were subjected to multivariable logistic regression analysis to identify variables with *p value* of ≤0.05 associated with utilization of IPTp-SP among pregnant women.

Results: A total of 384 pregnant women were interviewed. Their median age was 25 years (range of 14
– 49 years), 68% (262/384) were married and 90% (348/384) of all the participants resided in rural areas. More than half of the participants, 60% (232/384) utilized IPTp-SP3. Awareness of use and the benefits of IPTp was reported by 93% (256/384) of participants. Majority of the respondents, 67% (258/384) were unemployed, and 47% (182/384) had secondary education as their highest level of education. In the bivariate analysis, participant age 21-30 years {cOR=2.34, 95% CI=1.4–3.7}, belief that >3 doses of IPTp prevented MiP {cOR=3.09, 95% CI=1.5–6.2}and participant having attained tertiary education {cOR=2.71, 95% CI=1.4–5.1} were associated with uptake of three or more doses of IPTp by the participants. On multivariable logistics regression analysis, attendance of ANC at least 4 times {aOR=8.42, 95% CI=4.4–16.0} and participants taking IPTp-SP for the first time at 14-17 gestation weeks {aOR=7.79, 95% CI=3.2–18.7} were factors independently associated with optimal utilization of IPTp (IPTp-SP3).

Conclusion: A sub-optimal IPTp-SP 3 utilization (60%) way below WHO target recommendation of 80%. More than four ANC attendance with the first IPTp-SP uptake beginning 14-17 gestation weeks were independently associated with optimal utilization of IPTp (IPTp-SP3).

Recommendation: Pregnant women attending ANC at the facility should ensure that they attend ANC at least four times and take at least three doses of IPTp for maximum protection against malaria in pregnancy. Enhanced risk communication and community engagement by the community health volunteers on IPTp-SP awareness and importance.

Key Words: FELTP, IPTp-SP, Kenya, Malaria, Pregnancy, WHO

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONs

ANC	Ante Natal Care
EPI	Expanded programme on Immunization
NMCP	National Malaria Control Program
DOT	Direct Observational Therapy
IPTi-SP	Intermittent preventive treatment for infants with Sulfadoxine–Pyrimethamine
IPTp-SP	Intermittent preventive treatment in Pregnancy with Sulfadoxine–Pyrimethamine
IRS	Indoor residual spraying
KHIS	Kenya Health Information Software
KMIS	Kenya Malaria Indicator Survey
LSM	Larval Source Management
LLINs	Long-Lasting Insecticide Nets
MiP	Malaria in Pregnancy
MCH	Mother and child Health
MOH	Ministry of Health
NSCH	Nambale Sub-County Hospital
ODK	Open Data Kit
PI	Principal Investigator
RA	Research Assistant
SBC	Social Behaviour Change
SSA	Sub-Saharan Africa

OPERATIONAL DEFINITIONS

1. **Age**; referred to the respondent's self-reported number of complete years during her last birthday; classified into four levels i.e. <21, 21-30, 31-40, >41.
2. **Marital status**; referred to the self-reported current civil status of a respondent; classified as single, married, separated, divorced, widowed.
3. **Educational level**; referred to the self-reported highest level of education attained by a respondent, classified into four categories: no formal education, primary, secondary, and tertiary.
4. **Occupation**; denoted the self-reported occupation (livelihood) of the respondent at the time of survey classified as into 3 groups: unemployed, self-employed and employed.
5. **Gravidity**; referred to the number of pregnancies a woman has ever had irrespective of the outcome. Women were classified into 2 categories; primigravida (pregnant once) and multigravida (pregnant more than once.).
6. **Parity**; referred to the respondent's self -reported number of biological children, classified into 3 groups; nulliparous (never given birth) primipara (given birth once) and multipara (given birth more than twice).
7. **Knowledge**; referred to the respondents to the respondents' level of understanding through provision of correct response on malaria and IPTp-SP
8. **Directly Observed Therapy (DOT);** respondents self-reported account of compliance to administration of SP under the direct supervision of a health worker (at least for one dose)

9. **Intermittent preventive treatment in pregnancy (IPTp-SP**); a therapeutic dosage of SP administered to gravid women at predefined intervals (routine ANC visits), regardless of whether the woman is infected with malaria (at least 3 doses are considered complete as per WHO recommendation).

10. **Utilization of IPTp-SP**; extent to which a pregnant woman takes SP for malaria control during pregnancy. Based on the NMCP revised policy, responses classified in two categories:

    a) **Suboptimal:** meant that a woman received less than three doses of SP during pregnancy.

    b) **Optimal:** if the recommended three or more SP doses were taken during pregnancy.

CHAPTER ONE

INTRODUCTION

1.1 Background

Intermittent preventive treatment in pregnancy using Sulfadoxine Pyrimethamine (IPTp-SP) is an intervention measure used to prevent placental malaria among pregnant women living in malaria-endemic zones, as per the World Health Organization (WHO) recommendation. It involves the use of a preventive regimen of an antimalarial drug, sulfadoxine-pyrimethamine (SP) which is given orally through directly observation therapy (DOT) usually consisting of three tablets of SP given to all at- risk pregnant women living in malaria-endemic zones monthly usually beginning in the second trimester (from gestation week 13) continuing to the third trimesters (up to gestation week 40). The World Health Organization (WHO) recommends administering a minimum of at least three doses of intermittent preventive treatment of malaria using SP IPTp-SP) (WHO, 2014) to pregnant women living in malaria-endemic zones. Each amount given treats existing malaria infection in the mother and may also protect against new malaria infections for several weeks after receipt of the doses. Pregnant women generally due to hormonal changes during pregnancy period have lowered body immunity (2) and thus are more susceptible to infections, including malaria, hence the need to administer IPTp-SP to prevent malaria infections. Despite the WHO recommendations for the uptake of a minimum of three doses and a maximum of seven doses beginning the second trimester (from gestation week 13) up to birth, some missed opportunities still exist due to several factors, leading to mothers delivering babies having not achieved the optimal uptake doses (at least three IPTp-SP doses). These missed opportunities by pregnant women in the uptake of IPTp-SP have been previously associated with several health effects due to malaria infection, i.e. on a fetus,

low birth weights, preterm deliveries, and increased mortalities both for the mother and fetus (Desai et al., 2018), thus necessitating the need to investigate factors leading to missed IPTp-SP uptake amongst pregnant women attending ante-natal care (ANC).

Malaria prevalence in Kenya is at 6% while that of Busia County is at 39%. Malaria is the second leading cause of death in Busia County after newborn disorders (Kenya National Bureau of Statistics, 2024) despite the numerous interventions toward malaria control and elimination by the malaria control coordinator, who works closely with the Division of National Malaria Control Program (NMCP). Busia County lies in the lake-endemic region as a malaria epidemiological zone that experiences high malaria cases with a prevalence of 39% countrywide compared to Kenya's prevalence of 6% (Division of National Malaria Programme (DNMP) [Kenya] and ICF, 2021).

The overarching objectives for Kenya's Malaria strategy for 2023-2027 is to optimize coverage of appropriate and impactful interventions; accelerate adoption of research, innovation and emerging technologies to reduce malaria control and elimination efforts and lastly to ensure a resilient, sustainable, and collaborative malaria control programme though transformative leadership and governance at all levels (Ministry of Health, 2023) The strategy has seven objectives, and its second objective is to ensure optimum coverage of malaria chemoprevention interventions and vaccines in the eligible population.

Malaria prevention in pregnant women is achieved through various interventions, these includes; sleeping under long-lasting insecticide treated nets (LLINs), utilization of Intermittent Preventive Treatment of Malaria in pregnancy using Sulfadoxine Pyrimethamine (IPTp-SP) and practicing of social behaviour change (SBC). SBC under objective 4 of the KMS 2023-2027 is to ensure optimal malaria interventions by ensuring that eligible persons know what tools to use, how to use and when to use them

through overcoming barriers such stigma and misconceptions (Ministry of Health, 2023) . For IPTp-SP, the aim is to provide at least three doses of IPTp-SP to all pregnant women in these regions; but data from KHIS showed a sub-optimal utilization, i.e. only 49% of women in the lake endemic zone and 46% of women in the coastal endemic zone received three or more doses of SP rather than the set target of 80% uptake of the same (MoH, 2021). In conformity with World Health Organization (WHO) and Ministry of Health (MoH) Kenya, a minimum of three doses of IPTp-SP is recommended and these doses should be taken in an interval of separated by a month usually commencing in the second three months of pregnancy (gestation week 13) to delivery (gestation weeks 37-42 weeks) to prevent placental malaria (PM). Previous studies have shown that pregnant women who had three or more doses of IPTp-SP had less placental malaria with an increased mean birth weight (WHO, 2021). Uptake of more than three doses of IPTp-SP was linked to reduced pregnancy-associated malaria (PAM) plus the associated risk of maternal anaemia, preterm birth, and little birth weight (Cowman et al., 2016).

According to the data collected during the Kenya Malaria Indicator Survey (KMIS) in 2020 (Division of National Malaria Programme (DNMP) [Kenya] and ICF, 2021), a prevalence survey of the malaria countrywide, the proportion utilization of Intermittent Preventive Treatment of Malaria in pregnancy (IPTp) in Busia County was at 54.5% , though this quite different from data abstracted from the Kenya Health Information System (KHIS), which is a routine surveillance data system, which revealed the proportion of utilization IPTp to be at 26%. These discrepancies could be attributed to data quality issues, i.e. some facilities might have not been reporting into the KHIS as required due to; lack of reporting tools and gaps in capacity for malaria surveillance among Health Care Workers (HCWs) and thus necessitated an investigative study.

Busia County has seven sub-counties and amongst all the seven sub-counties of Busia County (Bunyala, Butula, Matayos, Nambale, Samia, Teso North and Teso South), Nambale sub-county reported lowest uptake of IPTp-SP in the last two years (2020 and 2021). Within Nambale sub-county, Nambale sub-county Hospital (NSCH) had the highest drop-out rate of IPTp-SP utilization compared to all other health facilities within that sub-county. In 2020, in Nambale Sub-County Hospital (NSCH), IPTp-SP doses uptake (1, 2, & 3) was 756 (60%), 280 (22%), and 111 ***(9%),*** respectively, and in the following year, 2021, IPTp-SP doses uptake (1, 2, & 3) was 832 (72%), 571 (48%) and 405 (***34%)*** respectively (KHIS, 2023). IPTp-SP 3 coverage for both years (2020 & 2021) in NSCH was below the target of the expected proportion of ***49%*** set at that time (MoH, 2021). Therefore, these sub-optimal uptakes of IPTp 3 necessitated the need to do a study on factors affecting IPTp-SP uptake in that facility whose findings would help influence policy-making and implementation to ensure that there is no future missed opportunities for IPTp-SP utilization by pregnant women seeking ANC services in that facility and region at large. Policy making would be based on the identified factors contributing to missed opportunities, i.e. individual factors, cultural factors and facility factors.

Malaria is a severe and sometimes fatal disease caused by a bite of an infective female Anopheles mosquito that searches for a blood meal for her egg development and viable offspring. The female Anopheles mosquito thus transmits malaria parasite Plasmodium *spp.* to non -infected person from the blood meal she had had previously obtained from biting an infected person (Cowman et al., 2016). Malaria is typically inherent in warmer climatic expanses - majorly in tropical and subtropical countries. Usually, higher temperatures and pools of water following heavy downpour or even presence of water bodies allow the *Anopheles* mosquito to thrive in large numbers (Fischera et al., 2020).

The malaria parasite, which grows and develops inside the mosquito, needs warmth to complete its growth cycle before they are mature enough to be transmitted to humans. There are over five known malaria parasite species causing malaria in humans (Sinden et al., 2002). *P. falciparum* and *P. vivax* species pose the greatest threat of all the species known worldwide. *P. falciparum* is known to be the most prevalent and deadliest malaria parasite and the most prevalent on the African continent. *P. vivax* is the dominant malaria parasite in most countries outside of sub-Saharan Africa. No one is immune to malaria infection, even though children of below five years old and pregnant mothers are at greater risk due to their weak body immunity due to age and hormonal changes respectively (Rosauro et al., 2020). Malaria infected pregnant mothers can transmit malaria parasites to her unborn infant before or during delivery if no proper precaution measures are taken, i.e. the offer of specific, appropriate and sufficient treatment of malaria in pregnancy (MiP). Poor people residing in countryside zones and in slums in urban areas who lack access to essential health services are also at greater risk for this disease than those living in urban areas with sufficient access to affordable and suitable healthcare services (Hill et al., 2015). Malaria illness usually presents with signs and symptoms that include chills, fever- temperatures above 38°C, headache, muscle pains, general body malaise, nausea and sometimes vomiting and diarrhea may also occur. The symptoms may begin between 7 -14 days following infection with malarial parasite from infected mosquito bites or even transfusion with an infected blood unit. Despite that malaria infection can be fatal, ailment and mortalities from malaria can usually be prevented through various means; i.e. use of long-lasting insecticide-treated nets (LLINs), indoor residual spraying (IRS) against mosquitoes, Larval source management (LSM) in water bodies suspected to be habitation for mosquito larvae, malaria vaccine implementation program (MVIP), proper and

appropriate wearing of protective clothing in heavily infested areas with mosquitoes, use of Intermittent Preventive treatment in infants (IPTi), use of Intermittent preventive treatment of malaria in pregnancy (IPTp) among pregnant women and advocating for social behavior change (SBC) in communities. In 2021, an estimated 247 million malaria cases were reported in 84 malaria-endemic countries, (WHO, 2022b) this was an increase from 245 million cases from the previous year, 2020, and most of these cases were from countries within the WHO African Region. In 2020 malaria deaths increased to an estimated 625,000, an increase of 57,000 from 2019. The estimated deaths in 2021 were 619,000, a slight decline compared with 2020. In the middle of 2019 and 2021 there were 63,000 deaths that were caused by disruptions to essential malaria services during the pandemic of COVID-19. In 2021, in 38 moderate to high transmission countries in the WHO African Region, there were an estimated 40 million pregnancies of which 13.3 million (32%) were exposed to malaria infection. West Africa had the highest prevalence of exposure to malaria during pregnancy, i.e. at 6.5 million (40.7%) of an estimated 16 million pregnant women who had malaria infection in 2021, whereas East Africa had 3.5 million (21%) (WHO, 2022).

Pregnant women are three more likely to suffer from severe malarial infection compared to non-pregnant women and may have a mortality rate of about 50% from the severe illness. In Malaria endemic zones, about 25% or more of pregnant women are infected with Malaria. Pregnant women at highest risk for infection and morbidity include the primigravida, pubescent, and those with HIV co-infection. Pregnant women in the second trimester (gestation weeks 13-26) are prone to higher infection rates, thus necessitating the need for prenatal care as part of malarial prevention and treatment efforts (S. Dunn et al., 2009). In 2020, a projected 33.8 million pregnancies were present in 33 risk transmission countries in the WHO African Region; 34% (11.6

million) of those pregnancies were exposed to malaria infection which resulted in 819,000 children born with a low birth weight, which could have been prevented if IPTp-SP 3 uptake was optimized to 90% for all the pregnant women (WHO, 2022)

In Kenya, malaria remains a significant public health problem and accounts for an estimated 13% to 15% of all the outpatient consultations. Approximately 70% of the population is at risk of malaria, including 13 million people in endemic areas and another 19 million in highland epidemic-prone and seasonal transmission areas (MoH, 2023) The Kenya Malaria Strategy (KMS) 2023-2027) goal is to reduce malaria incidence by 80% and malaria deaths by 90% of 2023 levels by 2027/2028 (Ministry of Health, 2023). There are four epidemiological zones in Kenya with a variation in the risk of malaria infection. Classification of these zones are based on malaria prevalence, topography and climatic factors (i.e. rainfall, temperature and humidity). These zones are namely; Highland epidemic-prone zones, Lake and Coast endemic zones, Seasonal zones and Low-risk areas. The various intervention measures deployed in these zones include the use of Long-Lasting Nets (LLINs), Intermittent Preventive Treatment in pregnancy (IPTp), Intermittent Preventive Treatment in infants (IPTi), Malaria Vaccine Implementation program (MVIP), Indoor residual spraying (IRS), larval source management (LSM), Case Management, Epidemic Preparedness and Response (EPR), Surveillance and Health Education/Behaviour Change communication (SBC).

1.1 Problem statement

Ideally the uptake of IPTp-SP by pregnant women is supposed to be at 100% for IPTp 1 and 80% for IPTp 3. The IPTp 3 uptake is used as the gold standard for assessment of IPTp coverage and access as per guidelines of the World Health Organization (WHO) and National Malaria Control Program (NMCP).

However, the reality on the ground reveals that the percentage IPTp uptake is not as per

set targets of NMCP. There has been a decreased utilization of IPTp-SP in the Country. Data abstracted from KHIS for aggregate reporting and analysis has shown a declining trend from proportion of IPTp 1 to IPTp 3 uptake which is worrying. The decreased IPTp uptake was also observed in the lake endemic malaria zones, which included Busia County. Survey data from the Kenya Malaria Indicator Survey (KMIS) of 2020, noted that in Busia County IPTp 1 was 84.4 % and IPTp 3 was 54.5% (MoH, 2021). In NSCH, in 2022, IPTp 3 uptake was 52% below the required set target of 80% set by the National Malaria Control Program (NMCP). This decreased IPTp uptake is likely to lead to pregnant women residing in the malaria-endemic zones being infected with malaria that might lead to malaria in pregnancy (MiP) and thus leading maternal/fetal anemia, intrauterine growth retardation, low birth weights, stillbirths, abortions and even maternal deaths. Economically, MIP may negatively impact on the economy, i.e. the enormous amounts of money that would have otherwise been used by MoH in provision of essential health care services would thus be diverted and used in taking care of severe malaria complications and deaths.

Therefore, decreased IPTp uptake in the country needs to be addressed to avert cases of Malaria in Pregnancy (MiP) and its consequences in the community and country at large.

1.2 Justification

According to the Kenya Malaria Indicator Survey (KMIS) 2020, the proportion of IPTp-SP utilization in Busia county was at 54.5% yet the data abstracted from KHIS revealed that it was at 26%. These discrepancies could be attributed to data quality issues, i.e. some facilities might have not been reporting into the KHIS as required due to; lack of reporting tools and gaps in capacity for malaria surveillance among Health Care Workers (HCWs) and thus necessitated an investigative study.

Despite the rollout of IPTp-SP in the endemic malaria zone, gaps still exist in utilizing the IPTp. A report by the National Malaria Control program (NMCP) highlighted that only 49% of women received three or more IPTp-SP doses in the lake endemic region (MoH, 2021) this figure was below the target of 100% protection against malaria as targeted in the objectives of Kenya's Malaria strategy (KMS) 2019-2023. Data abstracted from KHIS showed gaps in the uptake of IPTp-SP in the country, especially in Busia county, within Nambale sub-county and in the Nambale sub-county Hospital (NSCH), i.e. IPTp doses (1, 2, & 3) utilization was 756 (60%), 280 (22%), and 111 ***(9%)*** respectively in 2020 and in 2021 IPTp doses (1, 2, & 3) utilization was 832 (72%), 571 (48%) and 405(***34%)*** (Klein et al., 2016) (KHIS, 2023).

The aim of the study was to find the factors associated with declining trends of the IPTp-SP utilization among pregnant women attending the NSCH and compare with previous studies on IPTp-SP uptake within the region.

The outcome of the study findings would be used to improve on individual's health, i.e. sensitize on increased utilization of Intermittent Preventive Treatment of Malaria in pregnancy (IPTp), reducing rates of MiP to the bare minimum and its adverse effects (anemia, abortions, low birth weight, mortalities); and to increase productivity in the community due to saved person-hours loss that would have been lost during period of sickness.

The study will benefit Nambale Sub-County Hospital by reducing the financial burden associated with managing malaria complications, allowing the facility to redirect resources to other essential health service delivery programs.

For the Ministry of Health (MoH) and the National Malaria Control Program (NMCP), the findings will support improved policy development and more effective implementation of malaria prevention strategies.

1.3 Research question

What factors are associated with the utilization of IPTp-SP3+ among pregnant women of 36+ gestation weeks attending Nambale Sub-County Hospital (NSCH) in Busia County?

1.4 Objectives

General Objectives

To determine the utilization and describe factors associated with the uptake of Intermittent Preventive Treatment of Malaria in Pregnancy (IPTp), among pregnant women of 36+ gestation weeks attending Antenatal care clinic in Nambale Sub-County hospital in Busia County, Kenya.

Specific Objectives

1. To determine the proportion of pregnant women of 36+ gestation weeks utilizing IPTp-SP - 3 in Nambale Sub-County Hospital (NSCH) in Busia County.
2. To describe factors influencing utilization of IPTp-SP3+ among study participants
    a) Sociodemographic factors-Age, marital status, level of education
    b) Cultural factors-house/family decision make, myths/beliefs on IPTp utilization
    c) Individual factors- timing of ANC, number of ANC attended
    d) Health facility factors- staff attitude, DOT compliance

CHAPTER TWO

LITERATURE REVIEW

2.1 Intermittent Preventive Treatment in Pregnancy (IPTp)

Intermittent preventive treatment for malaria during pregnancy (IPTp) is a preventive regimen of the antimalarial drug Sulfadoxine-Pyrimethamine (SP) that is given monthly to all at risk pregnant women in their second (gestation weeks 13-26 weeks) and third trimesters (gestation weeks 29-40 weeks) residing in malaria-endemic zones as per the World Health Organization (WHO) recommendations. Each dose treats existing malaria infection in the mother and protects against new infections for several weeks after receipt. IPTp-SP is not recommended in the first trimester (gestation weeks 1-12 weeks) due to the effects of teratogenicity and therefore pregnant women are usually advised to use other preventive measures against malaria like sleeping under insecticide treated nets (ITNs), wearing of long sleeved clothes and use of insecticidal sprays against the vector-mosquito that transmits malaria (WHO, 2014, 2021).

2.1.1. Why IPTp?

Pregnant women usually have lowered immunity (Bauserman et al., 2019) during pregnancy, this is in order not to identify the growing fetus in the uterus as foreign body thus thereby rejecting it. The lowered immunity due to hormonal changes and immune cells response thus makes the pregnant women more susceptible to myriad of infections, including but not limited to malaria, hence the need to administer Intermittent preventive treatment for malaria during pregnancy using sulfadoxine-pyrimethamine (IPTp-SP) to prevent malaria infections. IPTp gives protection to the mother and her unborn baby, i.e. it reduces both maternal and fetal anemia, lowers placental parasitemia that might result in children born of low birth weight, or even stillbirths, premature babies and abortions (Darteh et al., 2021; Kakuru Abel. et al., 2021). IPTp-

SP is also penny wise in curbing maternal malaria and lowering of neonatal mortality in areas with moderate or high malaria transmission (WHO, 2014). Even though there has been some resistance to IPTp-SP utilization in the past, IPTp-SP has been evidenced to protect against neonatal mortality (efficacy protection of 18%) and low birth weight (21% deduction in LBW) (WHO, 2014).

2.1.2 IPTp Uptake

Currently, the World Health Organization (WHO) recommends three or more doses of SP given during antenatal care (ANC), spaced one month apart after 16 weeks of gestation till delivery. It involves using of a preventive regimen of an antimalarial drug, sulfadoxine-pyrimethamine (S.P.), which is given orally through direct observation therapy (DOT) consisting of three tablets of sulfadoxine-pyrimethamine to all at-risk pregnant women living in malaria-endemic zones monthly usually beginning in the second trimester and continuing to the third trimester. The World Health Organization (WHO) recommends administering a minimum of three doses of intermittent preventive treatment of malaria using sulfadoxine-pyrimethamine (IPTp-SP) (WHO Global Malaria Program 2014) to pregnant women living in malaria-endemic zones. Each quantity given treats existing malaria infection in the mother and may also protect against new malaria infections for several weeks after receipt of the doses.

2.1.3 Factors influencing IPTp utilization

There is evidence from previous studies on the association between various determinants and utilization of maternal health services. Interestingly, different studies conducted in different settings have reported conflicting findings suggesting that the variables are dynamic and context specific. It is therefore imperative to identify potential influencing factors to the optimal utilization of IPTp-SP during pregnancy. The independent variables can be presented in the following categories: social-

demographic (age, relationship status, academic status, employment situation, religious status, residence, family structure); individual factors (gravidity, parity, gestation weeks, total ANCs attended, timing of first ANC, health insurance, having information pertaining to IPTp-SP and belief in IPTp protection); cultural factors (beliefs and traditions) and health facility factors (presence of functioning DOT corner and health care workers –HCW's knowledge and attitude)

2.1.3.1 Maternal age

Maternal age is an important determination of service utilization, albeit in a complex way. Different studies have reported inconsistent associations between age and utilization of maternal health services. In one previous study, it was that noted that women of aged 35-49 years old had higher uptake of IPTp-SP 3, i.e. in a study done sub-Saharan Africa, on factors influencing IPTp uptake in pregnant women, women aged 40-44 compared to those aged 15-19 (aOR=1.147, 95% *CI* = [1.02,1.30] had higher odds of receiving three or more doses of IPTp-SP (Darteh et al., 2021). Also, in a different study- national survey done in Uganda on the uptake of IPTp-SP, pregnant women aged 15-19 had less odds of receiving at least three IPTp-SP doses compared to those aged above 30 years of age and of 45-49 years (aOR=0.42, CI=0.33-0.98) (Ameyaw et al., 2022; Martin et al., 2020). In the analysis of data from malaria indicator survey of 2020, In Kenya, on the determinants of malaria preventive measures during pregnancy in women aged 15-49 years, the pregnant women aged 35-49 years had higher odds in uptake of more than three doses of IPTp-SP compared to the pregnant women aged below ages of 35 years old (Mkubwa et al., 2022).

2.1.3.2 Marital status

Marital status has been proclaimed to be a strong predictor of health service utilization among women due to gender and dynamics of in-household decision-making. The

prevailing dynamics of decision making at household level can either enable or impede a woman's ability to access the integrated health services offered at ANC including MIP interventions. For instance, in Uganda and Kenya, married men are reported to be in control of household resources and ultimately hold exclusive privileges as decision makers. As a result, the decisions they make have a direct influence on care seeking practices of their spouses or whether are they are able to purchase LLITNs for malaria control (Chuma et al., 2010) This finding is also reflected and echoed by study findings from Tanzania revealing that married women reported difficulties related to getting permission from their partners to seek care at health facilities and consequently had lower rates of service utilization (Exavery et al., 2014).

In a study done in Sabatia sub-county, married women had higher odds than unmarried women in IPTp-SP dose uptake (Mutanyi et al., 2020). According to a study done in Ghana, living together was independently correlated with IPTp-SP uptake ($p<0.01$) (Coleman et al., 2020).

2.1.3.3 Education status

Earlier investigations have suggested that formal maternal education is one of the most potent determinants for utilization of health services (Exavery et al., 2014). In a study done in Arusha Tanzania on factors affecting uptake of ≥ 3 doses of IPTp, women of secondary or higher education had higher odds (aOR=1.6, 95% CI=1.1-2.4) of uptake compared to those who had primary or no formal education at all (Mchwampaka et al., 2019). Similar results were also obtained in Uganda, whereby 47.1% of highly educated women received at least three doses of IPTp-SP (Ameyaw et al., 2022). In Tanzania, on the issue of predictors for the uptake of optimal doses of IPTp-SP, women of primary school had higher odds of uptake IPTp-SP (aOR=2.2, 95% CI=1.26-3.67) compared to those who had secondary or higher education (aOR=2.1, 95% CI=1.08-4.22) (Mushi et

al., 2021).

2.1.3.4 Occupation status

Whether a pregnant woman is formally employed or not could have an effect on her health seeking behaviour. Some occupations, i.e. those pregnant women employed in the private amenities where getting time off for personal engagement might be challenging, may hinder the pregnant women from attending regular scheduled ANC thus, thereby missing out on the important preventive regimen of IPTp-SP. In a study done in East-Central Uganda, unemployed women were more likely to achieve the optimal utilization of IPTp-SP as compared to those employed in the private agricultural sector (Martin et al., 2020).

2.1.3.5 Religion

Religion in the past and even up to date has influenced how the general public respond to health issues, i.e. response to diseases, uptake of medication and vaccinations. Some religious leaders of various religious denominations have always imposed certain strong teachings and beliefs that have resulted in their followers avoiding vaccinations and refusing certain treatment while sick thus thereby making their followers have increased susceptibility to morbidities and even mortalities. In a study done in Northeastern Uganda, women adhering to Islam were found to be twice (1.73) likely to receive partial doses of IPTp as compared to Catholic women (Martin et al., 2020).

2.1.3.6 Residence

Place of residence has always played a key role in how people seek and access health services, be it in rural areas or semi-urban or even urban areas. Assumptions have always been made that those in rural areas might miss out on accessing health services as compared to those in urban or semi-urban areas due to the few and far off health

facilities, whereas those in urban dwellers are less probable to miss on seeking health services due to the availability of numerous health facilities. However, these assumptions may vary from place to place. In the national survey study done in Uganda, those urban dwellers and disadvantaged regions i.e. refugee camps were more likely to receive sub-optimal doses compared to those in the rural areas (Ameyaw et al., 2022). In a study done, in Nigeria, it was found out that women who resided in rural areas were less likely to take optimal doses of IPTp compared to urban replaced local women (aOR=0.425 95% CI=0.239-0.753) (Adebayo et al., 2021). These results are interesting, since one shows that being in urban areas predisposes one to missing out on IPTp yet the other one contracts it by stating that residing in rural areas is the one predisposed to missing out on optimal IPTp. These results are quite debatable; while being a residence of urban areas, one has access to health facilities with services available-IPTp, pregnant women might find it difficult to attend and adhere to all scheduled antenatal care (ANC) visits due to personal reasons like work engagement, long queues at the clinic among other reasons, thus missing out on the optimal IPTp-SP uptake. In the rural areas, several factors play a role in ensuring all pregnant women living in malaria endemic regions receive their optimal doses of IPTp and these include distance or proximity of health facilities, availability of Sulfadoxine-Pyrimethamine (SP), staff availability and personal reasons. Proximity to health centers that offer ANC services, i.e. far off facilities, has hindered the regular attendance of ANC thus missing out on recommended doses; in some cases, stock outs of SP and insufficient SP has made some women in these rural areas miss out on some or all doses required. In certain rural areas, limited staff to offer IPTp or even staff lacking sufficient knowledge on IPTp has made pregnant women miss out on the recommended doses. On individual reasons, lack of transport means to reach health facilities, occupational engagements like agriculture

that makes them ignore important dates, and forgetfulness in-conjunction with illiteracy, whereby these pregnant women forget the scheduled dates of ANC visits or even fail to follow the scheduled dates as recommended.

2.1.3.7 Gravidity and parity

Women who are pregnant for the first time(primigravida) are considered to be at the greatest risk to the effects of pregnancy-associated malaria (Tran et al., 2020). According to a meta-analysis from sub-Saharan Africa assessing factors affecting delivery and uptake of IPTp-SP services, there was an association between primi-gravidity and receipt of IPTp-SP compared to women who reported having previous live births (multi-gravidity), with significant variations among studies (Hill et al., 2013). In a study done in Ghana, being a multigravida was positively associated with adequate IPTp-SP uptake respondents (OR=3.4 95% CI=1.5-7.6) (Stephen et al., 2016).

Parity is reported to have statistically significant negative effect on attendance of ANC and ultimately uptake of IPTp-SP services. In a systematic review of literature from developing countries, it was reported that women of higher parity underutilize maternal health services whilst women who are pregnant for their first time possess better care seeking practices. In a study done in Tanzania, Nulliparous women (those with no children) had the highest uptake of recommended dosages (58%, $p<0.001$) when compared to those of multipara women (having three or more children), who had the lowest uptake (24%) of the recommended dosages of IPTp-SP (Kibusi et al., 2015).

2.1.3.8 Gestation week of first Antenatal care (ANC) attendance and receipt of IPTp-SP dose

The gestation week that pregnant women start attending ANC and begin receiving IPTp-SP greatly dictates as to whether a mother will fully achieve the optimal utilization of IPTp-SP dosage. Usually the earlier a pregnant woman commences ANC

visits, the more dosages she would have taken by the time she reaches delivery of the baby. In Tema Metropolis, Ghana, 41 (23%) of pregnant women who started ANC in their first trimester were able to have ≥8 visits and thus able to achieve ≥3 doses of IPTp-SP (Amankwah et al., 2019). Similar results were also obtained in a study done in Sabatia sub-county, Western Kenya, whereby gestational age of first antenatal care (ANC) visit resulted in IPTp-SP optimization (*p*=0.04) (Mutanyi et al., 2021). Also in study results done in Tanzania, attendance of ANC at first trimester was associated with greater uptakes of IPTp-SP (aOR=2.4, 95% CI=1.20-4.96.8) (Mushi et al., 2021).

2.1.3.9 Total number of Antenatal care (ANC) attended

Studies have shown that in areas where focused ANC coverage is high, it is accompanied by a corresponding increase in IPTp-SP utilization. Regular attendance of scheduled ANC visits, with more than four ANC visits (>4) equates to achieving optimal uptake of IPTp-SP (>3doses of IPTp-SP). Pregnant women who attended more than four ANC visits had higher odds of uptake of greater than three doses than those who attended less than four ANC visits. In a study done in Sabatia Sub-County in Western Kenya, on the determinants of IPTp-SP uptake, those pregnant women who had attended ≥4 ANC visits had optimal uptake of IPTp-SP (>3 doses of IPTp-SP (aOR=16.7, 95% CI=7.9-35.3) (Mutanyi et al., 2021). Similar results were also obtained in Tanzania, (aOR=1.9, 95% CI=1.34-2.83), Tanzania (aOR=3.1, 95% CI=2.1-4.6) and Gabon (Bouyou-Akotet et al., 2013; Mchwampaka et al., 2019; Mushi et al., 2021)

A study in Gabon revealed an association between increased IPTp-SP uptake with timely attendance of ANC clinics and also attendance of four or more ANC visits (Bouyou-Akotet et al., 2013), i.e. those pregnant women who attended ANC clinic

regularly without missing had an adequate and recommended uptake of IPTp-SP compared to those who missed on the ANC clinic visits. Attendance of more than four ANC visits by pregnant women was reported to have an increase in uptake of more than 3 doses of IPTp-SP.

2.1.3.10 Health Insurance

Having health insurance cover of any kind has an influence on health seeking behaviour amongst those who have it versus those who do not have. Insurance cover gives confidence to clients seeking health services, since they can always attend health facilities at whatever time they would wish to unlike those ones without, who have to budget for every single cost from transportation, consultation, diagnosis and treatment, thus most likely to miss out on seeking health services at the health facilities. According to an investigation research carried out in Nigeria on use of IPTp-SP, women who had been enrolled in to a medical insurance scheme had higher probability of optimal IPTp usage- it was an influential determinant of IPTp optimal usage among the pregnant women studied (Adebayo et al., 2021). Also, in Ghana, during a study of the coverage of IPTp amongst women with obstetric referrals, presence of health insurance among the pregnant women attending ANC, was found to be statistically significant in the optimal utilization of IPTp-SP (p=0.01) (Coleman et al., 2020)

2.1.3.11 Knowledge about IPTp-SP and belief in IPTp-SP protection

Studies from different countries in Africa have discussed the effect of knowledge about IPTp-SP and the eventual utilization of related interventions. In a cross sectional study done in river state Nigeria, women with knowledge about IPTp-SP had odds of 22 in optimal uptake of IPTp-SP as compared to those who were clueless on IPTp purpose and use (Darteh et al., 2021). Similar results were also obtained in Sabatia Sub-county in Western Kenya, where maternal knowledge of IPTp-SP was statistically significant

for optimal utilization of IPTp-SP (p=<0.001) (Mutanyi et al., 2021). Similar results showing positive association of information on IPTp-SP and optimization of IPTp-SP were also found in studies done in Nigeria and Mali (Ameh et al., 2016; Sangho et al., 2021). Belief in IPTp-SP protection against Malaria in pregnancy (MIP) also influences how pregnant women view the uptake of the same, i.e. those who believe in it are more likely to partake in it, than those who do not. In a study done in Mali, the belief in IPTp-SP protection was statistically significant (OR= 2.38[1.24,4.57]) to optimal uptake of IPTp-SP (Sangho et al., 2021). Though in contradictory study findings in a study done in Nigeria, belief in IPTp effectiveness never played a role in the IPTp-SP uptake (Okeke et al., 2023).

2.1.3.12 Cultural factors

Cultural beliefs have always had a greater influence on how people accept and use technologies and even health intervention and promotion products. In reference to pregnant mothers accessing health services, diverse cultural beliefs have played a big role, in that some cultural practices hinder the pregnant women from accessing ANC services at health facilities. In a study done in Tanzania, some pregnant women were apprehensive of attending ANC clinics due to fear of being seen as boastful by other persons on regular hospital visits and even the fear of bewitching thus thereby missing out on ANC visits, ending up not achieving the optimal IPTp-SP uptake (Mubyazi et al., 2014). In Ghana, the social-cultural stigma especially towards the young mothers of 18-24 years who drop out of school due to pregnancies and male partners' abandonment led to these young girls missing out on scheduled ANC visits and thus receiving sub-optimal IPTp (Aberese-Ako et al., 2021).

In Uganda and Kenya, husbands are reported to be in control of household resources and ultimately hold exclusive privileges as decision makers. As a result, the decisions they make have a direct influence on care seeking practices of their spouses or whether they are able to purchase LLITNs for malaria control (Chuma et al., 2010). This finding is also reflected in the findings from Tanzania revealing that married women reported difficulties related to getting permission from their partners to seek care at health facilities and consequently had lower rates of service utilization (Exavery et al., 2014).

2.1.3.13 Health care worker attitude

In health care systems experiencing resource constraints as well as in public health sector settings, poor health care workers' attitude can represent a major barrier to service delivery and utilization (Bouyou-Akotet et al., 2013). Health care workers' attitudes and behaviour towards clients can be a common deterrent to service utilization by pregnant women. The clients' perspective on how health care workers are discharging their duties is therefore key to understanding the resultant effect on utilization of services (Hill et al., 2013). In a study done in a private Heath facility in Tema, Metropolis in Ghana, education /counselling given by the attending midwives to pregnant women during the Antenatal care (ANC) visits on the significance of IPTp-SP was found to be significantly associated with the uptake of IPTp-SP, i.e. those educated/counselled, 31.9% took more than three (≥3 doses) in contrast to those not given any form of education/counselling on SP (13.6%) (p=0.001) (Amankwah et al., 2019). In Tanzania, pregnant women reported being subjected to penalties and fines imposed by health workers if they initiated ANC late. For fear of such fines, some pregnant women opted to miss visiting ANC facilities thereby affecting access and utilization of IPTp-SP and other critical health services (Mubyazi et al., 2010).

2.1.3.14 Health facility factors

Various factors based on the health facilities that pregnant women attend for ANC services have played a key role in ensuring that these women receive the optimal IPTp-SP doses. One such factor is the stock outs, shortages and inadequate supply of the IPTp-SP in health facilities offering ANC services to pregnant women. These supply issues have led to pregnant women not achieving their set targets by WHO guidelines of utilization of greater than three doses of IPTp-SP. This was observed in two studies, one done in a cross sectional study in Cross River state Nigeria on barriers to IPTp-SP use and in study of factors influencing drop-out rate of IPT-SP in Tomale Metropolis (Ameh et al., 2016; Doku et al., 2016). Other health facilities factors include but are not limited to lack of harmonized guidelines and poor accountability in health facilities impeding proper health service delivery. Rampant human resource challenges that includes low staff motivation, inadequate staffing, incorrect knowledge of IPTp recommendation, poor management of information and supply chain, poor provider-client relations and the long waiting time and queues in the health facilities have all contributed in one way or another to how pregnant women seek health services.

2.1.3.15 Governance and leadership

Inadequate leadership and bad administration leading to slow decentralization of services has hampered many health services provision and maintenance in countries and counties. A stronger political system is necessary for proper and efficient health service delivery. Low budget allocation towards certain policy implementation has also hampered efficient and effective health service deliveries (Thiam et al., 2013).

2.1.3.16 Wealth index

The wealth index is a composite measure of a household's cumulative living standard. The wealth index is calculated using easy-to-collect data on a household's ownership

of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities. Women who are categorized to be rich or coming from rich family structures versus those who are from underprivileged families are usually linked with regular attendance of health facilities unlike the unfortunate pregnant women. Women of rich origin are believed to have high odds of using optimal IPTp-SP utilization (Adebayo et al., 2021; Ameyaw et al., 2022). In one study done in Kenya, wealth index was found to be statistically significant to optimal utilization of IPTp-SP (RR 2.14, CI 1.19-3.84, *p*=0.011)

2.1.3.17 Knowledge gaps of IPTp-SP uptake

Data abstracted from Kenya malaria indicator survey (KMIS) of 2020, (Division of National Malaria Programme (DNMP) [Kenya] and ICF, 2021) reported that women with live births two years preceding the study report, who had taken only one or two doses of IPTP during pregnancy, cited reasons for non-completion of IPTp-SP uptake as due to lack of awareness on the need to take more than 3 doses (35%).

A cross-sectional study conducted in 2020, in Sabatia Sub-county, western Kenya, on determination of factors influencing the uptake of IPTp-SP among 372 post-delivery women aged 15-49 years revealed that a high ANC clinic workload hindered healthcare workers' capacity in offering intensive IPTp-SP education thus contributed to inconsistencies in uptake of IPTp (Mutanyi et al., 2021).

Health care workers (HCWs) knowledge on IPTp-SP was also shown to have a greater influence in IPTp uptake, thus those HCWs who lacked in appropriate knowledge on IPTp utilization led to the drop rate in uptake of the same by pregnant women as shown in a study done Tomale Metropolis (Doku et al., 2016).

Basic knowledge has been shown to greatly influence uptake of IPTp, i.e. those

pregnant women who have been informed of IPTp purpose and use are more likely to uptake IPTp, since they know what it is, how it works, the number of doses required, dosage intervals and its benefits (Babaleb, 2020). Sufficient knowledge on the merits of IPTp-SP and appropriate doses among pregnant women was positively associated with a greater uptake of ≥3 doses of IPTp-SP (Mutanyi et al., 2021).

Appropriate and sufficient knowledge on IPTp-SP uptake and benefits by pregnant women has been shown to increase uptake of more doses, i.e. ≥3 doses of IPTp-SP as recommended by the WHO guidelines; this was shown in results in several studies done, i.e. in the study of factors affecting uptake of more than 3 doses in selected health facilities in Arusha Tanzania and in a cross sectional study done in Cross River state in Nigeria (Ameh et al., 2016; Mchwampaka et al., 2019).

The knowledge gaps that were identified either among ANC-seeking clients or among healthcare workers providing ANC services were documented and subsequently shared with both the healthcare providers and the ANC clients. The gaps identified were also communicated to the facility in charge, the County Department of Health, and ultimately the National Malaria Control Program (NMCP) to influence the uptake and maximization of IPTp.

Based on information obtained from several literature reviews, a number of factors that could lead to missed opportunities in the utilization of IPTp-SP were identified, and these were illustrated in a conceptual framework presented in Figure 1 below.

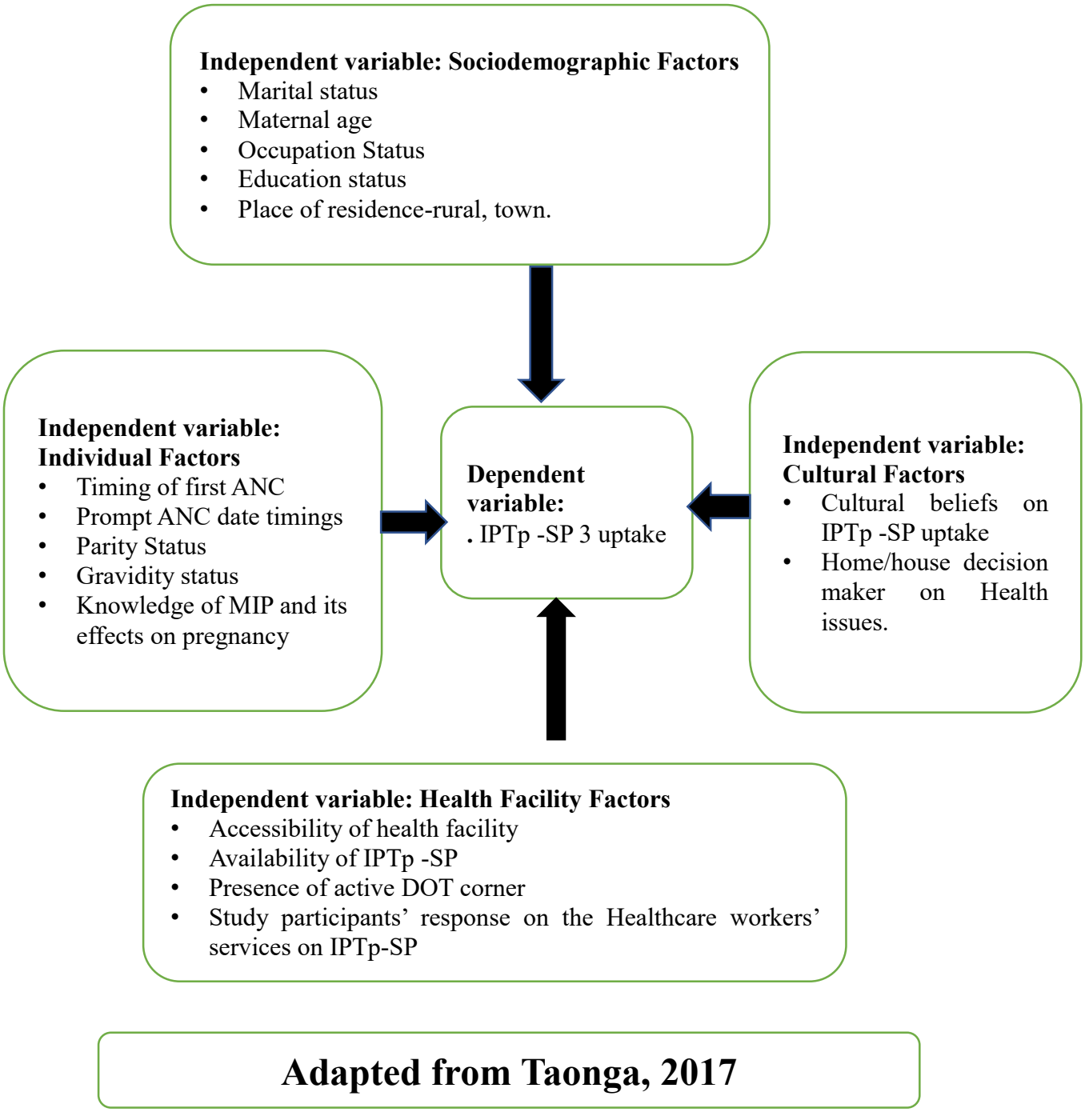


Figure 1: A conceptual framework showing the possible relationship between independent factors and the dependent factors (IPTp-SP) uptake

2.2 Malaria Epidemiology

Malaria is a severe and sometimes fatal disease caused by a bite of an infective female *Anopheles* mosquito. It is spread via mosquito vector during its search for blood meal for egg production; from one infected individual to a non-infected individual thereby transmitting the malaria parasite *Plasmodium spp.* Malaria is generally present in warmer regions - in tropical and subtropical countries. Higher temperatures favor the proliferation of the *Anopheles* mosquito. The malaria parasite, which grows and develops inside the mosquito, needs warmth to complete its growth before they are mature enough to be transmitted to humans. There are over five (5) parasite species causing malaria in humans (Sinden et al., 2002), and of all these species, *P. falciparum* and *P. vivax* pose the greatest threat of all the plasmodium species. *P. falciparum* is widely known to be the prevalent and deadliest malaria parasite in the African continent, on the other hand, *P. vivax* is known to be the dominant malaria parasite in most countries outside of Sub-Saharan Africa. Anyone can get malaria, though children under five years old due to their under-developed immunity and pregnant mothers due to the hormonal changes influencing their immunity, are usually the most vulnerable. Usually, an infected mother can transmit malaria to her unborn infant before (across the trans placental wall) or during delivery. Underprivileged people living in rural areas are at greater risk for malarial infection due to their living conditions that predispose them to malarial infection and limited access to essential healthcare amenities to seek treatment for malarial infection (Hill et al., 2015). Malaria usually presents with signs and symptoms that include but are not limited to; chills, fever, headache, muscle aches, general body malaise, nausea, vomiting and diarrhea. The symptoms may begin between 7 -14 days following infection. Even though malaria is a deadly disease, it can usually be prevented through various interventions, i.e. advocating for social behavior

change (SBC), like staying indoors at night and wearing of long sleeves clothes at night in heavily mosquito-infested areas, applying mosquito repellants and seeking health services (diagnosis and treatment) when infected. Other interventions include use of Insecticide Treated Nets (ITNs), administration of Intermittent Preventive Treatment in Pregnancy using Sulfadoxine Pyrimethamine (IPTp-SP) to pregnant women living in malaria endemic areas, use of Intermittent Preventive Treatment in infants (IPTi), use of Malaria Vaccine Implementation Program (MVIP) for children living in malaria endemic areas, and the indoor residual spraying (IRS) and Larval Source Management (LSM) in targeted areas.

According to the WHO world malaria report (WHO, 2022) there were an estimated 247 million cases of Malaria in 84 malaria-endemic countries in 2021, this figure increased from the previous 245 million cases in 2020, with the majority of cases emanating from countries in WHO African Region. Mortality cases increased to about 15.1 per 100,000 populations at risk in 2020, before decreasing slightly to 14.8 in 2021. Estimated deaths in 2020 and 2021 were 225,000 and 619,000 respectively.

In Malaria endemic areas, it was estimated that at least 25% of pregnant women were infected with Malaria, with the highest risk for infection and morbidity observed in primigravida, adolescents, and those with Human immune-deficiency virus (HIV) co-infections. Pregnant women have a likelihood of malarial infection, up to three times greater than their non-pregnant counterparts and have a mortality rate of about 50%. Pregnant women in the second trimester are more prone to malarial infection thus need prenatal care as part of malarial prevention and treatment interventions (S. Dunn et al., 2009).

In 2021, WHO world malaria report (WHO, 2022), highlighted that out of 40 million pregnancies, 13.3 million (32%) were exposed to Malaria in pregnancy (MiP) in 38 moderate and high transmission countries in the WHO African Region. This represented an additional 1.2 million women exposed to malaria in 2021 compared with 2020, as malaria risk in several countries increased in this period. These exposures would have later resulted in births of 961,000 children with low birth weight (LBW). These LBW could have been avoided if IPTp 3 coverage was optimized to 90% in pregnant women (WHO, 2022).

In Kenya, malaria disease poses significant public health problems and almost accounts for an estimated 13% to 15% of outpatient consultations. Approximately 70% of the population is at risk for malaria, including 13 million people in malaria-endemic areas and another 19 million in highland epidemic-prone and seasonal transmission areas (KMIS 2020) (Division of National Malaria Programme (DNMP) [Kenya] and ICF, 2021). The objectives for the Kenya Malaria Strategy (KMS 2023-2027) (Ministry of Health, 2023) is to reduce malaria incidence by 80 % and deaths by 90% of 2023 levels by 2027/2028 and interrupt indigenous malaria transmission in selected counties by 2027/2028. There are four epidemiological zones in Kenya with a variation in the risk of malaria infection (Ministry of Health, 2023) determined based on malaria prevalence, topography and climatic factors (i.e. rainfall, temperature and rainfall). The zones are; Highland epidemic-prone zones, Lake & Coast endemic zones, Seasonal zones and Low-risk areas. The various intervention measures deployed in these zones include the use of Long-Lasting Nets (LLINs), Intermittent Preventive Treatment in pregnancy (IPTp), case management, Epidemic preparedness and response (EPR) surveillance and Health Education/Behaviour change communication. Busia County lies in the lake-endemic region as a malaria epidemiological zone that experiences high

malaria cases with a prevalence of 39% countrywide compared to Kenya's prevalence of 6% (Division of National Malaria Programme (DNMP) [Kenya] and ICF, 2021). Malaria is the second leading cause of mortality in Busia County after neonatal disorders (KHIS, 2023), despite numerous interventions toward malaria control by the malaria control coordinator, who works closely with the National Malaria Control Program (NMCP) within the county.

2.4 Burden of Malaria in Pregnancy

In 2021, WHO world malaria report (WHO, 2022), highlighted that out of 40 million pregnancies, 13.3 million (32%) were exposed to Malaria in pregnancy (MiP) in 38 moderate and high transmission countries in the WHO African Region. This represented an additional 1.2 million women exposed to malaria in 2021 compared with 2020, as malaria risk in several countries increased in this period. These exposures could have later resulted in births of 961,000 children with low birth weight (LBW). These LBW would have been avoided if IPTp 3 coverage was optimized to 90% in pregnant women (WHO, 2022).

Malaria in pregnancy (MiP) is associated with both fetal and maternal anaemia, stillbirth, low birth weight (LBW) and maternal and fetal death (Bouyou-Akotet et al., 2013; Ndip Takem, 2013). Malaria's primary burden is in primigravida in communities where malaria transmission is high, whereas all gravidities are at risk in areas of low transmission.

Women pregnant with their first child (primigravida) are susceptible to severe P. falciparum disease from placental malaria because they lack immunity to placenta-specific cytoadherence proteins (McLEAN et al., 2015; Rieger Harden et al., 2015). However, in succeeding pregnancies, immunity towards placental parasites is acquired, which then reduces probability of undesirable effects of Malaria on the mother and fetus

and thus, asymptomatic parasitemia is common.

Reports from studies done in Africa demonstrated that symptom-free malaria infection was widespread in pregnant women in Sub-Saharan Africa (SSA); *P. falciparum, P. ovale, P. vivax,* and *P. malariae* were detected from asymptomatic malaria-infected pregnant women. However, P. falciparum was the predominant causative agent of asymptomatic Malaria. Pregnant women infected with asymptomatic Malaria were at a heightened risk of developing anemia than their non-infected pregnant women. Furthermore, primigravida women were more susceptible to symptom-free malaria infection than multigravida pregnant women. Recommendations from the study were that appropriate laboratory diagnosis of asymptomatic pregnant women for malaria and anaemia ought to be inclusive as part of routine antenatal care visits. Besides, further extensive studies using a susceptible method should be carried out to better understand the burden of asymptomatic malaria in pregnancy in SSA (Yimam et al., 2021).

The World Health Organization (WHO) recommends a three-pronged approach to prevention of Malaria in pregnancy (MiP), which has also been adopted by the National Malaria Control Program (NMCP) and these include: administration of intermittent preventive treatment of pregnancy using sulphadoxine-pyrimethamine (IPTp-SP) in pregnant women living in malaria-endemic with at least three doses for optimal benefit. Secondly, the use of Long-Lasting Insecticide Treated Nets (LLIN's) is also recommended for pregnant women residing in areas with high proliferation of mosquitoes. Third, proper malaria case management using artesunate plus clindamycin or quinine plus clindamycin and Artemisinin-based combination treatments (ACTs) is also one of the WHO recommendations to curb MiP.

The opportunity to use IPTp-SP to prevent malaria has faced numerous challenges, i.e. resistance to this drug combination has decreased its efficaciousness, and innovative alternatives are needed (Mutanyi et al., 2020). In zones of high stable transmission, adaptive immunity can mask critical symptoms but leave women susceptible to insidious effects such as severe maternal anaemia and perinatal, newly born, or post-neonatal death for their offspring (Fried et al., 2017).

Malaria infection during pregnancy (MiP) is a significant public health problem in Kenya, with considerable risks for the mother, her fetus, and the neonate (6,16). In 2020, MiP contributed to 2% of total confirmed malaria cases in Kenya, which rose to 2.2% in 2021. In Busia County, in 2020, MiP contributed to 2.2% of real confirmed malaria cases and 2.4 in 2021 (KHIS, 2023). Guidelines from World Health Organization (WHO) advocate for use of intermittent preventive treatment - sulfadoxine-pyrimethamine (IPTp-SP), to pregnant women living in malaria-endemic areas during routine antenatal care visits to prevent Malaria in pregnancy (MiP) (Ministry of Health, 2023). IPTp helps prevent malaria episodes, maternal and fetal anaemia, placental parasitemia, low birth weight, and neonatal mortality. Kenya first adopted a policy of providing IPTp in 1998, though uptake has been consistently low. An initial first dose of IPTp-SP is to be given in the second trimester (16^{th} week of pregnancy), and after that, given monthly with a 4 weeks' interval until delivery. IPTp-SP plays an important role in prevention of maternal malaria episodes and its effects like maternal and fetal anaemia, placental malaria, low birth weight, and newborn mortality (WHO, 2019). Data from the KMIS 2020, indicated an increase in the uptake of three or more doses of IPTp-SP in various epidemiological zones, i.e. from 35% in 2015 to 49% in 2020 in the Lake-endemic zone; 43% in 2015 to 46% in 2020 in the Coast-endemic zone. Nevertheless, decreased uptake of IPTp-SP was also observed

during the same time in the low risk zones, i.e. from 13% in 2015 to 8% in 2020. The Low-risk regions are not targeted areas for IPTp; therefore, adherence to policy guidelines to prevent misuse of commodities was enforced as recommended in the 2015 KMIS.

Busia County has seven Sub-Counties (Teso North, Teso South, Samia, Nambale, Butula, Matayos & Bunyala). Each of the sub-counties reports its uptake of IPTp-SP on the Kenya Health information system (KHIS) aggregate online platform. Data abstracted from KHIS aggregate showed that amongst the seven sub-counties, Nambale sub-county reported lowest uptake of IPTp-SP in the last two years (2020 and 2021). KHIS abstracted data, showed that Nambale Sub-County Hospital (NSCH) in Nambale sub-county recorded least number of doses offered from the initial first dose to subsequent doses shown (doses 2 & 3), i.e. in 2020, there were a total of 1,260 new ANC clients and IPTp doses offered (1- 3 IPTp doses) were 756 (60%), 280 (22%) and 111 (9%) and in 2021 a total of 1,190 new ANC clients and IPTp doses offered (1- 3 IPTp doses) were 852 (72%), 571 (48%) and 405 (34%). Data abstracted from KHIS shows no more significant differences in IPTp uptake in the Urban facilities (sub-counties hospitals) and the rural facilities (dispensaries and health centers), with IPTp-3 values ranging from as low as 21% to 80% in the rural facilities, while in the urban facilities is at 34%. Backed by these data facts from KHIS showing an increase in Malaria in pregnancy (MiP) with a decrease in IPTp doses offered (second and third doses, respectively); both nationally and county level, there is a need for an in-depth investigation into factors associated with varying uptake of IPTp-SP 3 despite high first ANC attendance.

2.5 Complications of Malaria in pregnancy

Acute symptomatic malaria and maternal pyrexia are associated with the complications of preterm labour, miscarriage, foetal acidosis, foetal heart rate abnormalities and intrauterine foetal demise (Bauserman et al., 2019; Takem et al., 2013). In endemic areas, the perinatal outcome is determined by several factors, including maternal parity, HIV status and maternal iron levels. Higher parasite counts and placental infection are borne in Primigravida and HIV-positive mothers. *P. falciparum* infections peak between 13 and 18 weeks' gestation, and it is assumed that the malaria parasite impairs trophoblast invasion within the placenta leading to vascular dysfunction and subsequent growth restriction.

2.6 Malaria Case management

For effective and efficient malaria case management, timely detection, and effective treatment of cases, remains a crucial constituent of malaria control and expulsion strategies. There are World Health Organization (WHO) guidelines available, developed in 2006 and periodically revised for treating Malaria; the contemporary newsletter was made public in 2015 (WHO, 2022). Adults and children who present with severe malaria should be treated with intravenous or intramuscular artesunate for at least 24 hours before being given oral medication. Once a patient has received at least 24 hours of parenteral therapy and can take oral medicine, complete treatment with three days of Artemisinin-based combination therapy (ACT) commences. These ACT includes; Artemether-Lumefantrine (AL)/Coartem and artesunate-mefloquine.

The endorsed treatment for uncomplicated malaria in the first trimester (gestation week 1-13 weeks) is a seven-day therapy of oral quinine. Artemether-Lumefantrine (AL) is the recommended treatment for uncomplicated malaria in the second and third trimesters. Oral quinine may also be used, but compliance must be ensured (Jhpiego

Brown' Wharf, 2021).

The endorsed medicine for treating severe malaria in pregnancy is by artesunate intravenous infusion. In the absence of artesunate, Artemether or quinine can be given. The preferred route of administration is intravenous for artesunate. However, in situations where intravenous route is not practicable, intramuscular route can be used as an alternative. Due to the increased risk of hypoglycemia in pregnant women, a dextrose-containing solution must be used for quinine administration (Jhpiego Brown' Wharf, 2021).

The objective of prevention of malaria in pregnancy is to reduce maternal and perinatal morbidity and mortality associated with malaria. The prevention strategies for Malaria in pregnancy (MiP) are consolidated into the overall antenatal care (ANC) package for maternal health care. These strategies include the provision of Intermittent preventive treatment for Malaria in pregnancy (IPTp), Long lasting Insecticidal Treated Nets (LLITNs), provision of prompt diagnosis and treatment of fever due to malaria and health education (Division of National Malaria program, 2020).

CHAPTER THREE

METHODS

3.1 Study Site

The study site was the Nambale sub-county Hospital (NSCH), situated in Nambale sub-county, in Nambale town along the Busia- Mumias Road and is bordered by Lake Victoria in Busia County. NSCH was founded in early 1962 as a dispensary. It was later upgraded to a sub-county Hospital (NSCH) by the county government of Busia in 2014. Currently, NSCH is a level 4 facility and has a total bed capacity of maternity- 9, male ward- 6, female ward- 8 and pediatrics - 8. NSCH has 6 health units attached to it, i.e. Pynet healthcare limited, Segero dispensary, Nambale community A, B, C community health units and Syekunya community health unit. NSCH performs both microscopy and Malaria rapid diagnostic testing (MRDTs) for malaria diagnosis.

Nambale town lies in the malaria lake endemic region and therefore encounters stable malaria transmission all year round. By and large, the area experiences a tropical climate with average temperatures ranging from 19 to 27 °C. The altitude for the place is about 1,200m above sea level. The area experiences two rainfall patterns annually and therefore the mosquito vector population in the region is usually high. The malaria transmission rate is enormous due to the suitable climatic conditions for mosquito vectors and as a result, the area experiences stable malaria transmission throughout the year. The intervention measures employed in the region include case management of malaria (diagnosis and treatment), use of long lasting insecticide treated nets (LLITNs) for protection against the vector-mosquito during sleeping, the practice of interior residual spraying (IRS), issue of Intermittent Preventive Treatment of malaria in pregnancy (IPTp), use of Intermittent Preventive Treatment of malaria in infants (IPTi),

advocating of social behaviour change (SBC) to its residence towards malaria prevention and health-service seeking behaviour.

3.2 Study period

The study was carried out in a record of three months, i.e. July to September 2023

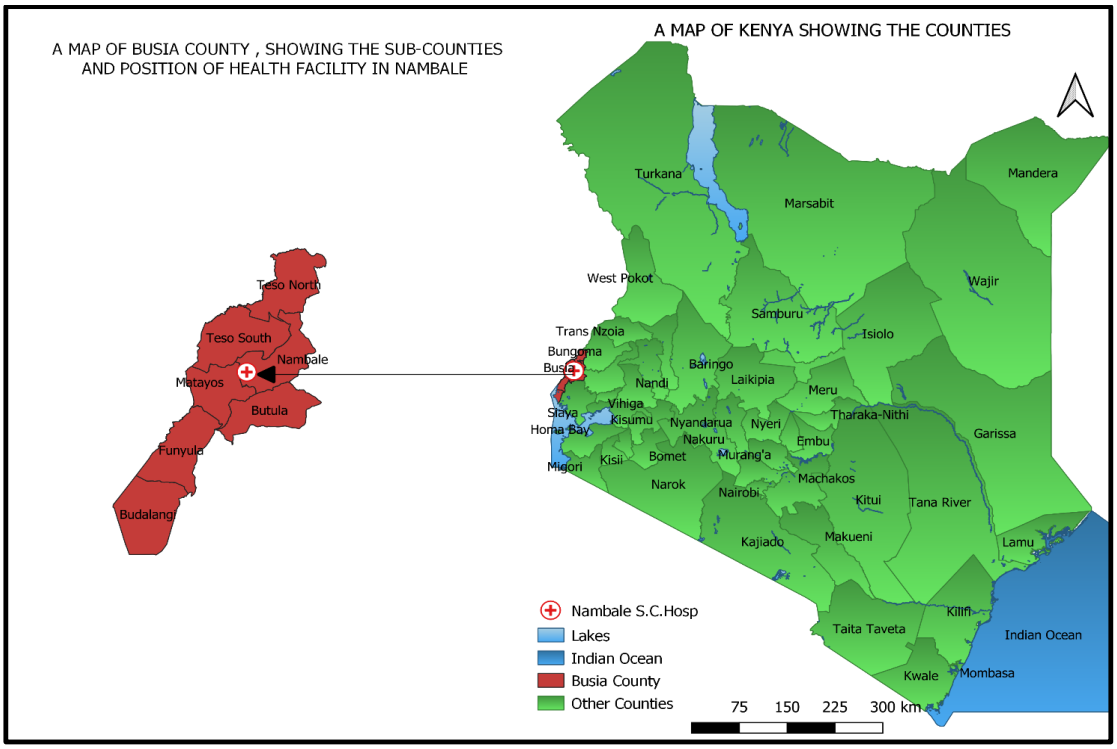


Figure 2: A Kenya map showing Busia County, its sub-counties, and the location of Nambale Sub-county hospital in Nambale. (source: created using QGIS 3.16 Hannover)

3.3 Study design

A facility based cross-sectional study design was used, this enabled collection of data from study participants as they came to the facility for their ANC visits.

3.4 Study Population

The study population was pregnant women aged 10-49 years and of gestational ages of 36 weeks and/or above attending ANC clinics in the Nambale Sub-County Hospital (NSCH).

3.4 1 Justification for use of 36 weeks' gestation

Although 37 weeks is widely recognized as the beginning of term pregnancy, using 36 weeks as an upper gestational limit in this study was used to avoid missing eligible participants who might have delivered at any gestation weeks between 37-40 since IPTp utilization is at 4 weeks apart.

Finally, for ethical considerations, at ≥37 weeks, women may be close to labor, making interviews uncomfortable or inappropriate. Limiting participation to ≤36 weeks ensures that participants are comfortable for the interview, there is minimal disruption to routine ANC or labor preparation and lastly lowers risk of interviewing a participant during pre-labor symptoms.

3.4.2 Justification for lower age limit (10 years)

Girls as young as 10 may begin menstruating meaning pregnancy is biologically possible and since IPTp-SP is only administered to pregnant women, they thus qualify for it and excluding them could lead to the underestimation of IPTp-SP uptake (ACERWC, 2022; Campbell et al., 2013; United Nations, 2020)

3.4.3 Justification for upper age limit (49 years)

The World Health Organization (WHO) and global health surveys define 15-49 years as the "reproductive age group". Several literature reviews have documented pregnancies below 15years of age (ACERWC, 2022; United Nations, 2020) while the upper limit of 49 years remains standard. Biologically, the ability to conceive also significantly decreases after 49 years due to menopause, though in rare circumstances pregnancies may occur beyond 49 years of age which may not be a target of IPTp-SP programs

3.5 Eligibility criteria

3.5.1 Inclusion criteria

- Pregnant women of 36 weeks' gestation or more attending Antenatal care (ANC) at the Nambale sub-county hospital (NSCH).
- Pregnant women on another preventive treatment like cotrimoxazole prophylaxis (CTXp).

NB: Those on CTXp were HIV+ individuals who were included in the study since they still remained a part of the ANC population receiving malaria prevention. Including them helped evaluate overall malaria prevention coverage, how many received CTX vs SP and whether ANC providers followed guidelines regarding SP contraindications. Ethically, excluding them would have introduced biasness, but by including them, made our study findings more generalizable, more ethically inclusive and more reflective of real ANC attendance patterns.

3.5.2 Exclusion criteria:

- Pregnant women with known allergy or hypersensitivity to sulfonamides.
- Pregnant women on 1st trimester

NB: Period of pregnancy was confirmed by checking the records available on everyone's mother child record ANC purple booklet and the hospital ANC attendance records.

3.6 Sample size Determination:

Cochrane (Cochran, 1977) formula was used for sample size calculations/determination.

The following assumptions were made:

Z: The score at 95% confidence interval (CI) = 1.96.

P: Expected proportion of pregnant women taking three or more doses of IPTp-SP = 49% based on the prevalence obtained during Kenya Malaria indicator survey (KMIS) of 2020 (Division of National Malaria Programme (DNMP) [Kenya] and ICF, 2021).

d: Degree of precision =0.05

Formula

$$n = \frac{Z^2 \times P \times (1-P)}{d^2}$$

$$[1.96 \times 1.96 \times 0.49 (1 - 0.49)]/0.0025$$

= 384

Therefore, my minimum sample size was 384 ANC clients.

3.7 Sampling design*:*

A consecutive sampling method was used. From the sample size calculation of 384 clients, about 5-10 clients meeting the eligibility criteria were recruited daily i.e. Monday to Friday and interviewed. Prior to the interviews, a daily visit was done in the ANC registration area and a pre-clinic briefing meeting was made. Eligible study participants were approached by the principal investigator and two research assistants. Screening checklist was verified, i.e. age between 10-49 years, gestation weeks >36 weeks, current cotrimoxazole use etc. adults were consented, as for minors' assent was sought from them plus a parental /guardian according to local ethics rule. Then questionnaire was administered to the study participants

Data abstracted from MoH 405 manual register showing number of pregnant women of gestation 36+weeks that attended ANC at Nambale sub-county Hospital for the year 2022 is as shown below:

Table 1: Number of pregnant women of 36+ weeks gestational age who attended ANC at Nambale Sub-county hospital for the year 2022

MONTH	NUMBER
January	52
February	57
March	67
April	83
May	108
June	115
July	78
August	64
September	70
October	103
November	123
December	101
TOTALS	**1018**

From the above data, it was concluded that Nambale Sub-County hospital (NSCH) had an average number of 84 antenatal care (ANC) clients (36+ gestation weeks) visiting monthly, with an average of four clients visiting on a daily basis except for weekends. From this information then it was possible to achieve the target of a sample size of 384 within a time frame of three months. Pregnant women of and above 36 weeks of gestation weeks attending ANC at the facility were identified through asking and verifying the same through ANC booklets and facility attendance register (MoH 405). The eligible clients were then informed of the purpose of the study and their consent/assent for participation in the study was sought. Any client who, upon being selected and declined to be interviewed was deemed a non-participant in the study and was thus excluded and the next available client was picked. With the help of the two study research assistants, previously trained on quality data gathering and accuracy, they helped with data collection using the soft copy version of the questionnaires on their mobile phones on a Kobocollect application, were able to administer the questionnaires on IPTp utilization to the consenting participants. The questionnaire captured the social-demographic factors (education status, marital status, religious

status, residence) individual factors (gravidity and parity status, timing of first ANC), Health facility factors (accessibility and availability of IPT-SP, presence of DOT) and cultural factors

3.8.1 Data collection tools

Structured questionnaires inputted on the Kobo tool box and uploaded on the intelligent android mobile phones was used to collect data variables from ANC clients, i.e. sections of the questionnaire included:

Section A; identifier information- date, time, unique identifiers, contacts, physical addresses/residence

Section B; biodata information- age and sex.

Section C; sociodemographic information- occupation, marital status, religion, level of education, family structure, health insurance status.

Section D; Risk factors information- directly observed therapy (DOT), cultural beliefs i.e. beliefs for/or against use of IPTp, home/house decision maker pertaining to seeking health services, accessibility to Health facility, knowledge on MiP and IPTP-SP uptake, availability of IPTp-SP, gravidae, parity status, gestation weeks of first ANC attendance and gestation weeks of commencement of utilization of IPTp.

3.9 Data Management

Coding of data was done, i.e. each participant was assigned a unique study identification number to replace names and protect confidentiality. Double data entry onto excel to minimize errors. The two data sets were compared and discrepancies were identified through the data entry validation tool and corrected, after which a final cleaned master dataset was created for analysis. Data cleaning was done, i.e. range

checks were done to ensure all entries fell within acceptable limits (10-49 years old). Missing data checks were done whereby blanks were flagged and coded appropriately. The soft copy data were stored in password-protected computers and backed up on encrypted external storage. Only authorized team members had access to the data set. Cleaned data were exported to Stata for statistical analysis.

3.10 Data analysis

The data collected on the Kobo tool box application was uploaded automatically every day into the online server until all the data from the 384 ANC clients was finalized. Thereafter, data extraction was done and a CSV file was downloaded from the kobo tool box online personal account. The data was then cleaned and checked for consistency and accuracy. Thereafter, the cleaned data was uploaded into STATA software (version15.1) for further analysis. Variables were recorded and labelled for easy interpretation, e.g. IPTp uptake categorized as 0 doses, 1 dose, > doses etc. STATA was employed to do univariate, bivariate and multivariable logistic regression.

Continuous variables (mother's age, gestational age, parity/gravidity, number of ANC attended) were analyzed through measures of central tendencies (median, mean) and measures of dispersion (range, standard deviations.) Kruskal-Wallis rank test was applied for comparison of medians of continuous variables and Chi square test was applied for the categorical variables (marital status, level of education, employment status, religion, residence, parity, gravidity, knowledge and attitude).

For Bivariate analysis, the Dependent variable (IPTp 3 utilization) was compared against the independent variable (age, level of education, religious background, residence, parity/gravidity status, awareness of IPTp, etc.) to identify associated factors. Variables with a *p-value* ≤ 0.2 at bivariate analysis were further subjected to

logistic regression analysis to manage for confounding. The use of $p<0.20$ was to avoid excluding potentially important variables too early if $p>0.05$ was used**.** By use of $p<0.20$ we ensured potential predictors, confounders and interacting variables were not missed before the final model is adjusted. Use of $p<0.20$ in the model led to robust outcome in that it screened for potential confounders and interacting factors, that are then corrected during modeling. Also, the guidelines of standard logistic regression modelling recommends using *p-values* between 0-15 and 0.25 at the bivariate stage to avoid excluding variables that may become significant once adjusted for other factors. The model was performed using stepwise backward elimination until all variables remaining in the model had *a p-value* ≤ 0.05. The relationship was evaluated in the remaining variables in the model.

3.11 Ethical consideration and Data privacy

Prior to initiating this study, Ethical approval was sought from the Moi University-Institutional Research Ethics Committee (IREC/482/2023) and National Commission for Science Technology and Innovation (NACOSTI/P/23/26928) as shown in Appendix 6 & 7.

Further authorization was also obtained from the County Department of Health (CDH), Busia County and the facility in charge, Nambale sub-county Hospital (NSCH). Observation of the three universal ethical principles was applied, i.e. respect for participants, beneficence and justice. All the study participants were consented/assented by fully explaining the purpose of the study, potential benefits and the fact that participation was voluntary. The importance of freedom of choice was reiterated by reminding participants of their right to withdraw consent at any time during the process without a penalty. Statistical discreetness was strictly observed by

not disclosing any information obtained from a third party. The personal identifiers of the subjects interviewed were overlooked during data analysis. Since the survey had no clinical components, the risks involved were minimal.

All data obtained was protected for privacy in Password-protected computer and cloud storage.

Informed consent was obtained from ANC clients of ages 18 – 49 years old.

- For ANC clients below 18 years of age but married, they were termed as emancipated minors and thus qualified as adults, therefore could give informed consent.

- For ANC clients below 18 years and unmarried, assent was obtained from the client and informed consent from the accompanying adults or maternity unit in-charge, after which they were interviewed.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of pregnant women

A total of 384 study participants were interviewed between 1st July 2023 to 30th September 2023. All were pregnant women of at least 36 weeks' gestation.

The median age of the study participants was 25 years with a range of 14 - 44 years old. Highest number of

participants (*n*=206, 54%) were aged 21–30 years and the lowest number of participants *(n*=3, 1%) were aged above 41 (Table 1). Those with secondary education were the highest (*n*=182, 47%) with ones having no formal education being the lowest (*n*=3, 1%) (Table 1).

Table 2: Socio-demographic characteristics of the respondents (N=384)

Variable	Frequency	Percent (%)
Age		
Below 21	106	28
21–30	206	54
31–40	69	17
Above 40	3	1
Mothers Education		
No formal education	3	1
Primary	123	32
Secondary	182	47
Tertiary	76	20
Occupation		
Unemployed	258	67
Self employed	84	22
Employed	42	11
Residence		
Rural	348	90
Urban	36	10
Marital status		
Cohabiting /Married	262	68
Single/Divorced/Widowed	122	32
Family structure		
Nuclear	235	61
Extended	141	37
Single parent	8	2

4.2 Socio-demographic characteristics of husbands/spouses

The highest number of study participants' husbands/spouses had primary education (*n*=99, 38%) with no formal education being the lowest (*n*=2, 1%). Most of these husbands/spouses were self-employed (*n*=122, 47%) with the least being employed (*n*=69, 26%) (Table 2).

Table 3: Socio-demographic characteristics of the husbands (N=262)

Variable	Frequency	Percent (%)
Husbands Education		
No formal education	2	1
Primary	99	38
Secondary	86	33
Tertiary	75	28
Occupation		
Unemployed	71	27
Self employed	122	47
Employed	69	26

4.3 Individual characteristics of the respondents

The highest number of respondents were Primigravida (*n*=196, 51%). On parity, Primipara constituted the highest number (*n*=195, 51%) and nulliparous the lowest number (*n*=7, 2%). On the current gestation weeks of the respondents, those of 38th gestation week were the majority (*n*=100, 26%) with those above 40th gestation week constituting the lowest number (*n*=29, 7%). The highest number of respondents began their 1st ANC at gestation weeks of >21 (*n*=151, 39%), with the least number of them starting at gestation weeks <12 (*n*=56, 15%) (Table 4). The highest number of participants attended more than four ANC visits (*n*=275, 72%) with the least number attending only one ANC visit (*n*=5, 1%). On health insurance cover, only 73% (*n*=281) of the respondents were covered by any type of insurance (Table 3)

Most respondents (*n*=356, 93%) acknowledged being aware of IPTp-SP. A huge number of respondents believed in IPTp-SP protection against MIP (*n*=229, 60%), with only a few dissenting (*n*=38, 10%) (Table 3).

Table 4: Individual factors of the respondents (N=384)

Variable	Frequency	Percent (%)
Gravidae		
Multigravida	188	49
Primigravida	196	51
Parity		
Multipara	182	47
Primipara	195	51
Nulliparous	7	2
Current Gestation Week		
36	64	17
37	50	13
38	100	26
39	66	17
40	75	20
Above 40	29	7
Gestation week of 1st ANC		
<12 weeks	56	15
13–16 weeks	98	25
17–20 weeks	79	21
>21 weeks	151	39
Total No of ANC attended		
1	5	1
2	39	10
3	65	17
4+	275	72
Has Health Insurance/cover		
No	103	27
Yes	281	73
Participants awareness on IPTp-SP		
No	28	7
Yes	356	93
Belief in IPTp-SP protection against Malaria		
Agree	229	60
Disagree	38	10
Not sure	117	30

4.4 Cultural factors of the respondents (*N*=384)

Only one study participant out of the 384 responded "Yes" to having cultural belief against the IPTp uptake, the rest dissenting (*n*=383, 99%). Many participants reported making sole decisions on matters pertaining to health in their homes (*n*=172, 45%), whereas a small number of respondents reported that their parents contributed towards their decision making in the house (*n*=9, 2%) (Table 4). A large number of participants reported not on being accompanied during ANC visits (*n*=301, 78%).

Table 5: Cultural characteristics of the respondents (N=384)

Variable	Frequency	Percent (%)
House/Home Decision Maker		
Self	172	45
Husband/spouse	15	4
Both husband and self	121	32
Parents	9	2
Both parents and self	67	17
Accompanied during ANC visit		
No	301	78
Yes	83	22
Persons accompanying participants during ANC visit	***N*=83**	
Friends	9	11
Husband or Spouse	51	61
Parents	23	28

4.5 Health facility characteristics (*N*=384)

A greater number of respondents reported that clean water was always provided for purposes of direct observational therapy-DOT (*n*=344, 90%) whereas a few dissented (*n*=4, 1%). (Table 5). On the participants' report of health care workers (HCWs) attitude towards pregnant women, a large number (*n*=323, 83%) reported on being warmly greeted and enough time spent with them by the HCWs and were also allowed to ask pertinent questions concerning their pregnancies. A smaller number (*n*=2, 1%) of respondents reported not being given enough time by the HCWs to ask pertinent questions (Table 5).

Table 6: Health facility characteristics (N=384)

Variable	Frequency	Percent (%)
Clean water for DOT available		
Always	344	90
Never	4	1
Sometimes	36	9
Clean glasses for DOT available		
Always	341	89
Never	4	1
Sometimes	39	10
Glasses for water sufficient in quantity		
Always	324	84
Never	7	2
Sometimes	53	14
Participants' report of health care workers (HCWs)attitude towards pregnant women		
HCWs counsels/educates pregnant women on IPTp benefits	6	2
HCWs avails time for questions by the pregnant mothers	2	1
HCWs acknowledges presence of pregnant women and accords enough client-service provider time interface	25	7
HCWs greets pregnant women warmly, spends enough time with them, and gives chance to ask questions	323	83
HCWs Greets Women warmly & counsels/educates them on IPTp benefits	28	7

4.6 IPTp-SP coverage

A total of 357/384 (93%) respondents received IPTp-SP doses, with those receiving at least three doses forming the largest number (*n*=232, 60%) (Table 6).

Table 7: IPTp-SP coverage (N=384)

Variable	Frequency	Percent (%)
Participants who received IPTp-SP doses		
No	27	7
Yes	357	93
Participants who received at least 3 doses of IPTp-SP		
Yes	232	60
No	152	40
Total No. of IPTp-SP doses utilized by participants		
0 doses	27	7
1 dose	33	9
2 doses	92	24
3 doses	141	37
4 doses	65	17
5+	26	6

4.7 Compliance with IPTp-SP

4.7.1 Reasons for uptake of > 3 doses of IPTp-SP (*N*=232)

A larger number of the respondents (*n*=137, 59%) reported that prompt ANC visits earlier in their gestation weeks led to them receiving more than three doses of IPTp-SP whereas a smaller number (*n*=2, 1%) reported that the health education they received from health care workers (HCWs) at the health facility made them achieve uptake of more than three doses of IPTp-SP (Table 7).

4.7. 2 Reasons for uptake of <3 doses of IPTp (*N*=152)

A larger number of the respondents (*n*=86, 56%) reported that starting ANC visits late in their gestation weeks led to them achieving the suboptimal doses, whereas a small number of the respondents (*n*=1, 1%) reported that the fear of side effects of drugs and lack of information from HCWs concerning uptake of IPTp-SP led into them receiving sub-optimal doses (Table 7).

Table 8: Compliance to IPTp-SP among pregnant women attending ANC in Nambale Sub-County Hospital, 2023.

Characteristics	Frequency	Percent (%)
Participants report on the uptake of >3 doses of IPTp-SP	***N*=232**	
HCWs educating pregnant women on the demerits of missing out on IPTp-SP	2	1
Never missed scheduled ANC dates	6	2
Never missed scheduled ANC dates and HCWs education on demerits of missing out on IPTp-SP	27	12
Never missed scheduled ANC dates and presence of IPTp-SP at the health facility	48	21
Never missed scheduled ANC dates and prompt ANC visits	9	4
Presence of IPTp-SP at the health facility	3	1
Prompt ANC visits in earlier gestation weeks	137	59
Participants report on the uptake of <3 doses of IPTp-SP	***N*=152**	
Previously resided in a county that never implemented IPTp-SP	8	5
Phobia for drug side effects side i.e. Nausea, vomiting etc.	1	1
Insufficient information on minimum doses to be consumed	1	1
Being on other preventive treatment, i.e. CTX	31	20
Missed the scheduled ANC visit dates	6	4
Late onset of ANC visits	86	56
No supplies at the health facility	19	13

4.8 Participants knowledge of Malaria in Pregnancy (MIP)-causes, effects and prevention (*N*=384)

Only 10/384 (3%) of the respondents had never heard about the disease malaria. A larger number of the respondents (*n*=354, 95%) knew that a bite of an infected mosquito would lead to malaria infection whereas only a few (*n*=7, 2%) knew of malarial transmission through infected blood transfusion (Table 8). Surprisingly, half of the respondents (*n*=193, 50%) reported not knowing about the effects of malaria in pregnancy (MIP) and a few (*n*=11, 3%) reported knowing about retarded foetal growth as one of the effects of MIP (Table 8).

Participants' knowledge of the prevention of malaria was the highest (*n*=368, 95%). Only a few of the participants were unaware of any preventive measures against malaria (*n*=4, 1%) (Table 8).

Table 9: Knowledge of Malaria in pregnancy among pregnant women attending ANC in Nambale sub-county hospital, 2023 (N=384)

Characteristics	Frequency	Percent (%)
Participant(s) ever heard about Malaria	***N=384***	
No	10	3
Yes	374	97
Participants knowledge on causes of Malaria	***N=374***	
Unaware	13	3
Through the bite of an infected mosquito	354	95
Through blood transfusion with malaria infected blood	7	2
Participants knowledge on effects of Malaria in pregnancy (MIP)	***N=374***	
Unaware	193	51
Abortion, still birth	73	20
Maternal anaemia & maternal deaths	70	19
Premature birth	27	7
Retarded foetal growth	11	3
Participants knowledge on prevention of Malaria infection	***N=374***	
Unaware	4	1
Clearance of mosquitoes possible habitats	2	1
Regular uptake of IPTp-SP and sleeping under treated mosquito nets	6	2
Sleeping Under treated mosquito nets	368	95
Wearing of protective clothing during mosquito biting time	4	1

4.9 Bivariate Analysis

To determine the presence of any association between the different independent variables and the outcome variables (IPTp-SP 3 utilization), Pearson's chi-square test was used and $p<0.2$ was considered significant. In executing the bivariate analysis, these parameters were correlated with the coverage of three or more doses of IPTP-SP; age or respondents, 21-30 years (p=0.001); highest level of education of the mother-Tertiary (p=0.002); highest level of education of husband/spouse-secondary (p=0.012); occupation of the mother–employed (p=0.009), self-employed (p=0.003); occupation of the husband/spouse-self-employed (p=0.001), gestation week of first ANC attendance at ≤20 weeks (p=0.000); gestation week of first receipt of IPTp-SP dose at ≤ 21 weeks (p=0.001); total ANCs attended up to date, >4ANC (p=0.001); having any type of health insurance-yes (p=0.009); person influencing health seeking behaviour-both husband and self (p=0.003): means of transport used to go for ANC- private means (p=0.009), public means (p=0.003); being accompanied during ANC visit-husband/spouse (p=0.005); having information pertaining to IPTp-SP-yes (p=0.001); belief in IPTp-SP protection-agree (p=0.002), provision of clean water and sufficient glasses for use in DOT (p=0.0001, HCWs education of pregnant women (p=0.001) and their provision of time to pregnant women to ask questions pertaining to pregnancy(p=0.011) (Table 9 -12)

Table 10: Bivariate analysis of socio-demographic characteristics associated with IPTp-SP coverage in Nambale Sub-County Hospital, Busia County, 2023 (N=384)

Variable	IPTp 3 Uptake		cOR(95% CI)	P-value
Age of Mother	**Yes (%)**	**No (%)**		
Below 21	51 (48)	55 (52)	**Ref**	
21–30	141 (68)	65 (32)	2.34 (1.4–3.7)	**0.001**
31–40	39 (57)	30 (43)	1.40 (0.7–2.5)	0.277
Above 40	1 (33)	2 (67)	0.53 (0.0–6.1)	0.618
Mothers Education level				
Primary	69 (56)	54 (44)	**Ref**	
No formal education	1 (33)	2 (67)	0.39 (0.0–4.4)	0.449
Secondary	103 (57)	79 (43)	1.02 (0.6–1.6)	0.932
Tertiary	59 (78)	17 (22)	2.71 (1.4–5.1)	**0.002**
Husband Educational level				
Primary	57(58)	42 (42)	**Ref**	
No formal education	0 (0)	2 (100)	1 (0.7–2.4)	0.295
Secondary	56 (65)	30 (35)	1.38 (1.2–4.5)	**0.012**
Tertiary	57 (76)	18 (24)	2.33 (0.9–2.0)	0.133
Mother Occupation				
Unemployed	139 (54)	119 (46)	**Ref**	
Employed	32 (76)	10 (24)	2.74 (1.2–5.8)	**0.009**
Self-employed	61 (73)	23 (27)	2.27 (1.3–3.8)	**0.003**
Husband Occupation				
Unemployed	34 (48)	37 (52)	**Ref**	
Employed	47 (68)	22 (32)	2.32 (1.1–4.6)	0.016
Self-employed	89 (73)	33 (27)	2.93 (1.5–5.4)	**0.001**

cOR –crude Odds Ratio, CI-confidence interval, Ref-Reference

Table 11: Bivariate analysis of individual characteristics associated with IPTp-SP coverage in Nambale Sub-County Hospital, Busia County, 2023 (N=384)

Variable	IPTp 3 Uptake		cOR(95% CI)	P-value
Gestation week of 1st ANC attendance	**Yes**	**No**		
>21 weeks	56 (37)	95 (63)	**Ref**	
13–16 weeks	80 (82)	18 (18)	7.54 (4.1–13.8)	**0.001**
17–20 weeks	4 (68)	25 (32)	3.66 (2.0–6.5)	**0.001**
<12 weeks	42 (75)	14 (25)	5.09 (2.5–10.1)	**0.001**
Gestation week of 1st receipt of IPTp-SP dose				
>21 gestation weeks	67 (39)	103 (61)	**Ref**	
14–17 gestation weeks	96 (92)	8 (8)	18.45 (8.4–40.4)	**0.001**
18–21 gestation weeks	69 (83)	14 (17)	7.58 (3.9–14.5)	**0.001**
Total ANCs attended				
≤3	21(19)	88 (81)	**Ref**	
≥4	211 (77)	64 (23)	13.8 (7.9–23.9)	**0.001**
Participants has health insurance				
No	51 (50)	52 (50)	**Ref**	
Yes	181 (64)	100 (36)	1.84 (1.1–2.9)	**0.009**
Participants means of transport used to ANC				
Walking	71 (50)	72 (50)	**Ref**	
Private means	15 (88)	2 (12)	7.61 (1.6–34.4)	**0.009**
Public means	146 (65)	78 (35)	1.89 (1.2–2.9)	**0.003**
Participants awareness on IPTp-SP				
No	5 (18)	23 (82)	**Ref**	
Yes	227 (64)	129 (36)	8.09 (3.0–21.8)	**0.001**
Belief in IPTp-SP protection against Malaria				
Disagree	15 (39)	23 (61)	**Ref**	
Agree	153 (67)	76 (33)	3.09 (1.5–6.2)	**0.002**
Not sure	64 (55)	53 (45)	1.85 (0.8–3.9)	0.105

cOR –crude Odds Ratio, CI-confidence interval, Ref-Reference

Table 12: Bivariate analysis of cultural characteristics associated with IPTp-SP coverage in Nambale Sub-County Hospital, Busia County, 2023 (N=384)

Variable	IPTp 3 Uptake		cOR (95% CI)	P-value
House/Home Decision Maker	**Yes**	**No**		
Self	99 (58)	73 (42)	**Ref**	
Both husband and self	90 (74)	31 (26)	2.14 (1.3–3.6)	**0.003**
Husband or spouse	11 (73)	4 (27)	2.03 (0.6–6.6)	0.242
Parents	2 (22)	7 (78)	0.21 (0.0–1.0)	0.056
Parents and self	30 (45)	37 (55)	0.59 (0.3–1.0)	0.076
People accompanying participants during ANC visit				
Parents	8 (35)	15 (65)	**Ref**	
Friends	3 (33)	6 (67)	0.94 (0.1–4.7)	0.938
Husband or spouse	36 (71)	15 (29)	4.5 (1.5–12.8)	**0.005**

cOR –crude Odds Ratio, CI-confidence interval, Ref-Reference

Table 13: Bivariate analysis of health facility characteristics associated with IPTp-SP coverage in Nambale Sub-County Hospital, Busia County, 2023 (N=384)

	IPTp 3 Uptake		cOR(95% CI)	P-value
Clean water for DOT available	**Yes**	**No**		
Sometimes	3 (31)	37 (169)	**Ref**	
Always	229 (67)	115 (33)	24.56 (7.4–81.3)	**0.001**
Clean glasses for DOT available				
Sometimes	6 (38)	37 (162)	**Ref**	
Always	226 (66)	115 (34)	12.12 (4.9–29.5)	**0.001**
Sufficient glasses for DOT available				
Sometimes	19 (85)	41 (115)	**Ref**	
Always	213 (66)	111 (34)	4.14 (2.2–7.4)	**0.001**
Health care workers (HCWs) counsels/educates pregnant women on IPTp-SP				
No	51 (46)	61 (54)	**Ref**	
Yes	181 (67)	91 (33)	2.38 (1.5–3.7)	**0.001**
Health care workers (HCWs) avails chance for asking questions				
No	93 (53)	81 (47)	**Ref**	
Yes	139 (66)	71 (34)	1.71 (1.1–2.5)	**0.011**

cOR –crude Odds Ratio, CI-confidence interval, Ref-Reference

4.10 Multivariable Logistic Regression Analysis

The variables that were subjected to stepwise backward logistic regression included: age of respondents, both highest level of education of the mother and father, both the occupation of mother and husband, gestation week off first ANC attendance and gestation week of first receipt of IPTp–SP dose, total number of ANCs attended, having health insurance, persons influencing health seeking behaviour of pregnant woman, means of transport used to attend ANC visits, persons accompanying pregnant women during ANC visits, information pertaining to IPTp-SP, belief in IPTp-SP protection against MIP and its complications, provision of clean water and clean sufficient glasses for IPTp uptake and HCWs provision of education/counsels pregnant women with their offer of chance to pregnant women for asking questions pertaining to pregnancy.

The variables that were retained in model formulation included: age group {cOR 9.46 (1.1–77.2), p value 0.036}, Highest education of mother {cOR 0.05(0.0-0.5), p value 0.013}, total ANC attended to date {cOR 43.81(1.7–1084), p value 0.021}, HCWs counsels' pregnant women {cOR 246.39 (2.7–22014), p value 0.016}, HCWs gives pregnant women chance to ask questions {cOR 0.03 (0.0-1.3), p value 0.071}, belief in IPTp protection {cOR 15.74 (1.3–186.4), p value 0.029}, and gestation of first IPTp uptake {cOR 0.01 (0.0-4356575), p value 0.009}.These retained variables were then subjected to multivariate logistic regression (Table 13.)

In multivariate analysis, just three variables were significantly associated with the coverage of three or more doses of IPTp-SP and these were; attendance of more than four ANCs {aOR 8.42 (4.4–16.0) p value 0.001}, gestation of first IPTp-SP uptake, i.e. 14–17 gestation weeks {aOR 7.79 (3.2–18.7) p value 0.001} and gestation weeks 18–21 {aOR 4.03 (1.9–8.4) p value 0.001} (Table 13). These three remaining variables were tested for interaction amongst themselves and were found to have no interactions.

4.11 Choice of reference group in bivariate and multivariate analysis

In both bivariate and multivariate analyses, categorical predictor variables were analyzed using a reference category against which other categories were compared. The reference group for each variable was selected based on either the most frequent category or the category representing the baseline or standard condition. This ensured stability of estimates and meaningful interpretation of odds ratios. The same reference categories were maintained across bivariate and multivariate models.

Table 14: Bivariate and Multivariate analysis of factors associated with IPTp-SP coverage in Nambale Sub-County Hospital, Busia County, 2023 (N=384)

Variable	IPTp 3 Uptake		cOR (95% C.I)	P-value	aOR (95% C.I)	P-value
Age of Mother	**Yes(%)**	**No(%)**				
Below 21	51 (48)	55 (52)		**Ref**		**Ref**
21–30	141 (68)	65 (32)	2.34 (1.4–3.7)	**0.001**	1.63 (0.8–3.2)	0.160
31–40	39 (57)	30 (43)	1.40 (0.7–2.5)	0.277	0.67 (0.2–1.7)	0.415
Above 40	1 (33)	2 (67)	0.53 (0.0–6.1)	0.618	1.49 (0.0–36.0)	0.807
Mothers Education level						
Primary	69 (56)	54 (44)		**Ref**		**Ref**
No formal education	1 (33)	2 (67)	0.39 (0.0–4.4)	0.449	1.90 (0.0–61.3)	0.717
Secondary	103 (57)	79 (43)	1.02 (0.6–1.6)	0.932	0.75 (0.3–1.5)	0.422
Tertiary	59 (78)	17 (22)	2.71 (1.4–5.1)	**0.002**	1.06 (0.4–2.7)	0.904
Gestation week of 1st receipt of IPTp-SP dose						
>21 gestation weeks	67 (39)	103 (61)		**Ref**		**Ref**
14–17 gestation weeks	96 (92)	8 (8)	18.45 (8.4–40.4)	**0.001**	7.79 (3.2–18.7)	**0.001**
18–21 gestation weeks	69 (83)	14 (17)	7.58 (3.9–14.5)	**0.001**	4.03 (1.9–8.4)	**0.001**
Total ANCs attended						
≤3	21(19)	88 (81		**Ref**		**Ref**
≥4	211 (77)	64 (23)	13.8 (7.9–23.9)	**0.001**	8.42 (4.4-16.0.)	**0.001**
Belief in IPTp-SP protection against Malaria						
Disagree	79 (51)	76 (49)		**Ref**		**Ref**
Agree	153 (67)	76 (33)	3.09 (1.5–6.2)	**0.002**	1.47 (0.7–2.7)	0.217
Health care workers (HCWs) counsels/educates pregnant women on IPTp-SP						
No	51 (46)	61 (54)		**Ref**		**Ref**
Yes	181 (67)	91 (33)	2.38 (1.5–3.7)	**0.000**	1.22 (0.6–2.2)	0.528
Health care workers (HCWs) avails chance for asking questions						
No	93 (53)	81 (47)		**Ref**		**Ref**
Yes	139 (66)	71 (34)	1.71 (1.1–2.5)	**0.011**	0.99 (0.5–1.9)	0.989

aOR –adjusted Odds Ratio, CI-confidence interval, Ref-Reference.

CHAPTER FIVE

5.1 DISCUSSION

Ideally the uptake of Intermittent Preventive Treatment of Malaria in pregnancy by Sulfadoxine –Pyrimethamine (IPTp –SP) by pregnant women in malaria endemic areas is targeted at 100% for IPTp 1 and at least 80% for IPTp 3. The IPTp 3 is used as the gold standard for assessment of IPTp coverage and access as per guidelines for the World Health organization (WHO) and the National Malaria Control Program (NMCP). Despite the set targets for IPTp utilization, both by WHO and NMCP, several factors seem to influence the uptake of the same. The purpose of this cross-sectional research was to explore the factors associated with adequate utilization of IPTp-SP which is recommended at three doses and above by the WHO and ministry of health (MoH) Kenya.

In this study, only 60% of pregnant women eligible for the IPTp uptake, received the recommended three doses of IPTp-SP as per the WHO requirements. Eligibility in this study referred to pregnant women who met all clinical and programmatic criteria for receiving IPTp-SP as recommended by WHO and national guidelines, and be of at least gestation weeks ≥13 weeks to 37 gestation weeks and having no contraindications to SP. The factors that were statistically significant with the uptake of more than three doses were the attendance of more than four (4) ANC visits and commencement of IPTp utilization earlier in the second trimester.

This study finding revealed a sub-optimal IPTp3 uptake way below the WHO target of 80%. Similar findings, were also found in a study done of 12 countries of Sub-Saharan Africa (SSA) which also showed a sub-optimal IPT3 uptake, these studies used a multilevel data analysis and still found similar results, i.e. they found out that uptake of more than 3 doses of IPTp was at 59.64% and 57.46% for Ghana and Burkina

respectively (Darteh et al., 2021).

However, this study finding differs from a number of previous studies. One such study was done in Sabatia in Western Kenya, a cross sectional study, that reported an optimal utilization of more than three doses of IPTp-SP at 79.6% (Mutanyi et al., 2021). Another cross sectional study, which also focused on the determination of IPTp-SP utilization in Sub-Saharan Africa, found a suboptimal utilization of IPTp-SP of 29.5% (Yaya et al., 2018). Also a sub optimal uptake of IPTp-3, i.e. 8% was noted in a study of a cross sectional done in Tanzania in 2021(Mushi et al., 2021), 53% in a cross sectional study done in western Kenya (Dellicour et al., 2016), 46.6% in a cross sectional study in Tema Metropolis in Ghana (Amankwah et al., 2019), 22.3% in a study done in East-Central Uganda (Martin et al., 2020).

In conclusion, this study finding of 60% utilization of IPTp3 by pregnant women at Nambale Sub-County Hospital in Busia County indicates a sub-optimal utilization. Therefore, this means that at the time of the study, of all pregnant women commencing their ANC attendance at the facility, only 60% end up utilizing the recommended doses of IPTp-SP of three or more, with the rest missing out, either due one or more reasons. Even though 40% of eligible pregnant women did not receive any dose of SP, this finding cannot be interpreted as a direct or linear indication that these women are more likely to develop malaria in pregnancy. The risk of malaria in pregnancy is influenced by multiple interacting biological, environmental, and behavioral factors, and cannot be inferred solely from IPTp uptake status.

5.2 Socio-demographic characteristics influencing optimal IPTp-SP uptake

Maternal age: From the study outcomes, it was evidenced that maternal age was positively associated with uptake of optimal utilization of IPTp-3, i.e. women aged 21-30 years were twice likely to have IPTp-3 uptake as when compared to other age groups at the bivariate analysis (*p=0.001).* However, this result was not statistically significant at the multivariate analysis (p=0.160). This results however contradicts with previous studies that found out that women of aged 35-49 years old had higher uptake of IPTp-3 as compared to other age groups, i.e. in a study done Sub-Saharan Africa (SSA), on the factors influencing IPTp uptake in pregnant women, women aged 40-44 were more likely to receive three or more doses of IPTp-SP as compared to those aged 15-19 (Darteh et al., 2021). Also, in a different study findings- national survey done in Uganda on the uptake of IPTp-SP, pregnant women aged 15-19 had less odds of receiving at least three IPTp-SP doses compared to those aged above 30 years of age and of 45-49 years (Ameyaw et al., 2022; Martin et al., 2020). However, the results of this study, carried out at Nambale, based on age groups might have been biased given the fact that, of all the study participants interviewed in Nambale, Busia County, 56% were women of ages 21-30, compared against those aged above 31 (18%) thus therefore giving the impression that pregnant women aged 21-30 years had higher IPTp3 utilization. Nevertheless, this study results based on age group, showed that pregnant women of younger ages might have got sufficient and appropriate information concerning the IPTp uptake early enough and thus their larger numbers in ANC attendance and IPTp uptake. In addition, these women in that age bracket (21-30) might be experiencing their first ever pregnancies thus therefore are keener on ensuring they do not default on ANC visits and uptake of IPTp for the safety of both their unborn babies and them. This is very laudable since many younger women would be likely to give birth free of

malaria complications during pregnancy or after birth, and by taking as many doses as required would thus boost IPTp 3 doses utilization as recommended by both WHO and MOH. Additionally, it also means when teenage or younger pregnant women of below 30 years old, attend to ANC clinics early enough, they are more likely to attend ANC clinics frequently without fail and protect their pregnancies through the uptake of appropriate dosage of IPTp-SP. This would thus mean that more cases of mortalities and morbidities associated with MIP would be averted and thus saving the individuals and community at large of the enormous expenses that would have otherwise been spent on addressing the same issue

Level of education of the pregnant woman was also noted to be a determining factor in influencing the IPTp-SP 3 utilization. The odds of IPTp-SP 3 uptake was 2.7 greater in women with tertiary education than those with other levels of education (p=0.002) at the bivariate analysis, though this was not statistically significant at multivariate analysis step (p=0.904). Similar studies findings have been documented in the past, showing an association between the highest level education of the mother and uptake of the IPTp-3, i.e. in a study done in Arusha Tanzania on factors affecting uptake of ≥ 3 doses of IPTp, women of secondary or higher education had greater odds of uptake compared to those who had primary or no education at all (Mchwampaka et al., 2019). Similar results were also obtained in Uganda, whereby 47.1% of highly educated women received at least three doses of IPTp-SP as when compared to pregnant women of primary or no formal education (Ameyaw et al., 2022). In a contradictory study results, one study done in Tanzania on the predictors for the uptake of optimal doses of IPTp-SP, women of primary school had higher odds of uptake IPTp-SP compared to those who had secondary or higher education (Mushi et al., 2021).

Highest level of education of the husband(s), i.e. secondary level, was also evidenced to have an association with the utilization of IPTp- 3 uptake at the bivariate analysis (p=0.012), though this not statistically significant at the multivariate analysis stage (p=0.080). No similar study findings were found for the level of education of husbands in relation to the utilization of IPTp-SP.

Therefore, it can be concluded that a higher level of education of the pregnant woman and their husbands could be associated with increased uptake of any health services provided in a society as showcased in this study and thus very important for IPTp-SP uptake. Highly educated pregnant women and their husbands could mean that they are well informed on the merits of antimalarial prophylaxis thus less likely to default on IPTp uptake as compared to those individuals with lower education status (MOPHS, 2016). Highly educated individuals or couples, i.e. those with tertiary education are also less likely to be ignorant of health services seeking as compared to those of lower education level, i.e. primary or no formal education. Furthermore, the highly educated individuals are better placed to follow prescriptions and keep up to scheduled dates unlike their counterparts who are of lesser education status and therefore in this case can avert mortalities and morbidities associated with MIP. Higher education status, i.e. tertiary, could also mean the possibility of acquiring better employment opportunities that provide sufficient income thus making health services seeking an easier task, unlike when unemployed which might hinder someone seeking health services, as they would be busy looking for money. This therefore points towards the need for both the county government and national government to push forward for accessible and affordable higher education institutions to all its citizens so as to ensure that all persons can appreciate the different health services provided in the health facilities and thus thereby

achieving the goal of optimal uptake of health services.

Occupation status of a pregnant woman and that of her husband was also found to have an influence towards the uptake of more than three doses of IPTp-SP in this study findings, i.e. their occupations status was positively associated with the uptake of more than three doses of IPTp-SP. The odds of IPTp 3 uptake was 2.74 among the employed pregnant women (p=0.009) and 2.27 in self-employed pregnant women as compared to those who were unemployed at the bivariate analysis. Pregnant women whose husbands/spouse were self-employed had higher odds of 2.93 in the uptake of IPTp 3 (p=0.001) as compared to those whose husbands were not employed in the bivariate analysis. In both cases, i.e. occupation of the pregnant woman and that of the husband, the variables were found not to be statistically significant in the multivariate analysis. Similar results have also been obtained in previous studies, i.e. in the cross-sectional study of the factors associated with the uptake of IPTp in Tema Metropolis, Ghana, which found out that occupation status of the pregnant woman and that of the spouse were not statistically significant (Amankwah et al., 2019). However, in a contradictory study findings documented from a study done in East-Central Uganda, whereby unemployed pregnant women were more likely to achieve the optimal utilization of IPTp-SP as compared to those employed in the agricultural sector (Martin et al., 2020). The results obtained in this study could mean that the pregnant women actively engaged in any source of employment are more doubtlessly to bear the cost of transportation costs to and from health facilities from their out of pockets or that of their husbands, and thus thereby more likely to attend all ANC clinic dates thus thereby end up getting all the recommended doses of IPTp. In addition, it could also mean that, the self/employed pregnant women would attend more scheduled ANC clinics unlike the

unemployed pregnant women since they are assured of some income, that would have made them miss out on scheduled ANC visits due to reasons such as searching for some sources of income for purposes of day-to-day upkeep. This thus means employment/occupation of any nature amongst the pregnant woman is of importance towards ensuring they adhere to ANC visits according to this study. This affirms that the pregnant women who are employed or self-employed are more likely to attend the ANC visits and partake of all the recommended doses of IPTp-SP thereby having a better chance of protection from MIP and its adverse effects more than those who have no form of employment at all. This reinforces the need for capacity building of all persons, especially pregnant women to have some sort of income generating activity that might earn them an income/money to enable them to attend ANC clinics and get the recommended health services provided therein.

On marital status of the respondents, this study found no association between marital status of pregnant women and the optimal utilization of IPTp-SP, not even at the bivariate analysis stage. Those who were cohabiting or married and those who were single, divorced or widowed all had equal chances of utilizing the IPTp-SP at the same rate. However, in other studies, contradictory findings were documented, i.e. marital status was found to be significant for IPTp-SP uptake before adjusting for other covariates. One such study was one carried out in Sabatia sub-county, whereby married women had higher odds than unmarried women in utilizing an optimal dose of IPTp-SP (Mutanyi et al., 2020). In another study done in Ghana, living together with a partner (marriage set up) was independently associated with IPTp-SP uptake as compared to living alone (alone) ($p<0.01$) (Coleman et al., 2020). In Tanzania, one study documented that being married was associated with 60% decline in the partial uptake

of IPTp-SP (RRR 0.40, 95% 0.17-0.96) (Exavery et al., 2014). Whereas this study found no association between marital status and an optimal IPTp3 uptake, most studies documented a positive association between the two (marital status and optimal IPTp3 uptake). Marital status plays a key role towards health seeking behaviour since the partners of the married or cohabiting pregnant women are more likely to offer moral, social and even financial support that makes it easier for the pregnant women to attend the ANC clinic and thus thereby achieving the optimal IPTp uptake. While marital status among pregnant women might play a key role in ensuring that they seek and receive the recommendation health services especially for the married/cohabiting individuals, in some cases it could act as deterrence; i.e. some husbands/spouse to these pregnant women could impose their non-belief in health seeking practice either based on ignorance, ego, tradition and/or cultural beliefs, thus thereby hindering their spouse from accessing the much needed health promotion services-IPTp utilization in this case, thus thereby exposing them to likelihood of acquiring Malaria in pregnancy (MIP) and suffer its consequences. Therefore, noble marital/cohabiting relationships need to be promoted and upheld for the well-being of the society. Despite the expected benefits of marital status, i.e. moral, physical, and financial support that might enhance clinic attendance, this study found no differences on IPTp-SP uptake amongst the married and non-married pregnant women, i.e. all had equal chances of attending ANC clinics and partaking the IPTp-SP and thus were able to avert adverse effects of MIP.

On the religious background status of the respondents, this study results found no association between one's religious background and the optimal IPTp utilization. Participants belonging to Islamic, Catholic or Protestant religious background/denomination had no significant effect on the optimal utilization of IPTp-

SP. In similar study results, done in Kumasi Ghana, there was no significant association between one's religious background status and the optimal IPTp-SP utilization (Addai-Mensah et al., 2018). However, in other contradictory study results, done in Eastern Uganda, women adhering to Islam were found to have high odds of 1.73 of receiving partial doses of IPTp as compared to Catholic women (Martin et al., 2020). Whereas, this study found no significant association between one's religious background and the optimal IPTp uptake, unlike the study done in East Central Uganda which found a slight association, it is the belief of the principal investigator that if the various religious denominations were in close working relationship with the health sector, then, the later would use the former to spread pertinent communication especially about prompt and effective IPTp uptake , thus ensuring all pregnant women attending to such denominations are up to date with their IPTp uptake. In the past and even up to date, religion has immensely influenced how members of society view and respond to health services seeking behaviour, i.e. response to attack by diseases and the uptake of medication/vaccinations. Some religious leaders of various religious denominations have always imposed certain stringent teachings and beliefs that have resulted in their congregants avoiding vaccinations and refusing other forms of medication when sick thus thereby making their followers have increased susceptibility to morbidities and even mortalities. Therefore, there is a need for the various levels of government administration to continuously keep the religious denominations at check on whatever teachings they have that may greatly impact on the health services seeking behaviour of their followers. In addition, all the administration levels of government need to work closely with the various religious denominations to drum up support of health services that the government is offering to its citizens to ensure a hundred per cent uptake to avert adverse side effects of various diseases.

Place of residence for the study participants was found to have no association with the optimal utilization of the IPTp-SP in this study findings, i.e. there was no significant association between the place of residence of the pregnant women and their optimal IPTp-SP utilization. Those who resided in urban areas and rural areas, all had an equal chance of accessing and utilizing the IPTp-SP at the same rate. This meant that proper and effective community communication was done in all areas of residence with pregnant women thus the findings of this study. However, in the literature reviewed, some association was found between the place of residence of pregnant women and their optimal IPTp utilization, i.e. in the national survey study done in Uganda, pregnant women who were residing in urban areas and refugee camps were more likely to receive sub-optimal doses compared to those in the rural areas (Ameyaw et al., 2022). In one study done, in Nigeria, it was found out that women who resided in rural areas were less likely to uptake optimal doses of IPTp compared to women residing in the urban areas (aOR=0.425 95% CI=0.239-0.753) (Adebayo et al., 2021). These results are quite interesting, since one study finding documented that being in urban areas predisposes one to missing out on IPTp, yet the other study contradicts it, by stating that residing in rural areas predisposes individuals to missing out in the optimal utilization of IPTp. These results are quite debatable, since being a resident of an urban area is usually associated with the ease of access to health facilities with almost all requisite health services available, including IPTp. Whereas, residing in a rural area is believed to limit access to health facilities with all essential services needed thus missing out on some services that might also include IPTp. Pregnant women residing in these areas-urban, would only fail to attend and adhere to all scheduled antenatal care (ANC) visits probably due to either personal reasons like work engagement or anticipated long queues at the clinic among other reasons, thus missing out on the optimal IPTp-SP

uptake, whereas in the rural areas, several factors might play a role in ensuring all pregnant women living in malaria endemic regions receive their optimal doses of IPTp and these possible options; distance or closeness of health facilities, availability of Sulfadoxine-Pyrimethamine (SP), staff availability among other reasons. Proximity to health centers that offer ANC services, i.e. far off facilities, may hinder the regular attendance of ANC thus pregnant women may miss out on the recommended dosage of IPTp. In some cases, stock outs of SP and insufficient SP has made some pregnant women in these rural areas miss out on some or all doses required. In certain rural areas, limited staff to offer IPTp or even staffs' insufficient knowledge on proper IPTp administration has resulted in some pregnant women missing out on the recommended doses. On individual reasons, lack of transport means to reach the health facilities, occupational engagements like farming that makes them ignore important clinic dates, and forgetfulness in-conjunction with illiteracy, whereby these pregnant women forget the scheduled dates of ANC visits or even fail to follow to the scheduled dates as recommended may lead to missed opportunities. Despite the different challenges experienced in different residential areas, there is need of all levels of the government –national and counties, to ensure that accessibility to affordable health services is enhanced to avoid miss outs on IPTp-SP by pregnant women, thus thereby avoiding MIP and its complications.

5.3 Individual characteristics influencing optimal IPTp-SP uptake

Gravidity and parity status: in this research, there was no significant association between gravidity and parity status of the pregnant woman with the optimal utilization of IPTp. Women of different gravidity and parity status had no distinct differences in the uptake of optimal IPTp-SP doses. This means that, despite some pregnant women

having been pregnant before and even bore children, still their IPTp utilization was similar to that of newly pregnant women. It is a common belief that pregnant women who have had more than one pregnancy in the past, should have had higher odds of IPTp uptake as compared to the newly pregnant women and thus must have achieved an optimal IPTp uptake. This was not the case in this study, thus therefore meant that all study participants, despite their gravidity or parity status, were still at risk of contracting MIP and suffering its adverse effects.

However, in the literature reviewed, some association was established to occur between gravidity status of pregnant women and their IPTp uptake, i.e. in a study done in Ghana, being a multigravida was positively associated with an adequate IPTp-SP utilization among the respondents (OR=3.4 95% CI=1.5-7.6) (Stephen et al., 2016). In one study done in Tanzania, Nulliparous women (those with no children) had the highest uptake of recommended dosages (58%, $p<0.001$) as compared to those of multipara women (having three or more children), who had the lowest (24%) utilization of the recommended dosages of IPTp-SP (Kibusi et al., 2015). These results are important in the understanding of the utilization of IPTp-SP amongst the different parity and gravidity status. Those women who have had numerous previous pregnancies (multigravidas) are more prima facie to uptake more IPTp-SP doses either due to numerous messages they have received in their past pregnancies about the benefits of IPTp-SP uptake or even the complications they could have developed in the past related to MIP as compared to nulligravida (never been pregnant before) and primigravida who are yet to learn more concerning care of pregnancy. On the contrary though, nulliparous women (those with no children) are more likely to uptake more IPTp-SP doses since they do not want to risk losing their firstborns due to malaria related complications, whereas multiparous women might miss on optimal IPTp-SP uptake due to other

competing tasks like taking care of other children thus missing out on the scheduled ANC dates, thus therefore missing out on the optimal uptake of IPTp-SP.

Gestation week of first Antenatal care (ANC) attendance among the pregnant women attending the Nambale sub-county hospital had a positive association with the uptake of greater than three doses of IPTp-SP in this study findings. The odds of IPTp-3 uptake were 7.54 times higher in pregnant women who started their first ANC at gestational weeks 13–16 as compared to those who started their first ANC later (p=0.000). This association was only significant at the bivariate analysis but not at the multivariate analysis level. This study results is similar with previous study findings carried out in Tema Metropolis, Ghana, whereby 41 (23%) of pregnant women who started ANC in their first three months of pregnancy were capable to have ≥8 visits and thus able to achieve ≥3 doses of IPTp-SP (Amankwah et al., 2019). Similar results were also obtained in a study done in Sabatia sub-county, Western Kenya, whereby gestational age of first antenatal care (ANC) visit resulted in optimization of IPTp-SP utilization (p=0.04) (Mutanyi et al., 2021). In one study done in Tanzania, attendance of ANC at first trimester was associated with greater uptakes of IPTp-SP (aOR=2.4, 95% CI=1.20-4.96.8) (Mushi et al., 2021). Attendance of ANC during the first trimester (gestational week 4-12) is key to accomplishing the uptake of all the IPTp-SP doses as recommended by WHO and MOH, since the pregnant woman would be informed early enough of the appropriate timing for future uptake of IPTp-SP doses without missing even on a single dosage. Also, by regularly attending the ANC, the progress of the unborn child would be closely monitored and the health status of the pregnant woman, thus thereby ensuring the safety of both. This therefore emphasizes the need to ensure that all pregnant women living in malaria endemic zones should be encouraged to start ANC clinics visits attendance early enough so as to ensure that they do not miss out on

IPTp-SP which is beneficial in prevention of Malaria in Pregnancy (MIP) and its adverse health effects like; fetal and maternal anemia, still-birth, premature birth and abortions.

Gestation week of first receipt of IPTp-SP dose was found to be statistically significant towards the uptake of IPTp-SP 3 in this study findings. During multivariate analysis, this variable maintained its significance demonstrating it predicts IPTp-SP utilization during pregnancy after controlling for the confounding effect of other variables in the regression model. Pregnant women who started attending ANC early enough and getting IPTp-SP doses at gestation weeks 14-17 were eight (8) times more likely to receive optimal IPTp-SP (p=0.000) and those of gestation weeks 18-21 were four (4) times more likely to receive optimal IPTp-SP (p=0.000) as when compared to those who began receiving their doses of IPTp-SP in later gestational age (>21). This result is similar to study findings obtained in a study done in Tema Metropolis, Ghana, whereby the expectant women who received optimal uptake of IPTp-SP 3 had begun their ANC attendance earlier in the gestation weeks (Amankwah et al., 2019). These results mean that the earlier the attendance of ANC visits by pregnant mothers during the first initial weeks of their gestation period, the higher the likelihood of optimizing uptake of IPTp-SP and thus therefore expectant women residing in malaria endemic zones should be encouraged to attend ANC clinic early enough in their pregnancy period to achieve optimal uptake. The pregnant women who start on IPTp-SP uptake late in their pregnancy's stages, i.e. 3rd trimester (gestation weeks 25-36 weeks) are more likely to get sub-optimal doses of the same and thus might suffer from MIP and its adverse effects. Receiving IPTp-SP early enough in the gestation weeks is beneficial to both the mother and the unborn foetus, as it protects against maternal anaemia, Malaria in Pregnancy (MIP) and its effects, i.e. still-birth, premature babies and

abortions. Also, as the pregnant women continue with the uptake of IPTp-SP as recommended, they would have helped the nation achieve the desired coverage targeted at by both WHO and MOH.

The total number of Antenatal care (ANC) clinic visits attended up to date of the interview was found to be statistically significant for the optimal uptake of IPTp-SP. During multivariate analysis, this variable maintained its significance demonstrating it predict IPTp-SP utilization during pregnancy after controlling for the confounding effect of other variables in the regression model, i.e. the odds of optimal IPTp-SP uptake was 8.42 times greater in expectant women who attended more than four (>4) ANC visits than those who attended less than four (<4) ANC visits (p=0.000). This results are similar to many previous studies in the past, i.e. the study done in Sabatia sub county in Western Kenya, on the determinants of IPTp-SP uptake, the pregnant women who had ≥4 ANC visits had optimal uptake of IPTp-SP (aOR=16.7, 95% CI=7.9-35.3) (Mutanyi et al., 2021). Similar results were also obtained in Tanzania, (aOR=1.9, 95% CI=1.34-2.83), Tanzania (aOR=3.1, 95% CI=2.1-4.6) and Gabon (Bouyou-Akotet et al., 2013; Mchwampaka et al., 2019; Mushi et al., 2021). Regular attendance of scheduled ANC visits, with more than four ANC visits (>4) equates to achieving optimal uptake of IPTp-SP (>3doses of IPTp-SP). Attendance of more than four ANC visits ensures that in cases where there was a stock out of IPTp-SP, in previous visits, now they would be able to achieve the recommended doses in future as they continue with their regular ANC visits. Thus, in order to ensure no pregnant woman living in malaria endemic regions is at risk of contracting malaria in pregnancy (MIP) and suffer from its complications, continued efficient and effective messaging on the attendance of all ANC visits needs to be promoted.

The health insurance status amongst the pregnant women attending study site was found to have a positive association towards achieving an optimal IPTp-SP uptake (≥3 doses) at the bivariate analysis (p=0.009) even though this was not statistically significant at the multivariate analysis. This result is also consistent with findings from earlier studies that determined that health insurance status of pregnant mothers does in deed influence the uptake of IPTp-SP, i.e.in a study done in Nigeria on use of IPTp-SP, women who had been enrolled in to a health insurance scheme had greater odds of optimal IPTp uptake as compared to those with no any form of health insurance; it was a significant predictor of IPTp optimal usage among the pregnant women studied (Adebayo et al., 2021). Also similar study findings were obtained in Ghana, during a study of the coverage of IPTp amongst women with obstetric referrals, whereby presence of health insurance among the women, was found to be statistically significant with the optimal utilization of IPTp-SP (p=0.01) (Coleman et al., 2020). Having health insurance among pregnant women is presumed to highly motivate pregnant women to attend ANC clinics more frequently than those who do not have insurance at all, in that they are not afraid of unforeseen expenses that might arise whenever they visit the clinics since they (their future health seeking services) are covered. Health insurance cover not only provides security and stability to the insured but also builds confidence in seeking health services whenever one is experiencing some health problem. This explains the reasons as to why more pregnant women need to be enrolled into affordable health cover/insurance to ensure that they never miss out on both ANC visits and other regular health checks, and thus by attending the scheduled Ante natal care (ANC) they would be optimizing IPTp-SP uptake, i.e. would have utilized the minimum three doses of IPTp-SP and maybe a maximum of seven doses.

On the influence of health-conscious actions among expectant women in relation to optimal uptake of IPTp-SP 3, this was also found to have a positive correlation though not statistically significant. Both the health-seeking behaviour of pregnant women and that of their husband or relatives was noted to positively influence optimal IPTp-SP uptake (≥3 doses) (p= 0.003). This result is also in accordance with the findings in earlier studies that determined that influence of friends, relatives and close family members towards health seeking behaviour by expectant women had influence on the optimal utilization of IPTp-SP (Klein et al., 2016). This well explains the famous bible quote, "two are better than one", in that in cases where the pregnant woman would be unwilling to go for the scheduled ANC clinic, the husband would come in handy in convincing her to attend. In giving their pregnant spouses moral, physical and financial support, no pregnant woman would likely miss on the ANC dates and thus by doing so end up optimizing the IPTp-SP uptake. Both influences also show the synergistic effects of two different opinions or ideas when brought together. One or both partners might have previous knowledge concerning health issues and thus when shared with the significant other would ensure appropriate health seeking behaviour. This calls for continued social behaviour change (SBC) messaging to the public on the importance of couples' engagement in health issues rather than leaving it all to mothers (pregnant).

Means of transport used to go for Antenatal care (ANC) visits was also found to be in connection with the optimal utilization of IPTp-SP doses (≥3 doses) even though the results were not statistically significant. Those who used private means had higher odds, i.e. 7.61 times of ANC attendance with uptake of IPTp-SP 3 (p= 0.009) followed by those who used public means of transportation, who had odds of 1.89 in uptake of IPTp-3(p= 0.003) as compared to those who walked to health facilities to seek ANC services. The association between mode of transport and IPTp3 uptake demonstrated a

particularly wide confidence interval for the group using private means of transport. This imprecision is attributable to the small number of women who reported using private vehicles in this rural setting, leading to sparse data and unstable odds ratio estimates. Additionally, the private transport group is highly heterogeneous in terms of socioeconomic characteristics, which may have contributed to further variability in their health-seeking behaviour. The combination of small sample size and unadjusted confounding during bivariate analysis therefore resulted in a wider CI compared to women who walked or used public means, whose larger numbers produced more stable and precise estimates. Therefore, it may be assumed that in cases where health facilities seem far off from residential areas of most pregnant women, distance may act as impediment towards their regular attendance of the scheduled ANC visits, thus, thereby missing out on the IPTp-SP doses uptake. When IPTp-SP is missed out due to this reason in addition to many others, pregnant women and their unborn foetus are at risk of contracting malaria in pregnancy (MIP) and get affected by its various serious complications. No similar study results were found in any of the literature reviewed.

On presence of knowledge pertaining to IPTp-SP, this study results found out that, the pregnant women who had any slightest information pertaining to IPTp-SP had great odds (cOR8.09) of achieving optimal utilization of IPTp-SP than those who had never had any information pertaining to IPTp purpose and utilization even though this finding was not statistically significant. This result is consistent with findings from previous studies that documented that, appropriate and sufficient knowledge about IPTp-SP purpose and utilization increased the odds of achieving optimal IPTp-SP uptake as compared to lack of such knowledge in IPTp. In a cross sectional study done in river state Nigeria, women knowledgeable about IPTp-SP had odds of 22 in optimal uptake

of IPTp-SP as compared to those who were clueless on the same (Darteh et al., 2021). Similar results were also obtained in Sabatia Sub-county in Western Kenya, where maternal knowledge of IPTp-SP was statistically significant for optimal utilization of IPTp-SP (p=<0.001) (Mutanyi et al., 2021). Similar results, showing positive association of information on IPTp-SP and optimization of IPTp-SP were also found in studies done in Nigeria and Mali (Ameh et al., 2016; Sangho et al., 2021). These results justify the importance of sharing and spreading knowledge about health products and services with the public (society), i.e. if one/many knows that adhering to requirements of certain health practices would greatly improve on their lives/health status and that of their future off-springs, then they are more likely to adhere to it religiously. This calls for both the national government and county government to continue with public health sensitization through various media means available.

5.4 Cultural characteristics influencing optimal IPTp-SP uptake

On persons accompanying pregnant women when going for ANC visits, being accompanied by husband to the ANC visit was positively associated with the optimal uptake of IPTp-SP at bivariate analysis as compared with being accompanied by either parents or friends (cOR=4.5, 95% CI=1.5-12.8, p= 0.005). However, this was not statistically significant at the multivariate analysis. This result is also consistent with findings from a study done in one district in Ghana that determined that being accompanied by a male partner to the ANC was associated with the optimal utilization of IPTp-SP (Asiimwe & Anto, 2023). These results, both show how much of a partner (male) support during pregnancy and especially accompanying her to ANC clinic has greater odds of making her complete all the recommended IPTp-doses. The male partner's support, by accompanying/escorting the pregnant women when going for the

ANC visits, plays a big role in the society especially with regards to issues of public health. The accompany given to pregnant women by their spouses makes their ANC visits less tiresome, since they have someone to keep them engaged during the whole process; also during these accompanying sessions, both the pregnant women and spouses get more informed on issues pertaining to health and safety of pregnant women including the importance of IPTp and thus are more likely to ensure uptake of all the recommended doses. In addition, spouses accompanying their female partners, make them feel appreciated, secured and acknowledged as equal partners in the pregnancy, thus therefore the pregnant women would be able to optimize IPTp-SP uptake that will prevent them from MIP and its complications, and by so doing that, they would have helped the country and region at large in achieving the WHO set targets of 80% coverage of IPTp-SP 3.

There was an insignificant correlation between the cultural beliefs of pregnant women and their optimal IPTp uptake. Out of all the respondents interviewed, only one respondent reported to have had some cultural beliefs against IPTp uptake, but nevertheless that never hindered her from fully optimizing IPTp-SP utilization. However, in literature reviewed, some associations were found between the two, i.e. cultural beliefs and the IPTp-SP uptake. In one study done in Tanzania, some pregnant women expressed phobia of attending the ANC clinics due to fear of being seen as boastful by other persons on regular hospital visits and even the phobia of being bewitched by jealous persons deflated their morale thus thereby missing out on scheduled ANC visits thus, ending up not achieving the optimal IPTp-SP uptake (Mubyazi et al., 2014). In Ghana, the social-cultural stigma especially towards the young pregnant women of 18-24 years who drop out of school due to early pregnancies

in conjunction with the male partners' abandonment led to these young pregnant women missing out on scheduled ANC visits and thus thereby ended up receiving sub-optimal IPTp (Aberese-Ako et al., 2021). The requirement of husbands consenting to their wives going to ANC clinics and taking the prescribed drugs at the health facilities also led to some women missing out on taking up the optimal doses of IPTp-SP (Hill et al., 2013). So, even though in this study settings, cultural belief never played part in hindrance of IPTp uptake maybe due to strong call on social behaviour change in the community especially on the uptake of IPTp; it the belief of the principal investigator that some cultural beliefs have been known to hinder the proper utilization of some pertinent health products in a society. Nevertheless, by proper communal engagement through public barazas, road shows, and door to door enlightening, the unfavorable cultural beliefs might be done away with to ensure proper embrace of the various health promotions services and products available for the public within the community.

Belief in IPTp-SP protection against Malaria in Pregnancy (MIP) when used consistently by pregnant women attending antenatal care (ANC) was also found to be positively associated with optimal IPTp uptake at the bivariate analysis (p=0.002) though this was not statistically significant at the multivariate analysis stage (p=0.217). This result is similar to a study done in Nigeria, whereby belief in IPTp effectiveness never played a role in the optimal utilization of IPTp-SP (Okeke et al., 2023). However, this results contradicts findings of a study done in Mali, whereby the belief in IPTp-SP protection was statistically significant {OR= 2.38 (1.24,4.57)} (Sangho et al., 2021). These results demonstrate the critical importance of belief in the health services provided in the society and their actual uptake, in that if clients have confidence in the governmental or non-governmental health services and products, then, they are likely

to go to wherever these services are offered and utilize them appropriately, thus, thereby helping the country/government not only achieve their targeted coverage but also protecting the general public, thus, thereby reducing huge expenses that would have otherwise been incurred in treatment of preventable diseases and burial of lost lives.

5.5 Health facility characteristics influencing optimal IPTp-SP uptake

The effective and efficient operation of the direct observed therapy (DOT) in the study site, i.e. provisional of clean, sufficient glasses and safe clean drinking water played a key role towards the optimal utilization of IPTp-SP, even though this was not yet statistically significant. The odds for optimal IPTp-SP utilization at the bivariate analysis was for clean drinking water (c*OR*=25, *p*=0.000), clean glasses (c*OR*=12, *p*=0.000) and sufficient glasses (c*OR*=4, *p*=0.000). The wide CI for clean water availability in bivariate analysis was likely due to sparse data in the ‘sometimes available’ category, which reduced precision of the estimated association despite the large total sample size. However, these variables were not statically significant when subjected to the multivariate analysis stage. Comparable results were obtained in an investigation done in Nigeria about the barriers and factors to effective IPTp utilization, whereby absence of clean drinking water and clean cups to administer SP in the directly observed therapy (DOT) limited the complete uptake of IPTp-SP (Ogba et al., 2022). Similar results were also found in a study done in Sabatia sub-county, Western Kenya, of which it was established that, there was insignificant correlation between IPTp-SP uptake and water provision (*p*=0.07), clean water (*p*=0.38), clean cups (*p*=0.40) and enough cups (*p*=0.46) (Mutanyi et al., 2020). The results demonstrate the pivotal role that DOT corner plays towards ensuring that all clients partake of given medication while still at the facility, to avoid miss out either due to forgetfulness or accidental loss

of medication while in transit to their residential areas or even when they reach their homesteads.

The attitude of health care workers (HCWs) towards clients visiting health facilities has always had some implication on how the clients respond towards health-seeking practices. When the HWCs attitude is wanting, most clients would rather opt out of seeking essential healthcare in those places where the HWCs with attitude issues are and rather visit a different health facility which has friendlier and understanding HCWs. Thus, therefore, HCWs attitude is key in ensuring that clients achieve their optimal uptake of any medication given, and if HWCs have attitude issues, then, there might be a decline in targeted coverage of various health service interventions offered at those various health facilities.

On the issues of pregnant women being counselled and educated on pregnancy issues by the HCWs, this study found out that, expectant women who confirmed to being educated and counselled by the health care workers (HCWs), were twice more likely to receive optimal IPTp-SP doses as compared to those who confirmed to not being counselled or educated. Though, again, this was only significant at bivariate analysis (p=0.000), and not statistically significant at multivariate analysis. In a similar study done in a private Heath facility in Tema, Metropolis in Ghana, education and the counselling given by the attending midwives to pregnant women during the Antenatal care (ANC) visits on the importance of IPTp-SP was found to be significantly associated with the uptake of IPTp-SP, i.e. those educated and/or counselled, 31.9% took more than three (≥3) doses as when compared to those who were not given any education or counselling on IPTp-SP (13.6%) (p=0.001) (Amankwah et al., 2019). This thus demonstrates the importance of education and counselling services being offered

to clients visiting various health facilities, since these may result in more clients being free with the HCWs, seeking clarifications on pertinent health issues and thus thereby end up utilizing the various health services and products as it is required of them. This would further ensure coverage and uptake of health services as per the guidelines and recommendations of WHO and MOH.

In addition, those pregnant women who were offered an opportunity by the health care workers (HCWs) to ask questions pertaining to their pregnancies and general health, were twice more likely to receive optimal IPTp-SP doses as compared to those who were not given any chance to ask questions. This result too, was only significant at the bivariate analysis (p=0.011) and not statistically significant at the multivariate analysis.

5.6 Limitations

Recall bias on the exact gestation week of pregnancy among pregnant women at the ANC clinic in Nambale Sub-County Hospital (NSCH). However, this was solved by checking on the individual ANC booklets and Hospital register, MOH 405.The study was conducted only at Nambale Sub-County Hospital, which may not represent pregnant women in other facilities in Nambale Sub-County, or private clinics or the general community, thus limiting the generalizability of the findings.

In addition, the study only explored client level perspectives leaving out health system variables (Key informant interviews –KII) that significantly contribute to deficiencies in health service delivery. Also pregnant women who were in the 1st and 2nd trimester, allergic to sulfonamides were excluded yet these groups may have different characteristics affecting representativeness.

As a cross-sectional study, our factors identified may not necessarily represent causal factors as may better be identified through a cohort study following clients' /study participants over time, however, the factors we identified are in line with other studies on IPTp utilization. However, we do believe that our findings generated evidence on the optimal IPTp-service utilization and will therefore guide future policy direction not only in Busia County, but also nationally and regionally

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This research aimed at looking at the utilization of IPTp-SP 3 among pregnant women of 36+ gestation weeks attending Nambale Sub-County hospital in Busia County and looked at various factors influencing the uptake of IPTp-SP. From the study findings, the utilization of IPTp-SP3, it is evidenced that the proportion of women receiving optimal IPTp-SP (> 3 doses of SP) was at 60%, which falls way below the WHO recommended levels and the target of the country's program (MOH Kenya) set at 80%. The sociodemographic factors influencing IPTp3 utilization were the pregnant woman being 21-30 years old, pregnant woman having attained a tertiary education level as the highest and being either self-employed or employed.

The cultural factors influencing IPTp3 utilization were pregnant women being accompanied by spouses to the ANC clinic and either the spouse or herself being a decision maker in their house.

The individual factors influencing IPTp3 utilization were pregnant women having a health insurance cover, being aware of IPTp purpose and use, believing in IPTp protection, starting of ANC attendance and IPTp utilization as gestation weeks of 13-16 weeks and attending at least four or more (≥4) ANC clinics.

The health facility factors influencing IPTp3 utilization were the presence of a functional DOT corner, the HCWs counselling pregnant women and also availing time for questioning on health issues to the pregnant women.

The study attempted to identify the key bottlenecks from the clients' perspective regarding the acceptability and uptake of IPTp-SP during pregnancy. These findings

add to the existing pool of evidence of IPTp-SP utilization and forms the basis for designing and prioritizing of new or existing high impact interventions. The study shows that while associations between potential determinants and IPTp-SP 3 uptake were observed, most of these independent variables did not show statistical significance to predict the optimal utilization of the service. In contrast to findings from previous studies that IPTp-SP 3 is dependent on socio-demographic factors, this study did not find such findings. Rather, findings from this study suggest that optimal IPTp-SP utilization is dependent on individual factors like; the total ANC visits attended by the pregnant women, and the gestation weeks of first IPTp-SP uptake, which were found to be statistically significant.

Based on comparisons made with previous studies, these findings highlight contextual variations and similarities regarding obstacles to access, delivery and utilization of IPTp-SP across different socio-economic and geographic borders. These findings provide important insights on the delivery and utilization of the intervention, however, while they may be generalized to the study area, similar conclusions may not be applicable to the whole or parts of the country. Therefore, to fully understand the influence of different determinants of optimal IPTp-SP utilization, a large scale community based study is proposed. To achieve maximum impact on IPTp-SP coverage, stakeholders should also conduct thorough barrier analysis before settling for specific bottlenecks to address. For the individual factors that show association with IPTp-SP utilization, there is a need for stakeholders to intensify health communication programs to create demand and build trust for this life saving intervention.

Past efforts have mostly focused on investigating the influence of attitude, beliefs, knowledge and practices at community on IPTp-SP optimization. However, it is equally paramount to explore the effect of these variables on service delivery from the policy makers' and health practitioners' perspective (WHO, 2014). Findings from such studies would help identify the critical barriers to national level planning, decision making and overall performance of health care workers in terms of IPTp-SP. In addition, the results can provide insights into existing barriers that hinder adapting suitable, context specific and needs-based strategies that accelerate effective coverage of IPTp-SP.

6.2 Recommendations

To improve uptake of IPTp-SP3 at Nambale Sub-County Hospital, a coordinated multi-level approach should be implemented. The Sub-County Health Management Team (SCHMT) and facility in-charge should ensure early ANC initiation through community sensitization led by Community Health Volunteers (CHVs), with emphasis on booking before 12 weeks of gestation and completing at least four ANC visits. The ANC clinic staff and nurses should strengthen routine, client-centered counselling on IPTp-SP at every ANC contact, address myths and misconceptions, actively involve male partners, and ensure consistent implementation of DOT by maintaining a functional DOT corner. The hospital management and county malaria coordinator should provide regular refresher training and supportive supervision to improve staff attitude and adherence to national IPTp guidelines, while ensuring uninterrupted availability of SP and basic DOT supplies. Additionally, the county health department should support enrollment of pregnant women into health insurance schemes and facilitate reminder and default-tracing mechanisms through CHVs to enhance continuity of ANC attendance and completion of recommended IPTp doses.

REFERENCES

Aberese-Ako, M., Magnussen, P., Ampofo, G. D., Gyapong, M., Ansah, E., & Tagbor, H. (2021). An ethnographic study of how health system, socio-cultural and individual factors influence uptake of intermittent preventive treatment of malaria in pregnancy with sulfadoxine-pyrimethamine in a Ghanaian context. *PLoS ONE*, *16*(10 October), 1–30.

ACERWC. (2022). *TEENAGE PREGNANCY IN AFRICA*.

Addai-Mensah, O., Annani-Akollor, M. E., Fondjo, L. A., Sarbeng, K., Anto, E. O., Owiredu, E. W., & Arthur, S. N. (2018). Regular antenatal attendance and education influence the uptake of intermittent preventive treatment of malaria in pregnancy: A cross-sectional study at the University Hospital, Kumasi, Ghana. *Journal of Tropical Medicine*, *2018*.

Adebayo, Y. R., Oyeleye, O. J., Oluwatope, O. B., Ilesanmi, B. B., & Oni, T. O. (2021). *Using Andersen ' s Behavioural Model of Health Services use to Examine usage of Intermittent Preventive Treatment of Malaria in Pregnancy in*. 1–23.

Amankwah, Selina, Anto, & Francis. (2019). *Factors Associated with Uptake of Intermittent Preventive Treatment of Malaria in Pregnancy: A Cross-Sectional Study in Private Health Facilities in Tema Metropolis , Ghana*. *2019*.

Ameh, S., Owoaje, E., Oyo-Ita, A., Kabiru, C. W., Akpet, O. E. O., Etokidem, A., Enembe, O., & Ekpenyong, N. (2016). Barriers to and determinants of the use of intermittent preventive treatment of malaria in pregnancy in Cross River State, Nigeria: A cross-sectional study. *BMC Pregnancy and Childbirth*, *16*(1), 1–9.

Ameyaw, Kwabena, & Edward. (2022). Uptake of intermittent preventive treatment of malaria in pregnancy using sulfadoxine - pyrimethamine (IPTp - SP) in Uganda : a national survey. *Malaria Journal*, 1–10.

Asiimwe, N., & Anto, F. (2023). Factors associated with optimal uptake of sulphadoxine-pyrimethamine in pregnancy: a facility-based cross-sectional study in the Ningo-Prampram district of Ghana. *Research Square*, 1–23.

Babaleb, E. N. and M. S. (2020). Knowledge and Utilisation of Intermittent Preventive Treatment of Malaria among Pregnant Women in Muramvya Health District, Burundi, 2018. *The East Africa Health Research Journal*, *4*.

Bauserman, M., Conroy, A. L., North, K., Patterson, J., Bose, C., & Meshnick, S. (2019). An overview of malaria in pregnancy. *Seminars in Perinatology*, *43*(5), 282–290.

Bouyou-Akotet, M. K., Mawili-Mboumba, D. P., & Kombila, M. (2013). *Antenatal care visit attendance, intermittent preventive treatment and bed net use during pregnancy in Gabon*.

Campbell, B., Martinelli-heckadon, S., & Wong, S. (2013). *Motherhood in Childhood*.

Chuma, J., Okungu, V., & Molyneux, C. (2010). Barriers to prompt and effective malaria treatment among the poorest population in Kenya. *Malaria Journal*, *9*(1), 1–14.

Coleman, A., Coleman, M. A., Arhinful, D. K., Grobusch, K. K., Ansah, E. K., & Koram, K. A. (2020). Coverage of intermittent preventive treatment of malaria in pregnancy (IPTp) influences delivery outcomes among women with obstetric referrals at the district level in Ghana. *Malaria Journal*, 1–13.

Darteh, E. K. M., Dickson, K. S., Ahinkorah, B. O., Owusu, B. A., Okyere, J., Salihu, T., Bio Bediako, V., Budu, E., Agbemavi, W., Edjah, J. O., & Seidu, A. A. (2021). Factors influencing the uptake of intermittent preventive treatment among pregnant women in sub-Saharan Africa: a multilevel analysis. *Archives of Public Health*, *79*(1), 1–9.

Darteh1, Maafo, E. K., Dickson1, Sekyi, K., Ahinkorah2, Opoku, B., Owusu1, Afriyie, B., Okyere1, Joshua, Salihu1, Tarif, Bediako1, Bio, V., Budu1, Eugene, Agbemavi1*, W., Seidu4, Edjah3, J. O., & Abdul-Aziz, A. (2021). Factors influencing the uptake of intermittent preventive treatment among pregnant women in sub-Saharan Africa: a multilevel analysis. *Archives of Public Health , BMC*, *79*(182), 2, 9.

Dellicour, S., Hill, J., Bruce, J., Ouma, P., Marwanga, D., Otieno, P., Desai, M., Hamel, M. J., Kariuki, S., & Webster, J. (2016). Effectiveness of the delivery of interventions to prevent malaria in pregnancy in Kenya. *Malaria Journal*, *15:221*.

Dept Registration, C. (2024). *Kenya Vital Statistics*.

Doku, D. T., Zankawah, M. M., & Adu-Gyamfi, A. B. (2016). Factors influencing dropout rate of intermittent preventive treatment of malaria during pregnancy. *BMC Research Notes*, *9*(1), 1–7.

Exavery, A., Mbaruku, G., Mbuyita, S., Makemba, A., Kinyonge, I. P., & Kweka, H. (2014). Factors affecting uptake of optimal doses of sulphadoxine-pyrimethamine for intermittent preventive treatment of malaria in pregnancy in six districts of Tanzania. *Malaria Journal*, 13(1), 1–9.

Fried, Michal, Duffy, & E, P. (2017). *Malaria during Pregnancy*. https://doi.org/10.1101/cshperspect.a025551

Hill, J., Hoyt, J., van Eijk, A. M., D'Mello-Guyett, L., ter Kuile, F. O., Steketee, R., Smith, H., & Webster, J. (2013). Factors Affecting the Delivery, Access, and Use of Interventions to Prevent Malaria in Pregnancy in Sub-Saharan Africa: A Systematic Review and Meta-Analysis. *PLoS Medicine*, *10*(7).

Hill, J., Kayentao, K., Achieng, F., Diarra, S., Dellicour, S., Diawara, S. I., Hamel, M. J., Ouma, P., Desai, M., Doumbo, O. K., Ter Kuile, F. O., & Webster, J. (2015). Access and use of interventions to prevent and treat malaria among pregnant women in Kenya and Mali: A qualitative study. *PLoS ONE*, *10*(3).

Jhpiego. (2021). *Prevention and Control of Malaria in Pregnancy Reference Manual*. www.jhpiego.org

KHIS. (2023). *No Title*. https://hiskenya.org/

Kibusi, M., S., Kimunai, Eunice, Hines, & S., C. (2015). Predictors for uptake of intermittent preventive treatment of malaria in pregnancy (IPTp) in Tanzania. *BMC Public Health*, *15*(1), 1–8.

Klein, M. C., Harvey, S. A., Diarra, H., Hurley, E. A., Rao, N., Diop, S., & Doumbia, S. (2016). "There is no free here, you have to pay": actual and perceived costs as barriers to intermittent preventive treatment of malaria in pregnancy in Mali. *Malaria Journal*, *15*(1), 1–8. -0

Martin, M. K., Venantius, K. B., Patricia, N., Bernard, K., Keith, B., Allen, K., Godfrey, A., & Twesigye Rogers, K. T. D. and B. M. D. (2020). Correlates of uptake of optimal doses of sulfadoxine-pyrimethamine for prevention of malaria during pregnancy in East-Central Uganda. *Malaria Journal*, *19:153*.

Mchwampaka, W. M., Tarimo, D., Chacky, F., Mohamed, A., Kishimba, R., & Samwel, A. (2019). Factors affecting uptake of ≥ 3 doses of Sulfadoxine-Pyrimethamine for malaria prevention in pregnancy in selected health facilities, Arusha region, Tanzania. *BMC Pregnancy and Childbirth*, *19*(1), 1–8.

Mkubwa, B., Kagura, J., Chirwa, T., Ibisomi, L., & Kinyanjui, S. (2022). Determinants of utilization of malaria preventive measures during pregnancy among women aged 15 to 49 years in Kenya: an analysis of the Malaria Indicator Survey 2020. *Malaria Journal*, *21*(1), 1–9.

MoH. (2021). *2020 Malaria Indicator Survey Report*.

MoH. (2023). *MALARIA*. MoH. https://www.afro.who.int/sites/default/files/2025-03/Kenya Malaria Strategy %7C 2023-2027.pdf

MOPHS. (2016). President's Malaria Initiative Kenya: Malaria Operational Plan FY 2016. *President's Malaria Initiative*, 1–75. https://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy-15/fy-2015-nigeria-malaria-operational-plan.pdf?sfvrsn=6

Mubyazi, G. M., Bloch, P., Magnussen, P., Olsen, Ø. E., Byskov, J., Hansen, K. S., & Bygbjerg, I. C. (2010). Women's experiences and views about costs of seeking malaria chemoprevention and other antenatal services: A qualitative study from two districts in rural Tanzania. *Malaria Journal*, *9*(1), 1–13.

Mubyazi, M., G., Bloch, & Paul. (2014). Psychosocial, behavioural and health system barriers to delivery and uptake of intermittent preventive treatment of malaria in pregnancy in Tanzania - Viewpoints of service providers in Mkuranga and Mufindi districts. *BMC Health Services Research*, *14*.

Mushi, V., Mbotwa, C. H., Zacharia, A., Ambrose, T., & V., M. F. (2021). *Predictors for the uptake of optimal doses of sulfadoxine-pyrimethamine for intermittent preventive treatment of malaria during pregnancy in Tanzania: further analysis of the data of the 2015–2016 Tanzania demographic and health survey and malaria indicat*. *20;75*.

Mutanyi, A, J., Onguru, O, D., Ogolla, O, S., Adipo, & B, L. (2020). *Improvement cues of lesion absorption using the adjuvant therapy of traditional Chinese medicine Qinbudan tablet for retreatment pulmonary tuberculosis with standard anti-tuberculosis regimen*.

Mutanyi, J. A., Onguru, D. O., Ogolla, S. O., & Adipo, L. B. (2021). Determinants of the uptake of intermittent preventive treatment of malaria in pregnancy with sulphadoxine pyrimethamine in Sabatia Sub County, Western Kenya. *10:106*.

Ogba, P., Baumann, A., Chidwick, H., Banfield, L., & DiLiberto, D. D. (2022). Barriers and facilitators to access and uptake of intermittent preventive treatment with sulfadoxine-pyrimethamine among pregnant women in Nigeria: a scoping review. *MalariaWorld Journal*, *13*, 4.

Okeke, G., Id, K., Msafiri, J., Id, F., Ibisomi, L., Chirwa, T., & Kagura, J. (2023). *PLOS GLOBAL PUBLIC HEALTH Factors associated with the uptake of Intermittent Preventive Treatment (IPTp-SP) for malaria in pregnancy : Further analysis of the 2018 Nigeria Demographic and Health Survey*. 1–20.

S.Dunn, Julliana, & Nour. (2009). *Malaria and Pregnancy: A Global Health Perspective*. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2760896/pdf/RIOG002003_0186.pdf

Sangho, O., Tounkara, M., Whiting-Collins, L. J., Beebe, M., Winch, P. J., & Doumbia, S. (2021). Determinants of intermittent preventive treatment with sulfadoxine–pyrimethamine in pregnant women (IPTp-SP) in Mali, a household survey. *Malaria Journal*, *20*(1), 1–11.

Sinden, E, R., Gilles, & M, H. (2002). *Essential Malariology*.

Stephen, A. A. I., Wurapa, F., Afari, E. A., Sackey, S. O., Malm, K. L., & Nyarko, K. (2016). Factors influencing utilization of intermittent preventive treatment for pregnancy in the Gushegu district, Ghana, 2013. *Pan African Medical Journal*, *25*(Supp 1), 6–9.

Takem, Ndip, E., D'Alessandro, & Umberto. (2013). Malaria in Pregnancy. *Mediterr J Hematol Infect Dis 2013; 5; Open Journal SystemMEDITERRANEAN JOURNAL OF HEMATOLOGY AND INFECTIOUS DISEASES*, *2035–3006*.

Thiam, S., Kimotho, V., & Gatonga, P. (2013). Why are IPTp coverage targets so elusive in sub-Saharan Africa? A systematic review of health system barriers. *Malaria Journal*, *12*(1), 1–7.

Tran, E. E., Tran, E. E., Cheeks, M. L., Kakuru, A., Muhindo, M. K., Natureeba, P., Nakalembe, M., Ategeka, J., Nayebare, P., Kamya, M., Havlir, D., Feeney, M. E., Dorsey, G., & Gaw, S. L. (2020). The impact of gravidity, symptomatology and timing of infection on placental malaria. *Malaria Journal*, *19*(1), 1–11.

United Nations. (2020). *Fertility among Young Adolescents at Ages 10-14 Years - A global assessment Fertility among Young Adolescents*.

WHO. (2014). WHO policy brief for the implementation of intermittent preventive treatment of malaria in pregnancy April 2013 (revised January 2014). *WHO Department of Maternal, Newborn, Child and Adolescent Health*, *October 2012*, 1–13. http://whqlibdoc.who.int/hq/2001/WHO_RHR_01.30.pdf

WHO. (2021). *WHO policy brief for the implementation of intermittent preventive treatment of malaria in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP)*. https://www.who.int/publications/i/item/WHO-HTM-GMP-2014.4

WHO. (2022a). *World malaria report 2022*.

WHO. (2022b). *World malaria report 2022*.

Yaya, S., A.Uthman, Amouzou, A., & G.Bishwajit. (2018). *Use of Intermittent Preventive Treatment among Pregnant Women in Sub-Saharan Africa : Evidence from Malaria Indicator Surveys*.

APPENDICES

Appendix 1: Individual Questionnaire

Interviewer's Name……

Phone Contact……..……..…….

Date……..……..……

Interviewee's Name…….…….

Interviewee's Unique identifier…….

Interviewee's Guardian/ Parents Name…….…….

Phone contact of interviewees/Guardian……..……..……..……..

Physical address ……..

Age of interviewee …….

What gestation week are you? ……

PART I: SOCIODEMOGRAPHIC FACTORS OF THE RESPONDENT

Do You have any insurance type? Yes [ ] No [ ]

Which insurance type is it? NHIF [ ] Linda Mama [ ] Others [ ]

What is your Marital status? Married [ ] Divorced [ ] Separated [ ] Single [ ] Student [ ]

Which family structure do are you in?

Nuclear family [ ] Single parent Family [ ] Extended family [ ] Same-sex Family [ ]

What religion do you attend?

Atheist [ ] Catholic [ ] Islam [ ] Protestant [ ] Buddhist [ ] others [ ]

What is the highest level of education have you attended?

None [ ] Primary [ ] Secondary school [ ] Tertiary [ ]

What is your Occupation?

Student [ ] Unemployed [ ] S e l f Employed [ ] Employed [ ] Others [ ]

What is the Occupation of your Husband?

Student [ ] Unemployed [ ] S e l f Employed [ ] Employed [ ] Others [ ]

Where do you reside? Rural [ ] Urban [ ] semi-urban [ ]

How long does it take you to access nearest health facility for ANC services? ……

Does this affect you regular attendance of ANC visits? YES [ ] NO [ ]

Who influences decision-making in your household?

Self [ ] Husband [ ] Both husband and Self [ ] Parents [ ]

Are there cultural beliefs concerning attending ANC clinics? No [ ] Yes [ ]

What are these beliefs?.....

Does anyone accompany you during ANC visits? Yes [ ] No [ ]

Who accompanies you when visiting health facilities for ANC clinic visits?

Parents [ ] Husband / spouse[ ] Other family members [ ] Neighbor's [ ] Friends [ ]

What means of transport do you use to reach health facility for ANC clinic?

Walking [ ] Private Means [ ] Public Means [ ]

What is the average time spent during ANC visit? 1 hour [ ] 1-2 hours [ ] 3+hours |

Does this affect your regular attendance of ANC Visits? Yes [ ] No [ ]

Which gravida are you? Primigravida [ ] Multigravida [ ]

Which Para are you? Nulliparous [ ] Primipara [ ] Multipara [ ]

At what gestation weeks did you start attending the 1st ANC clinic?

≤12 weeks [ ] 13-16 weeks [ ] 17-20 weeks [ ] ≥ 21weeks [ ]

How many ANC clinic visits have you attended so far up to date? 1 [ ] 2 [ ] 3 [ ] ≥3

PART II: KNOWLEDGE OF MALARIA IN PREGNANCY AND ITS COSEQUENC

Have you heard of the disease Malaria? Yes ( ) No ( )

How does one contract Malaria ?

I don't know ( )

Through the bite of an infected mosquito-female anopheles mosquito ( )

Through blood transfusion with infected blood ( )

What signs and symptoms show that you have malaria

Fever ( ) Chills ( ) Headache ( ) Vomiting ( ) Nausea ( ) Fatigue ( ) Diarrhoea ( )

Have you ever contracted Malaria in pregnancy? Yes ( ) No ( )

Did you get a laboratory test to confirm the same? Yes ( ) No ( )

What was the result of the Laboratory test? Negative ( ) Positive ( )

Where did you get treatment for Malaria?

Private chemist

Government facility

Private Hospital or faith-based facility

Herbalist or traditional healers

What would Malaria in pregnancy cause

I don't know ( ) Abortion ( ) Still birth ( ) Retarded fetal growth ( ) Pre-mature birth ( )

In what ways can one prevent malaria in pregnancy

I don't know

Sleeping under treated mosquito nets every single night

Regular uptake of IPTp-SP

Clearing of surrounding that may act as mosquito habitats

Wearing of protective clothing during mosquito biting hours

Use of insecticides in the house or homes

PART III: KNOWLEDGE ON IPTp-SP

Do you any information pertaining to IPTp uptake? Yes ( ) No ( )

Which source did you get this information from?

Health facilities during ANC visit

Neighbours and friends

Social media, i.e. radios, TVs etc.

Community Health Volunteers (CHVs) and Community Health Promoters (CHPs)

Social places, i.e. worship places, chief barazas, market areas

What type of information did you get?

[ ] It prevents Malaria and its consequences for pregnancy

[ ] One should take a minimum of doses (3 tablets per dose) & a maximum of 7 doses of IPTp-SP

[ ] The initial first dose to be taken at beginning of the second trimester(>gestation weeks 14)

[ ] There should be a 4 weeks spacing between each successive dose of IPTP-SP uptake

Do you believe in IPTp-SP as a protective measure against complications of Malaria in pregnancy?

Not sure [ ] Agree [ ] Disagree [ ]

Did you receive any IPTp-SP doses? Yes ( ) No ( )

At what gestation weeks did you start receiving the 1st IPTp-SP Doses?

Confirm with ANC booklet

14 – 17 gestation weeks [ ] 18 – 21 gestation weeks [ ] ≥ 21 gestation weeks [ ]

Did you receive at least 3 doses of IPTp-SP? Yes ( ) No ( )

How many IPTp-SP doses have you taken so far? * Confirm with ANC booklet

1 dose [ ] 2 -3 doses [ ] >3 doses [ ]

What made you take less than 3 doses of IPTp-SP?

Started late ANC clinic visits and thus missed on some doses [ ]

I was on another preventive treatment, i.e. cotrimoxazole prophylaxis (CTX), etc.

Missed the scheduled ANC clinic dates and thus missed timely intakes [ ]

Was not given doses at the facility [ ]

There were no supplies of the same at the facility during my ANC visits ( )

No staff was available to supervise uptake of the same, thus missed out [ ]

I disliked the tablets, thus, never consumed them despite being given [ ]

I feared the side effects following of the drugs, i.e. nausea, vomiting, dizziness, allergic reactions, etc. thus never took them [ ]

I was given, but forgot to take or even misplaced them since I never took them while at the facility ( )

I was from a county that doesn't implement IPTp but now I am resident of this county ( )

What made you take more than 3 doses of IPTp-SP

Started ANC clinic dates earlier in the gestation weeks [ ]

Never missed any ANC clinic dates [ ]

My healthcare givers informed of the dire consequences of missing out on taking medication [ ]

Presence of IPTp at the health facility

Previous knowledge of importance of uptake of IPTp-SP

Presence of active DOT corners for ease of uptake of doses, thus avoiding miss outs.

PART IV: HEALTH SERVICE CHARACTERISTICS ASSOCIATED WITH UPTAKE OF IPTp-SP

Was clean water ever provided at the facility for IPTp doses uptake?

Always **[ ]** **Sometimes [ ]** **Never [ ]**

Were clean cups/glasses ever provided at the facility for IPTp doses uptake?

Always **[ ]** **Sometimes [ ]** **Never [ ]**

Were the cups/glasses provided sufficient for all to use?

Always **[ ]** **Sometimes [ ]** **Never [ ]**

Do the Health-care workers (HCWs) do the following to you pregnant women?

**Read the list to them

Greets the pregnant women warmly **[ ]**

Spends enough time with each pregnant mother

Counsels/educates pregnant women on IPTp benefits

Gives pregnant women chance to ask questions pertaining to their pregnancy

Informs us (pregnant women) of their rights to accept or decline certain medication due to medical reasons/cultural beliefs.

Has the behaviour of Health-care workers (HCWs) during ANC visits ever influenced your attendance of ANC visits Yes ( ) No ( )

If YES, how did it affect you? …….

Appendix 2A: Consent Form

Interviewer's Name……..…….

Date……

Title of Study: The Utilization of Intermittent Preventive Treatment of Malaria In Pregnancy In Nambale Sub-County Hospital, Busia County, Kenya

Introduction:

I am from the Division of National Malaria Control Program (NCMP) and a resident of the Field Epidemiology and Laboratory Training Program (FELTP). I am going to ask you a few questions concerning your knowledge about the uptake of Intermittent preventive treatment of Malaria in pregnancy and get to know how many doses of IPTp-SP you have had so far.

Purpose of the study:

To get information on the start of ANC clinic visits. Know how many IPTp-SP has been offered to the ANC clients. Get to know what factors influence the uptake of IPTp-SP. Abstract information on the knowledge gap on IPTp uptake. The research results will provide guidelines for ensuring that IPTp-SP uptake and coverage is well done to avoid missed opportunities. The findings will also help inform the Ministry of Health (MoH) at the National, County governments and other stakeholders on the strengths and weaknesses identified and areas that need improvement.

Expectations of the study:

If you agree to participate in this study, I would like to ask you some few questions using a standardized questionnaire. This will take between 15 to 30 minutes to complete. I expect you to be open and honest with your answers, as it will not only help me in my studies, but it will also be of importance to you, the hospital, community, and country at large. No individual information will be shared without your consent. Your participation in this survey is entirely voluntary, and should you feel like not proceeding further you are free to opt-out. I also expect some few questions from you, should you not understand any statements here-in.

Risks:

There are no envisaged risks to you as a participant in this study.

Benefits:

The information obtained will help me to understand any shortcomings if any, that are contributing to missed opportunities for uptake of IPT-SP. Two, I will further educate you on the importance of regular ANC visits and prompt intake of IPT-SP. The results of this study will further form a basis for proper implementation of IPTp-SP coverage and uptake and also come up with extra recommendations for the same.

Confidentiality:

Any information obtained from you will be kept confidential and used solely for purposes of this research only. The results of this research may be published in scientific journals or be presented at scientific conferences, but your identity will remain undisclosed.

Compensation:

If you accept to participate in this study, there will be no participation fee.

Alternatives:

You have a choice to agree or decline to participate in this study. If you opt not to participate in the survey, you can withdraw your participation at any time if you so wish, without any consequences whatsoever.

Approval of the study: This study will be ratified by the Moi Teaching and Referral Hospital Ethics and Research Committee and the Board of Postgraduate studies Moi university P.O. Box 3-30100 Eldoret, Kenya

In case of any further questions or concerns, you can address them to the directors of the above institution

Consent Signing (Adults/Emancipated Minors):

Emancipated Minors

Minors: Is any person who has not attained the full age of legal responsibility, in Kenyan context, below 18 years' old

Emancipated minor: legal way for children to become adults before they attain 18 years wither through; marriage or attaining status of self-reliance (financially). Once a child is emancipated his parents do not have control//custody over her/him any more

I am well aware of the study's risks and benefits. I had the opportunity to ask questions which were answered satisfactorily. I also understand that I am free to choose not to take part in this survey at any time and that if I decline, it will not affect my rights, position, or privileges or my family in any way. I, therefore, consent to participate in this study voluntarily.

Name of participant……..……..……

Age (in years): ……

Marital Status (Single/Married/divorced/widowed) ……

Whom do you stay with (husband/parents/guardian) ……

Are you financially independent or financially dependent on parents /guardian (YES/NO)…….

Signature/ thumbprint of participant……..…Date……

Name of researcher (principal Investigator) /research assistant……...

Signature…… Date ……

Appendix 2B: Assent Form

Interviewer's Name…….

Date……..…

Title of Study: The Utilization of Intermittent Preventive Treatment of Malaria in Pregnancy In Nambale Sub-County Hospital, Busia County, Kenya

Introduction:

I am from the Division of National Malaria program (DNMP) and a resident of the Field Epidemiology and Laboratory Training Program (FELTP). I am going to ask you a few questions concerning your knowledge about the uptake of Intermittent preventive treatment of Malaria in pregnancy and get to know how many doses of IPTp-SP you have had so far.

Purpose of the study:

To get information on the start of ANC clinic visits. Know how many IPTp-SP has been offered to the ANC clients. Get to know what factors influence the uptake of IPTp-SP. Abstract information on the knowledge gap on IPTp uptake. The research results will provide guidelines for ensuring that IPTp-SP uptake and coverage is well done to avoid missed opportunities. The findings will also help inform the Ministry of Health (MoH) at the National, County governments and other stakeholders on the strengths and weaknesses identified and areas that need improvement.

Expectations of the study:

If you agree to participate in this study, I would like to ask you some few questions using a standardized questionnaire. This will take between 15 to 30 minutes to complete. I expect you to be open and honest with your answers, as it will not only help me in my studies, but it will also be of importance to you, the hospital, community, and country at large. No individual information will be shared without your

consent. Your participation in this survey is entirely voluntary, and should you feel like not proceeding further you are free to opt-out. I also expect some few questions from you, should you not understand any statements here-in.

Risks:

There are no envisaged risks to you as a participant in this study.

Benefits:

The information obtained will help me to understand any shortcomings if any, that are contributing to missed opportunities for uptake of IPT-SP. Two, I will further educate you on the importance of regular ANC visits and prompt intake of IPT-SP. The results of this study will further form a basis for proper implementation of IPTp-SP coverage and uptake and also come up with extra recommendations for the same.

Confidentiality:

Any information obtained from you will be kept confidential and used solely for purposes of this research only. The results of this research may be published in scientific journals or be presented at scientific conferences, but your identity will remain undisclosed.

Compensation:

If you accept to participate in this study, there will be no participation fee.

Alternatives:

You have a choice to agree or decline to participate in this study. If you opt not to participate in the survey, you can withdraw your participation at any time if you so wish, without any consequences whatsoever.

Approval of the study: This study will be ratified by the Moi Teaching and Referral Hospital Ethics and Research Committee and the Board of Postgraduate studies Moi university P. O. Box 3-30100 Eldoret, Kenya

In case of any further questions or concerns, you can address them to the directors of the above institution.

Assent Signing

I am well aware of the study's risks and benefits. I had the opportunity to ask questions which were answered satisfactorily. I also understand that I am free to choose not to take part in this survey at any ti and that if I decline, it will not affect my rights, position, or privileges or my family in any way. I, theref assent to participate in this study voluntarily

Name of participant……..……..……

Age (in years): ……..

Signature/ thumbprint of participant……..…Date……

Name of Guardian/Parent……..……..……

Signature/ thumbprint of Guardian/Parent……Date……

Name of researcher/research assistant……..……...

Signature…….. Date ……

Appendix 3: Dummy Tables Table 1: Biodata information

Variables	Frequencies (n=384)	Percentages (%)
Age(years)		
<18		
19--24		
25-30		
31-36		
36-49		

Table 2: Sociodemographic information

Variables	Frequencies (n=384)	Percentages (%)
Education Level		
None		
Primary		
Secondary		
Tertiary		
Occupation		
Student		
Unemployed		
Employed		
Self-employed		
Marital status		
Single		
Married		
Widowed		
Separated		
Divorced		

Religion Catholic Protestant Islam Hinduism Atheist		
Family structure Nuclear family Same-sex family Single-parent family Step-family Extended family		
Residence Urban Rural		
Parity 0 1 2-4 5+		
Gravidity Gravida 1 Gravida >2		
Insurance Yes No		

Table 3: Risk Factor Characteristics

Variables	**Frequencies (n=384)**	**Percentages (%)**
Timing of 1st ANC visit		
1st trimester		
2nd trimester		
3rd trimester		
Number of ANC Visits		
<4		
≥4		
Drug information by nurses		
No information Given		
Information Given		
Drug side effects		
Nausea		
Vomiting		
Dizziness		

Table 4: Bivariate Analysis of factors associated with IPTp-SP coverage, NSCH (n=384)

No	Variable	Frequency (n=384) (%)	Sub-optimal dose 1-2	*Optimal dose 3+*	*p- value*	cOR	(95% CI
1.	**ANC attendance** <4 ≥4						
2.	**Age(years)** <18 19—24 25-30 31-36 36-49						
3	**Education Level** None Primary Secondary Tertiary						
4	**Occupation** Student Unemployed Employed Self-employed						
5.	**Religion** Catholic Protestant Islam Hinduism Atheist						
6.	**Marital status** Single Married Widowed Separated Divorced						
7.	**Residence** Urban Rural						
8.	**Parity** 0 1 2-4 5+						

Table 5: Multivariable logistic regression analysis

No	Variable	Frequency (%)	Sub-optimal dose 1-2	*Optimal dose 3+*	*p-value*	cOR	(95% CI	*p-value*	AOR	(95% CI
1.	**ANC attendance** <4 ≥									
2.	**Age(years)** <18 19—24 25-30 31-36 36-49									
3	**Education Level** None Primary Secondary Tertiary									
4	**Occupation** Student Unemployed Employed Self-employed									
5.	**Religion** Catholic Protestant Islam Hinduism Atheist									
6.	**Marital status** Single Married Widowed Separated Divorced									
7.	**Residence** Urban Rural									
8.	**Parity** 0 1 2-4 5+									

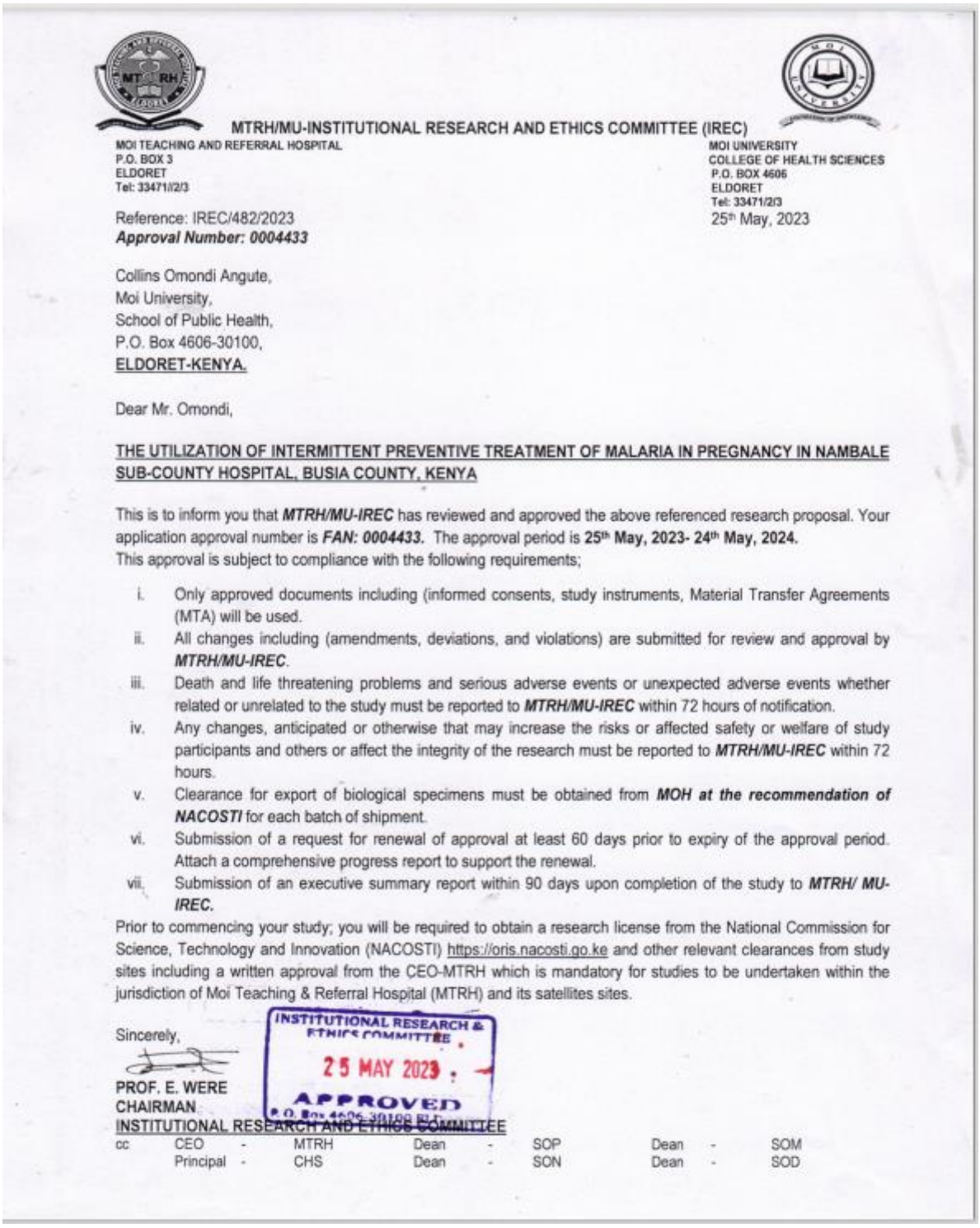
Appendix 4: Work plan/time plan

TASK	1st-2nd Aug 2022	3rd Aug 2022	20th Sept-30th Nov '22 2022	1st Dec to 31st Jan 2023	1st March-June 30th 2023	July-Sept 2023	Oct 2023	Aug 2024	Dec 2025
Proposal writing									
Proposal presentation to faculty									
Proposal presentation to supervisors and waiting for approvals									
Proposal presentation to IREC & NACOSTI and waiting for approvals									
Data collection									
Data Analysis & interpretation									
Mock defense									
Final defense									
Graduation									

Appendix 5: BUDGET

No.	BUDGET ITEM	UNIT COST@(KSHS)	SUBTOTAL (KSHS)
1.	Plagiarism check using Turnitin- 3 times	1500	4,500
2.	Accommodation for the principal investigator(researcher) - 88 days	8,500	748,000
3.	Research assistant (1) lunch allowance 88 days	1,000	88,000
4.	Traveling expenses for the researcher to & from Nambale- two-way trip	2,500	5,000
5.	Pens – 10	20	200
6.	Reams of photocopy papers- 2 reams	500	1,000
7.	IREC Fees	2,500	2,500
8.	NACOSTI fees	2,500	2,500
9.	Printing costs (consent forms, IREC &NACOSTI letters) -500 cps	5	2,500
10	Printing & binding costs for Thesis work	4,000	4,000
11	Any unforeseen expenses (airtime etc.)	800	800
	TOTAL COST		**859,000**

Appendix 6a: Approval Letter –IREC



MTRH/MU-INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3

MOI UNIVERSITY
COLLEGE OF HEALTH SCIENCES
P.O. BOX 4606
ELDORET
Tel: 33471/2/3

Reference: IREC/482/2023
Approval Number: 0004433

25th May, 2023

Collins Omondi Angute,
Moi University,
School of Public Health,
P.O. Box 4606-30100,
ELDORET-KENYA.

Dear Mr. Omondi,

THE UTILIZATION OF INTERMITTENT PREVENTIVE TREATMENT OF MALARIA IN PREGNANCY IN NAMBALE SUB-COUNTY HOSPITAL, BUSIA COUNTY, KENYA

This is to inform you that ***MTRH/MU-IREC*** has reviewed and approved the above referenced research proposal. Your application approval number is ***FAN: 0004433.*** The approval period is **25th May, 2023- 24th May, 2024.**
This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, Material Transfer Agreements (MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***MTRH/MU-IREC***.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***MTRH/MU-IREC*** within 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***MTRH/MU-IREC*** within 72 hours.
v. Clearance for export of biological specimens must be obtained from ***MOH at the recommendation of NACOSTI*** for each batch of shipment.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to ***MTRH/ MU-IREC.***

Prior to commencing your study; you will be required to obtain a research license from the National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and other relevant clearances from study sites including a written approval from the CEO-MTRH which is mandatory for studies to be undertaken within the jurisdiction of Moi Teaching & Referral Hospital (MTRH) and its satellites sites.

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
25 MAY 2023
APPROVED
P. O. Box 4606-30100 ELDORET

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc CEO - MTRH Dean - SOP Dean - SOM
Principal - CHS Dean - SON Dean - SOD

Appendix 6b: Final Decision Certificate –IREC

Final Decision Certificate

This document certifies that the study:

"The Utilization Of Intermittent Preventive Treatment of Malaria In Pregnancy Services In Nambale Sub-County Hospital, Busia County, Kenya."

Principal Investigator: Mr. ANGUTE, COLLINS OMONDI
Reference number: IREC482/2023

Was reviewed and received the following status:
"done"
Additional Comments: Final decision: **approved**
Comments sent:

No Comments from the Reviewers.

Appendix 7: Approval Letter from NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **451621**

Date of Issue: **30/June/2023**

RESEARCH LICENSE

This is to Certify that Mr.. Collins Omondi Angute of Moi University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Busia on the topic: The Utilization Of Intermittent Preventive Treatment of Malaria In Pregnancy in Nambale Sub-County Hospital, Busia County, Kenya. for the period ending : 30/June/2024.

License No: **NACOSTI/P/23/26928**

451621

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix 8: Approval Letter from Busia County Government

COUNTY GOVERNMENT OF BUSIA
County Director of Health
Health & Sanitation Department
P.O. BOX 1040 – 50400
BUSIA, KENYA

CG/BSA/H/ADM/1/56/VOL.III (92)

Date: 7th July, 2023.

TO:
THE MOH I/C,
NAMBALE SUB COUNTY HOSPITAL
BUSIA COUNTY

Dear Sir,

RE: RESEARCH AUTHORIZATION – COLLINS OMONDI ANGUTE

This is to confirm that the above named who is a MSc in Field Epidemiology and Laboratory Training student at Moi University has been authorized to conduct a study entitled **"The Utilization of Intermittent Preventive Treatment of Malaria in Pregnancy in Nambale Sub County Hospital, Busia County Kenya,"** in partial fulfilment of his degree.

Kindly accord him any necessary cooperation.

The NACOSTI approval license No. **NACOSTI/P/23/26928** and Moi University IREC approval letter N **0004433** are attached for your perusal.

Yours faithfully,

COUNTY DIRECTOR
HEALTH
Date 07/07/2023
BUSIA COUNTY

Dr Melsa Lutomia,
County Director,
Department of Health and Sanitation,
Busia County.

CC
CECM - Department of Health and Sanitation
CHIEF OFFICER - Department of Health and Sanitation