

**SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA**



**UPTAKE OF INTERMITTENT PREVENTIVE TREATMENT FOR
MALARIA AND BIRTH OUTCOMES IN SELECTED HEALTH
FACILITIES IN THE BRONG AHAFO REGION OF GHANA**

**SAMUEL DAPAA
(10551624)**

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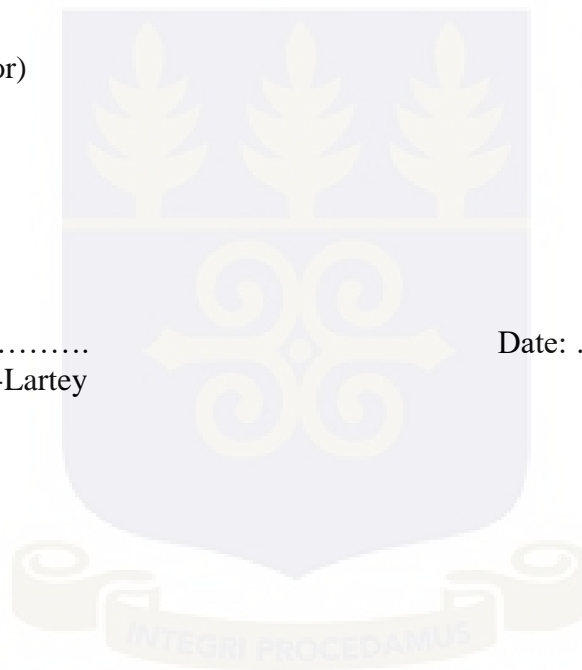
DECLARATION

I SAMUEL DAPAA, declare that this research is my own work produced from research undertaken under supervision. Portions of works used from other researchers have been duly referenced. This research has not been presented anywhere else for the purpose of another degree.

..... Date:
Mr. Samuel Dapaa
(Principal Investigator)

..... Date:
Dr. Adolphina Addo-Lartey
(Supervisor)

..... Date:
Prof. Kwasi Torpey
(Co-supervisor)



DEDICATION

This research is dedicated to Mr. Benson K. Kumah, my father.



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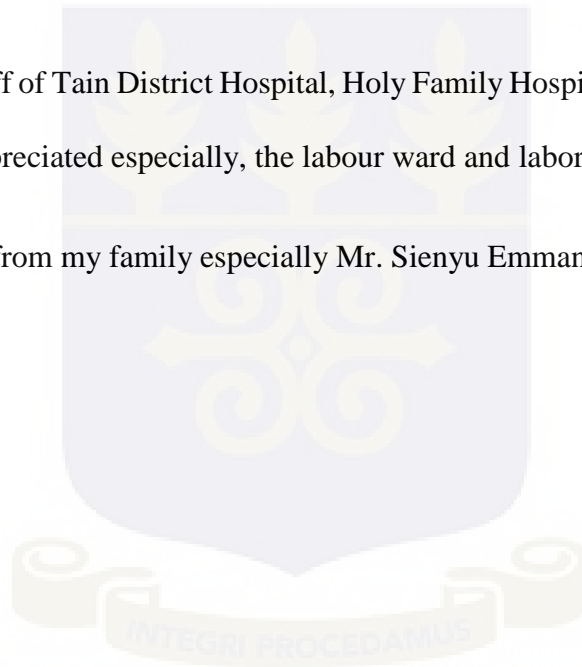


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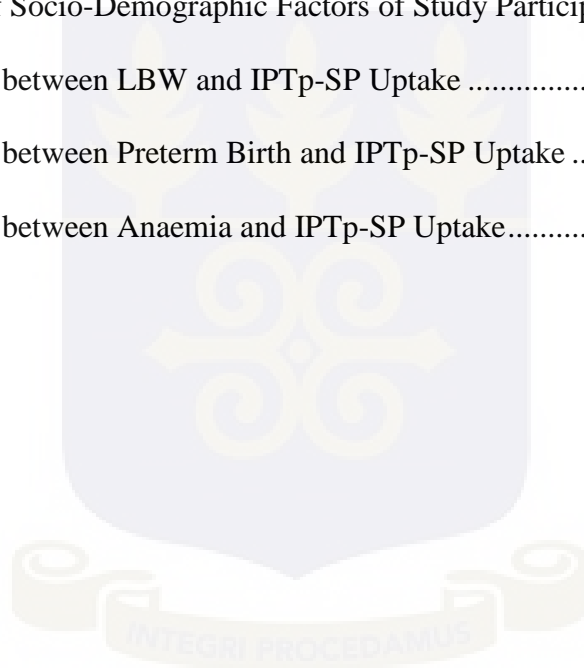
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LIST OF ABBREVIATIONS

AA	Artesunate Armodiaquine
ACT	Artemisinin Based Combination Therapy
AIRR	Adjusted Incidence Rate Ratio
AL	Artemether Lumefantrine
ANC	Antenatal Care
AOR	Adjusted Odds Ratio
CHAG	Christian Health Association of Ghana
DHIMS2	District Health Information Management System II
DOT	Directly Observed Therapy
FANC	Focus Antenatal Clinic
G6PD	Glucose-6-Phosphate Dehydrogenase
GHS	Ghana Health Service
HFH	Holy Family Hospital
IPT	Intermittent Preventive Treatment
IPTp	Intermittent Preventive Treatment in Pregnancy
IPTp-SP	Intermittent Preventive Treatment in pregnancy with Sulfadoxine-Pyrimethamine
IRS	Indoor Residual Spraying (with Insecticide)
ITNs	Insecticide Treated Mosquito Nets
MCH	Mathias Catholic Hospital
MDA	Mass Drug Administration
MIP	Malaria in Pregnancy
MOH	Ministry of Health
NCHS	National Catholic Health Service
NMCP	National Malaria Control Programme
OPD	Out Patient's Department

OR	Odds Ratio
PAM	Pregnancy Associated Malaria
RBM	Roll Back Malaria
SD	Standard Deviation
SMC	Seasonal Malaria Chemoprophylaxis
SP	Sulfadoxine-Pyrimethamine
TDH	Tain District Hospital
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
WHO	World Health Organization



DEFINITION OF TERMS

DOT: A pregnant woman swallowing SP at an antenatal care clinic under the direct observation of a qualified healthcare worker.

IPT: Administration of anti-malarial drugs at predefined intervals to clear presumed parasites from the blood of a pregnant woman. This is based on the assumption that every pregnant woman in areas of high stable malaria transmission has malaria parasite in her blood.

IPTp-SP coverage: The percentage of pregnant women who receive IPTp-SP by DOT out of all pregnant women visiting ANC in a particular facility/district.

IPTp-SP uptake: Process by which pregnant women take SP at ANC clinics as a form of intermittent preventive treatment for malaria

IPTp-SP1: The percentage of pregnant women who received one dose of SP during their most recent pregnancy.

IPTp-SP2: The percentage of pregnant women who received two doses of SP during their most recent pregnancy.

IPTp-SP3: The percentage of pregnant women who received three doses of SP during their most recent pregnancy.

IPTp-SP4+: The percentage of pregnant women who received four or more doses of SP during their most recent pregnancy.

Low birth weight: A new born baby with body weight of less than 2.5kg

Maternal anaemia: A pregnant woman with haemoglobin level of less than 8.0g/dl

Placental malaria: Pregnancy-associated malaria (PAM) or placental malaria is a presentation of the common illness that is particularly life-threatening to both mother and developing fetus

Pre-term birth: Baby born before completion the normal duration of pregnancy of 36 weeks

Stillbirth: Baby born with no sign of life at or after 28 weeks of gestation



ABSTRACT

Background

Malaria in pregnancy is a public health problem especially in sub-Saharan Africa. “Intermittent Preventive Treatment in pregnancy using Sulfadoxine-Pyrimethamine” (IPTp-SP) is one of the proven interventions for preventing malaria in pregnancy. The WHO policy on IPTp-SP recommends a universal coverage of four or more doses per pregnancy. However, in 2014, only 17% of eligible pregnant women received three or more doses of IPTp-SP in the Brong Ahafo region of Ghana.

Malaria in pregnancy and its complications have devastating effects on the mother, fetus and the infant. These include anaemia, preterm birth, low birth weight, stillbirth, intrauterine growth retardation, growth and learning disabilities of the infant. Uptake of recommended doses of IPTp-SP reduces the risk of adverse birth outcomes.

Presently, there is scarcity of data on IPTp-SP4+ uptake and birth outcomes in the Brong Ahafo region. The purpose of this study was therefore to assess the uptake of IPTp-SP4+ and pregnancy outcomes in the Brong Ahafo region.

Methods

This study was a quantitative, cross-sectional and hospital based which included 443 pregnant women delivering in three hospitals in the Brong Ahafo region from April to July, 2017. A structured questionnaire was used to interview participants. Birth weight of babies, haemoglobin level and other relevant data were retrieved from the antenatal care records card and the delivery register. Blood was taken from the intervillous space of the placenta for the detection of placental malaria. Data was analyzed with StataMP 13 and Microsoft Excel 2013.

Results

The average age of mothers was 27.2 years (SD=6.6). The mean haemoglobin level checked at 36 weeks was 10.2g/dl (SD=2.7) and the mean birth weight was 3.0kg (SD=0.5). Majority (79.2%) of respondents were married and marital status was not different among urban and rural dwellers. Ownership of insecticide treated mosquito net was 73.0% while utilization was 49.8%. Uptake of IPTp-SP1 and IPTp-SP4+ were 80.9% and 19.8% respectively. The prevalence of low birth weight (LBW), preterm birth and stillbirth were 12.2%, 5.3% and 2.0% respectively. The prevalence of maternal anaemia at 36 weeks was 3.2%. Pregnant women who had higher doses of IPTp-SP (4+) had reduced odds of LBW (OR; 0.59, 95% CI; 0.47-0.74), preterm birth (OR; 0.59, 95% CI; 0.43-0.82) and anaemia (OR; 0.87, 95% CI; 0.57-1.31).

Conclusion

The uptake of IPTp-SP4+ was 19.8% in the Brong Ahafo region which was statistically higher than the 2016 national average of 16.7%. Higher doses of IPTp-SP had lower risk of LBW, preterm birth, anaemia and stillbirth. The association between higher doses of IPTp-SP (4+) and stillbirth or anaemia was not statistically significant.

CHAPTER ONE

INTRODUCTION

1.1 Background

Malaria is a parasitic disease caused by a protozoan of the genus *Plasmodium*. There are five known species of *Plasmodium* parasite which cause human malaria. These are *falciparum*, *ovale*, *malariae*, *vivax* and *knowlesi*. The parasite is mainly transmitted through the bite of an infected female *anopheles* mosquito.

Malaria infection is endemic in sub-Saharan Africa especially Ghana. It is endemic in developing countries especially sub-Saharan Africa. This is as a result of the conducive environmental conditions such as poor drainage and sanitation systems which are associated with poverty. These factors promote the thriving of the vector and aid in the transmission of the parasite.

According to the World Health Organization (WHO), 214 million cases of malaria were reported globally in 2015 out of which 88% occurred in the WHO African Region. A total of 438,000 malarial deaths occurred worldwide with 90% occurring in the African Region (World Health Organization, 2015).

The Ghana National Malaria Control Programme (NMCP) 2015 report indicates that 10.1 million people were infected with malaria in 2015. Ghana recorded as high as 2,133 malarial deaths in 2015. The case fatality rate among people above 5 years in Brong Ahafo from July to September 2015 was 0.40% (NMCP, 2015).

Malaria in pregnancy is a public health problem. It therefore deserves the necessary attention from policy makers, care providers and the general public. A total of 18,593 pregnant women were confirmed to be infected with malaria at the Out Patient Departments (OPDs)

in all health facilities throughout the Brong Ahafo region alone in 2015 according to data from the District Health Information Management System II (DHIMS2).

Malaria infection has contributed to high morbidity and mortality especially among pregnant women and children less than 5 years all over the world and in Africa in particular. Malaria infection and its subsequent complications has a devastating effect, especially in pregnant women and in children under five years (Fokam, Ngimuh, Kimbi, & Wanji, 2016). Some of these effects are anemia, stillbirth and low birth weight. The consequences of Malaria in Pregnancy (MIP) are not limited to the mother alone but also to the fetus and newborn child. To the fetus, intrauterine growth retardation is one of the adverse effects of MIP. The newborn is prone to growth and learning disabilities as a result of persistent infection of the mother during pregnancy.

There are many interventions in the prevention of malaria parasite transmission in humans. Among these are vector control, prevention of mosquito bites through the use of Insecticide Treated Mosquito Nets (ITNs) and seasonal malaria chemoprophylaxis (SMC). Indoor Residual Spraying (IRS) as well as Mass Drug Administration (MDA) have also proven to be other useful intervention tools for the prevention and control of malaria over the years.

In 2004, the World Health Organization (WHO) recommended the following interventions as a comprehensive package for the prevention of MIP.

- Intermittent Preventive Treatment during pregnancy (IPTp) using Sulfadoxine-Pyrimethamine (SP)
- Consistent use of Insecticide Treated Mosquito Nets (ITNs)
- Prompt and effective case management of clinical malaria and anemia

Ghana subsequently adopted and supported these approaches to the prevention and control of malaria in pregnancy (MIP) since 2004 (Therapy, 2011). The intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP) policy adopted in 2004 recommended three doses of IPTp-SP for all pregnant women. These were to be taken at a monthly interval starting from sixteen weeks of pregnancy through a Directly Observed Therapy (DOT) at a Focus Antenatal Clinic (FANC).

The World Health Organization (WHO) update the “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP) policy in 2012 (WHO, 2012b). The revised IPTp-SP policy recommends uptake of IPT1 through to IPT4+ starting from week thirteen. The policy further recommends a universal coverage. All pregnant women should take up to at least IPT4+ in the third trimester of pregnancy before delivery.

The use of insecticide treated mosquito net (ITN) is another intervention that goes hand in hand with “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine”. The World Health Organization (WHO) recommends a universal coverage of ITN for pregnant women. All pregnant women are given an ITN on their first registration at the antenatal care (ANC) clinic. This implies that all women who visit and ANC clinic during pregnancy should possess an ITN.

1.2 Statement of the Problem

Uptake of “intermittent preventive treatment in pregnancy” (IPTp) is generally low especially, higher doses of IPTp (WHO, 2016).

According to the Ghana national malaria control Programme (NMCP) report, the uptake of IPT4+ in 2015 was 15.7% (NMCP, 2016b). This increased by a one percentage point to 16.7% in 2016 which was still low compared to the 2015 figure.

Although the ANC coverage for Brong Ahafo in 2015 was 84.7%, “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP) coverage was low (DHIMS2, 2016). The proportion of pregnant women in Brong Ahafo region who took IPTp-SP4+ was 20%.

Factors such as stock outs of sulfadoxine-pyrimethamine, low antenatal care coverage, distance and lack of healthcare facilities are known to contribute to low uptake of IPTp-SP.

It is presumed that pregnant women living in areas of stable malaria transmission have malaria parasites in their blood. Intermittent preventive treatment with sulfadoxine-pyrimethamine would therefore help clear the parasite in their blood (GHS, 2015).

Without proper and consistent uptake of IPT during pregnancy, the incidence of malaria infection and its complication (placental sequestration of *P. falciparum*, anemia, stillbirth, pre-term birth and low birth weight) would be increased (Chepkemai Ng’etich-Mutulei & Odhiambo, 2014).

Without adequate information on the uptake of “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” and its related birth outcomes. Authorities may relax in their efforts in improving these indicators.

The purpose of this study is to assess “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP) for malaria uptake, anemia, stillbirth, pre-term birth and low birth weight in the Brong Ahafo Region of Ghana. This will provide basis for the regional health administration to scale up the administration of IPTp-SP4+ in the region.

1.3 Conceptual Framework

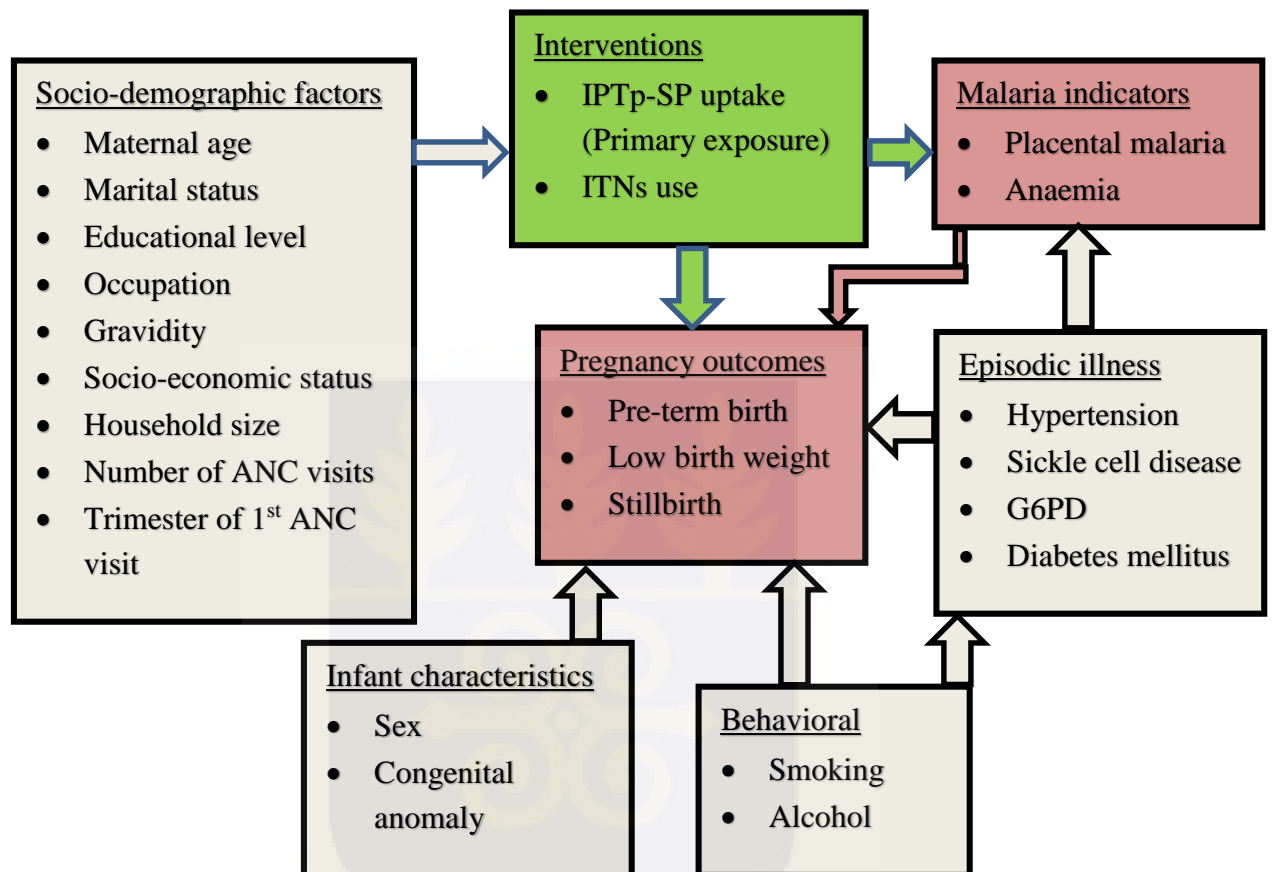


Figure 1: Conceptual Framework for IPTp Uptake and Birth Outcomes

1.4 Narration of Conceptual Framework

The prevalence of stillbirth and low birth weight can be influenced by placental malaria and anaemia which are complications of malaria infection. Interventions such as “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” uptake and insecticide treated mosquito nets use can help reduce the incidence of malaria infection and subsequently, its complications.

Socio-demographic factors such as maternal age, marital status, level of education, occupation, gravidity, socio-economic status, household size, number of antenatal care visits, etc., have the tendency to negatively affect the uptake of “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” and insecticide treated mosquito net use.

Episodic illnesses such as hypertension and other metabolic disorders can affect the pregnancy outcomes and anaemia. Smoking and alcohol consumption can lead to stillbirth, low birth weight and anaemia during pregnancy as well as episodic illness. Congenital anomalies and sex of the infant can be confounders and effect modifiers to the associations between “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” and the pregnancy outcomes.

1.5 Justification

Since 2004, Ghana has adopted a multi-pronged approach recommended by the WHO for the prevention and control of malaria in pregnancy (MIP). The use of “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP) has progressed from IPT3 to IPT4+ over the period (WHO, 2012b).

From a study in Hohoe, Ghana, by Agbozo et al., pregnant women who took only one dose of “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP) had an increased risk of low birth weight (RR; 1.57, CI; 1.02–2.39, $p=0.039$) compared to those who took three doses (RR; 1.57, CI; 1.24–1.98, $p<0.001$) (Agbozo, Abubakari, Der, & Jahn, 2016).

Adequate information on the current trend of “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP) uptake in the Brong Ahafo region

and its associations with pregnancy outcomes may help the regional health administration and the selected facilities to implement innovative way of improving these indicators.

1.6 Objectives

The objectives of the study are illustrated in the following subsections

1.6.1 General

To determine the uptake of IPTp-SP for malaria and birth outcomes among women who have completed their full term of pregnancy in selected districts of the Brong Ahafo region

1.6.2 Specific

- To determine the uptake of IPTp-SP4+ among women who have completed their full term of pregnancy in selected districts in Brong Ahafo region
- To determine the proportion of stillbirth, pre-term birth and low birth weight in selected districts of the Brong Ahafo region
- To determine the proportion of anemia among women who have completed their full term of pregnancy in selected districts of the Brong Ahafo region
- To determine the association between IPTp-SP4+ and stillbirth, pre-term birth, low birth weight and anemia in the selected districts

1.7 Hypotheses

Women who take “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP4+) will have a reduction in the risk of stillbirth, pre-term birth, low birth weight and anemia compared to women who do not take IPTp-SP during pregnancy.

CHAPTER TWO

LITERATURE REVIEW

During the literature review process, the topic was broken down into thematic areas. Various keywords and search terms were identified based on the themes. Search engines were used among others to search for relevant literature concerning the study area and topic. These were PubMed, Google scholar, Science Direct and Hinary. During the search, Boolean operators such as 'AND' and 'OR' were used to obtain the relevant articles.

This chapter mainly focused on:

- Malaria infection during pregnancy
- Policies, programmes, strategies and targets for malaria prevention
- Coverage of IPTp
- Factors influencing IPTp uptake
- IPTp and pregnancy outcomes
- IPTp and Anaemia
- IPTp and Placental Malaria

2.1 Malaria Infection during Pregnancy

Malaria infection, especially MIP, is a public health problem. *P. falciparum* infection, the most malignant form of malaria has a wide range of adverse effects in pregnant women, the fetus and the newborn (Nosten et al., 1999). Studies have shown that malaria in pregnancy can cause anaemia, febrile illness, haemorrhage, etc. in a pregnant woman. To the fetus, MIP can cause abortion, stillbirth and congenital infections. To the newborn the likely adverse effects are low birth weight as a result of prematurity and intrauterine growth retardation (Menendez, 2003).

Globally, an estimated 125 million pregnancies occurred in malaria transmission areas in 2007. These resulted in about 83 million live births. The risk of malaria infection during pregnancy in endemic areas is 50% higher compared with non-pregnant women. MIP is usually asymptomatic with higher prevalence occurring in women below 19 (WHO, 2014). About 35% preventable LBW are attributable to malaria infection during pregnancy. Surviving infants may still suffer from the lasting effect of intrauterine malaria infection in terms of development and learning abilities.

According to Cottrell and others, submicroscopic infections of *P. falciparum* were significantly associated with increased risks of LBW in primigravid (OR=6.09, CI; 1.16-31.95) and premature births in multigravida (OR=2.25, CI;1.13-4.46) (Cottrell et al., 2015).

2.2 Policies, Programmes, Strategies and Targets

This section elaborates the policies, programmes, strategies and targets aimed at improving the outcomes of malaria infection.

2.2.1 The Roll Back Malaria (RBM) Partnership

The RBM is a partnership for the control of malaria which was launched in 1998 by the WHO. Key partners include the United Nations Children's Fund (UNICEF), the World Bank and the United Nations Development Program (UNDP). The objectives of the partnership are to:

- Scale-up malaria prevention and treatment in endemic countries
- Mobilize resources to increase donor funding for malaria
- Increase public awareness about malaria through advocacy

In April 2000, the African Summit adopted the Abuja Declaration in which the regional leaders committed to ensure that 60% of pregnant women in malaria endemic areas have access to effective treatment and prevention of malaria (WHO, 2004). This initiative has reduced global malaria deaths by an estimated 38%, with 43 countries reducing malaria cases/deaths by 50% (IFPMA, 2012).

Target set and approved by the RBM Partnership Board in 2011 was to achieve universal access to and utilization of prevention measures. In terms of ITNs, every person at risk possess and sleep under an ITN or in a place protected by IRS.

Universal access to ITNs and IPTp are effective tools which can scale up the prevention and treatment of malaria in endemic areas.

2.2.2 National Anti-Malarial Drug Policy

The WHO recommends that IPTp-SP should be given to all pregnant women in areas where malaria transmission is moderate-to-high. This policy was first introduced in the year 2000 and adopted by the WHO African Region in 2004. It was updated in 2012 as result of research conducted into the safety of multiple doses of SP. The IPTp policy recommends four or more doses during pregnancy. Administration should start early during the second trimester after quickening. IPTp should be administered as DOT at least one month apart. The policy further states that IPT can be administered up to the time of delivery. It can also be taken either with food or on an empty stomach (WHO, 2012b).

SP is safe and efficacious, therefore it is the only antimalarial recommended by the WHO for the purpose of “intermittent preventive treatment during pregnancy”.

Ndeseruba and others concluded in their study in Tanzania that, only two doses of IPTp-SP for the full duration of the pregnancy were not effective for the prevention of MIP and its adverse pregnancy outcomes (Ndeserua, Juma, Moshia, & Chilongola, 2015).

Ghana in 2002 adopted a new anti-malaria drug policy based on artemisinin-based combination therapy (ACTs). This was to replace chloroquine and quinine as mono therapy (WHO, 2006; GHS, 2008). The following ACTs were specifically recommended by WHO for use in the African region:

- Artesunate + Armodiaquine (AA)
- Artemether + Lumefantrine (AL)
- Sulfadoxine-pyrimethamine (SP)

All these ACTs are used in Ghana under different circumstances. ACT regimens are expected to provide a complete treatment after three days with an artemisinin derivative. These are given based on body weight (WHO, 2012).

2.2.3 Test, Treat and Track Initiative

This is an initiative to scale up diagnostic, therapeutic treatment and surveillance of malaria in endemic areas (WHO, 2012a). This initiative was launched by the WHO in 2012 on World Malaria Day. It is also called T3, and encourages malaria endemic countries, donor partners and other holders to scale up diagnostic testing, treatment and malaria surveillance (WHO, 2014). This policy ensures that:

- All suspected cases of malaria are tested
- Every confirmed malaria case is treated with a recommended anti-malarial drug
- Every malaria case is tracked in a surveillance system

2.3 Uptake of IPTp

The global target for IPTp coverage is 80% yet studies have shown that this target is hardly achieved in many countries. According to (Fokam et al., 2016), IPTp coverage among pregnant women in Cameroon attending antenatal care in the Buea Health District is 63.2%. The uptake of IPTp in a rural town in Nigeria was 40.4%, with only 14.6% of them taking the second dose during pregnancy as recommended by WHO (Amoran et al., 2012).

According to the Ghana National Malaria Control Programme, the coverage of IPTp 1, 3 and 5 were 70.3%, 45.2% and 6.8% respectively in the 3rd quarter of 2015 (NMCP, 2015).

A cross sectional study by Muhammad et al. in a tertiary hospital in northeastern Nigeria revealed that, 43% of pregnant women received two or more doses of sulfadoxine-pyrimethamine for intermittent preventive treatment (Muhammad et al., 2016). Another study conducted in Mansa, Zambia, reported a 2% IPT4 uptake (Mace et al., 2015a).

2.4 Factors Influencing IPTp Uptake

Many factors contribute to the uptake of IPTp for malaria prevention. These include socio-demographic, gestational age at first ANC, level of knowledge of IPTp, availability of IPTp logistics as well as staff attitude (Antwi, 2010).

A study by Amoran et al., revealed that the knowledge of IPTp, as prophylaxis for malaria prevention, among pregnant women was a predictor for IPTp use in a western town in northern Nigeria (Amoran et al., 2012).

Chepkemoi and Odhiambo in their study titled *Factors Influencing the Uptake of Intermittent Preventive Treatment for Malaria in Pregnancy: Evidence from Bungoma East District, Kenya*

Angela concluded that, starting ANC as early as in the second month of pregnancy had 10.5 times the odds of taking IPT_{p2+} compared to those initiating ANC at month six. Also, those initiating ANC at the third month had 6.4 times the odds of taking IPT_{p2+} compared with the same reference group. (Chepkemai Ng'etich-Mutulei & Odhiambo, 2014). Furthermore, women with radio as their main source of information had 3.7 times the odds of taking IPT_{p2+} compared with those with relying solely on community health workers as their main source of information (Chepkemai Ng'etich-Mutulei & Odhiambo, 2014).

A research by Antwi in the Bosomtwe district of Ghana showed that, parity was associated with the doses of IPT_p uptake by pregnant women. She further concluded that stock outs of SP could potentially destroy the gains made in IPT_p program implementation (Antwi, 2010). Diala and others also found that stock outs together with individual women's beliefs as well as lack of understanding of IPT contribute to low uptake and adherence (Diala, Pennas, Marin, & Belay, 2013).

Protas and other in their study found that, early ANC booking contributed to a timely uptake of 1st dose IPT_p (AOR 2.59; 95 % CI 1.51–4.46; P = 0.001). They also found that SP availability at the facility was another predictor of the timely uptake of IPT_p (AOR 4.63; 95 % CI 2.51–8.54; P < 0.0001) (Protas, Tarimo, & Moshiro, 2016).

Funding is a major factor for increasing access and subsequently utilization of preventive tools of malaria control. The WHO in its findings (WHO, 2014) reported that fund disbursement for malaria control activities was associated positively with increased coverage of IPT and ITN.

2.5 Associations between IPTp Uptake and Pregnancy Outcomes

Authors have reported on IPTp uptake and its associations with pregnancy outcomes. This section talks about some of these associations.

2.5.1 Low Birth Weight

Low birth weight is the weight of a newborn baby less than 2.5kg. It is an important factor relating to the risk of early infant mortality. Infants with LBW have three times the odds of dying compared with those with normal birth weight (WHO, 2014). Malaria infection during pregnancy can cause intrauterine growth retardation and preterm birth. These are important risk factor for LBW.

A research conducted in Mansa, Zambia, showed that uptake of two or more doses of IPTp-SP was associated with a protective effect from MIP. Each dose of IPTp-SP contributed to a 46% and 37% decrease in the frequency of LBW among primigravid (a woman who is pregnant for the first time) and multigravida (a pregnant woman who has had at least one previous pregnancy) women respectively (Mace et al., 2015b). The same study reported a LBW prevalence of 8% and further suggested that the degree of protection offered by IPTp-SP was dependent on the number of doses taken as well as the specific birth outcome.

In a research, of all primigravid and secundigravid mothers who delivered LBW babies, 63 % had one dose of IPTp whereas 20 % had at least two doses. Also, of all multigravida mothers who delivered LBW babies, 84 % have had one dose whereas only 11 % have had at least two doses of IPTp-SP (Muhammad et al., 2016).

A study in Ghana by Agbozo & others found that, the relative risk of mother giving birth to LBW babies among pregnant women who took only one dose of IPTp was 1.57 (CI; 1.02-2.39, $p=0.039$) whereas those with no IPTp during pregnancy was found to be 1.57 (CI; 1.24-1.98, $p<0.0001$) compared to those who took three doses (Agbozo et al., 2016).

According to Valea and others in their study of the effect of adding a third dose of SP on birth outcomes in Burkina Faso, they found that although the uptake of SP3 and SP2 were generally low, the prevalence of LBW in SP3 and SP2 groups were similar (adjusted Incident Rate Ratio, AIRR: 0.92, 95%CI: 0.69-1.24) (Valea et al., 2010). Primigravid mothers had a significant risk of LBW.

2.5.2 Prematurity (Preterm Birth)

Analysis done by Valea et al. in their study of IPTp-SP in Burkina Faso indicated a trend of reduced risk of premature delivery in the group which took SP3 group. However, the difference between those who took SP2 and SP3 did not show any statistical significance (Valea et al., 2010).

Increased risk of premature birth was found by Mosha and others to be associated with exposure to quinine prophylaxis (OR 2.6; 1.3–5.3) as compared to Artemether Lumefantrine with (OR 1.4; 0.8–2.5) (Mosha et al., 2014).

Malar and others in their study established that blood parasitaemia was associated with preterm delivery as a result of resistance to IPTp in western Uganda (Malar et al., 2015).

2.5.3 Still Birth (SB)

The prevalence of SB reported in Mansa, Zambia, was 2% (Mace et al., 2015a). IPT uptake although proven to be beneficial, exposure to some anti-malarial drugs during pregnancy have shown some sort of increased risk of stillbirth. A study by Mosha et al. found that mothers exposed to quinine in the first trimester of pregnancy was associated with an increased risk of stillbirth (OR 2.5; 1.3–5.1) (Mosha et al., 2014).

Sidra and others concluded that, there was clear evidence of the reduction of stillbirth as a result of adequate intermittent preventive treatment of malaria and syphilis (Sidra et al., 2011).S

2.6 Associations between IPTp Uptake and Placental Malaria

From studies conducted using peripheral blood to detect malaria, a proportion of placental malaria are not detected. Placental malaria not detected by microscopy range from 0.2% to as high as 22%.

A study conducted in Gabon from 2005 to 2011 indicated that the prevalence of microscopic *P. falciparum* during pregnancy declined substantially following the implementation of IPTp-SP administration (Bouyou-Akotet et al., 2016).

Placental sequestration of *P. falciparum* occurs as a result of malarial infection during pregnancy, therefore any intervention aimed at preventing MIP would reduce the incidence of placental parasitaemia. A cross-sectional study in North-Western Tanzania showed that IPTp-SP was associated with Placental parasitaemia and adverse birth outcomes. Uptake of three or more doses of IPTp-SP reduced the odds of placental parasitaemia (Mpogoro et al., 2014).

According to Muhammad & others, 83% of pregnant women who tested positive for malaria, in their research had received less than two doses of IPTp during the period of their pregnancies (OR: 3.1; 95 % CI: 1.5–6.7) (Muhammad et al., 2016).

Gutman & others in their study in Malawi concluded that, although IPTp-SP did not reduce the occurrence of placental infection during pregnancy, it was associated with improved birth outcomes (Gutman et al., 2013).

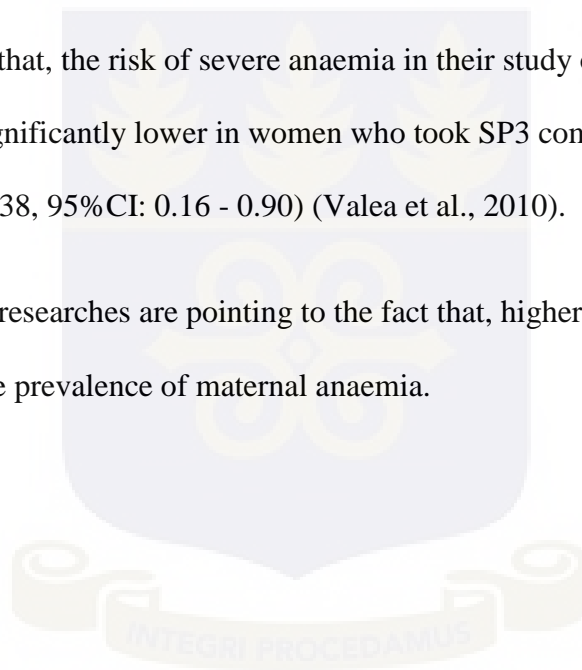
2.7 Associations between IPTp Uptake and Anaemia

Severe maternal anaemia is when the haemoglobin level of a pregnant woman is less than 8.0g/dl. Malarial anaemia is mostly caused by hemolysis (the destruction of infected and uninfected red blood cells) and splenic sequestration of the malaria parasite. An estimated 26% of all severe maternal anaemia are attributable to malaria (WHO, 2014).

Muhammad & others in their study concluded that IPTp-SP uptake was generally low in a tertiary hospital in northeastern Nigeria which corresponded to a high prevalence of maternal anaemia (Muhammad et al., 2016).

Valea et al. reported that, the risk of severe anaemia in their study of pregnant women in Burkina Faso was significantly lower in women who took SP3 compared to those who took SP2 (AIRR = 0.38, 95%CI: 0.16 - 0.90) (Valea et al., 2010).

Findings of all these researches are pointing to the fact that, higher uptake of IPTp can effectively reduce the prevalence of maternal anaemia.



CHAPTER THREE

METHODS

3.1 Type of study

This was a quantitative cross-sectional study based in the district/municipal hospitals from January to June, 2017. It included all women who had delivered in the selected district/municipal hospitals in the Brong Ahafo region from April to June, 2017. Those who declined to respond to the questionnaire administered were not included in the study.

3.2 Study area

The study was carried out in the Brong Ahafo Region (BAR) of Ghana. BAR is one of the ten regions of Ghana. It has twenty-seven administrative districts/municipalities comprising of both urban and rural settings. With Sunyani as its capital, BAR has a total land size of 39,557 square kilometers (Ghana Statistical Service, 2012). Every district/municipality in the region has at least a health facility where antenatal, delivery and post-natal services are rendered.

Three hospitals were selected to represent the region in this study. Holy Family Hospital (HFH), in Techiman Municipal, was selected to represent the urban districts in the region. Mathias Catholic Hospital (MCH) and Tain District Hospital (TDH) in Pru and Tain Districts respectively, were selected to participate on behalf of the districts of rural setting in the region. Study subjects were selected among women who had just delivered in the aforementioned hospitals.



Figure 2: Map of Brong Ahafo Region Showing District Boundaries

3.2.1 Holy Family Hospital

The Holy Family Hospital (HFH) is the main referral hospital in the Techiman municipal. The municipal has a total of fifty healthcare facilities which offer antenatal care (ANC) services. These consist of two Christian Health Association of Ghana (CHAG) facilities, forty government facilities and eight private facilities. HFH has a bed capacity of 198 and a staff strength of 357 consisting of various cadre of professionals. It is a National Catholic Health Service (NCHS). HFH offer ANC services from Monday to Friday in a week. The average monthly ANC attendance is 4,510 and the average number of deliveries in the hospital are 200 per month. In 2016, HFH experienced sulfadoxine-pyrimethamine (SP) stock out on seven different occasions. Three of these stock outs exceeded seven days.

3.2.2 Mathias Catholic Hospital

Mathias Catholic Hospital (MCH) is a Christian Health Association of Ghana (CHAG) facility. It is the district hospital for the Pru district. It serves as the referral hospital for the district. There are twenty-one healthcare facilities which offer antenatal care (ANC) services in the Pru district. MCH has a bed capacity of 120 and a staff strength of over 250. ANC services are offered on outpatient department (OPD) bases from Monday to Wednesday in a week. The average ANC attendance is 2077 per month. The hospital conducts an average of 180 deliveries per month. The hospital recorded 137 multigravida mothers with severe anaemia (haemoglobin level of $<7.0\text{g/dl}$) in 2015. In the same year, mothers who reported insecticide treated mosquito net use at their first and second ANC visits were 2,112 and 3,522 respectively. The district experienced sulfadoxine-pyrimethamine stock out on four occasions during the year 2016. MCH also experienced stock out of sulfadoxine-pyrimethamine (SP) on four occasions in the year 2016. Three of these stock outs lasted more than seven days.

3.2.3 Tain District Hospital

The Tain district is one of the 27 districts in the Brong Ahafo region. It is generally made up of rural communities. There are 37 health facilities offering antenatal care (ANC) services in the district. Tain district hospital, the main referral hospital in the district, has a bed capacity of 60. TDH attends to an average of 978 ANC clients a month. The average number of deliveries in the hospital per month is 100. In the year 2016, TDH recorded stock out of sulfadoxine-pyrimethamine (SP) on three different occasions which each of them lasted for over seven consecutive days.

3.3 Variables

Table 1: List of Variables

No.	Variable name	Operational definition	Type of variable	Scale of measurement
1	Age	Age of mother in years	Independent	Continuous
2	Marital status	Marital status of mother	Independent	Categorical
3	Education	Educational status of mother	Independent	Categorical
4	Occupation	Occupation of mother	Independent	Categorical
5	Gravidity	Number of pregnancies a mother has had including the current one	Independent	Continuous
6	ANC Visits	Number of times a mother had visited the antenatal care clinic during the current pregnancy	Independent	Continuous
7	Trimester	The trimester in which mother attended first ANC clinic	Independent	Categorical
8	HB	Haemoglobin level of mother at 36 weeks of gestation	Independent	Continuous
9	Anaemia	Mother's HB less than 8.0g/dl	Independent	Categorical
10	ITN use	Whether a mother slept under insecticide treated mosquito net throughout the pregnancy	Independent	Categorical
11	IPTp-SP	Number of doses of SP a mother took during the pregnancy	Independent	Categorical
12	Anti-worm	Whether a mother took any anti-helminthic during the pregnancy	Independent	Categorical
13	Pregnancy outcome	Outcome of the pregnancy	Dependent	Categorical
14	Birth outcome	Outcome of the birth process	Dependent	Categorical
15	Weight	Birth weight of baby	Dependent	Continuous

ANC=Antenatal Care, HB=Haemoglobin, ITN=Insecticide treated mosquito net, IPTp-SP=Intermittent Preventive Treatment, SP=Sulfadoxine-Pyrimethamine

3.4 Study population

The study included all women who had delivered in the selected health care facilities from April to June, 2017 and record review. The total number of expected deliveries in the selected districts for the year 2017 was 92,440.

The region has a total of 34,137 households according to the 2010 population and housing census. The average household size is four. About 43.4% of the population aged 12 years and older are married, 43.8% have never married whilst 4.5% are in consensual unions. Also 3.8% are widowed, 3.2% divorced and 1.3% are separated.

Of the population 11 years and above, 73.3% are literate and 26.7% non- literate. The proportion of literate males is higher (50.8%) than that of females (49.2%).

3.5 Sampling

3.5.1 Sample size

The total number of deliveries for the study area in the year 2015 was 14,289. An uptake of 55% for “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP) was used. (DHIMS2, 2016). The utility function for population survey of Epi Info version 7.1.5.2 was used to calculate for the sample size at 95% confidence level. A precision level of 5% was used. A minimum sample of 370 was reached for the study. During the pretest of the questionnaire, a non-response rate of 20% was established. Therefore, the sample size was increased by 15% (74) to get a final sample size of 444.

3.5.2 Sampling procedure

The first stage of sampling involved selecting sampling points (clusters). The clusters consisted of the 27 district/municipal hospitals in the region. These were stratified into urban and rural. One district/municipal was randomly selected from the urban stratum and two

districts were selected randomly from the rural stratum to obtain three sampling sites. The sampling sites were Tain District Hospital and Mathias Catholic Hospital in Nsawkaw and Yeji respectively, representing the rural districts. Techiman Holy Family Hospital also represented the urban district.

The second stage involved the serial selection of participating subjects. Every woman who had just delivered in the facility was requested to participate. The first mother who delivered on 1st May 2017, the day data collection started, was selected to participate as the first participant. Every other mother who delivered subsequently was selected provided she consented to participate. Informed consent was sought from participants and those who declined to participate were excluded from the study without any form of intimidation with regards to provision of healthcare.

3.6 Data collection methods & tools

Participants were interviewed using a structured questionnaire in English. The questionnaire was designed using 'Kobo Collect' (a software application from Kobo Toolbox). The data was collected using Android phones by trained research assistants. For women who did not understand English, the questions were interpreted in Asante Twi. For those who did not understand any of the aforementioned languages, they were interviewed through a reliable interpreter in any language of their choice. In the event where there was no reliable interpreter in a language of her choice, that particular mother was excluded from the study.

Data on the hemoglobin (Hb) levels of the participants at their first Antenatal Care (ANC) visit and prior to delivery were collected from the ANC records card. Information on the sickle cell status and G6PD activity of participants were collected from their ANC records cards. These Hb levels were compared to determine whether the participant was anemic during the pregnancy. Birth weight of the baby delivered was recorded. For multiple babies

delivered, the birth weight of each baby was recorded separately for that participant. The gestation age of the pregnancy was also recorded to determine whether it was pre-term delivery or not. Other relevant information on the participants were also retrieved from the delivery register at the facility. Information which were not documented in both the ANC records card and the delivery register were verbally retrieved from the participants. Some of these variables were insecticide treated mosquito net use, household size and ethnicity. The records reviewed were on the selected mothers who had already been interviewed verbally.

3.7 Data Processing and Analysis

Data collected was aggregated and exported into Microsoft Office Excel file. The data was cleaned and prepared to be suitable for analysis. Variables which required to be coded were coded as such. Continuous variables which needed to be changed into categorical variables were converted. Maternal age of respondents was grouped into less than 18 years, 18-24 years, 25-34 years and 35-49 years. The level of education of participants was regrouped into no formal education, basic education (primary/middle school/junior high school), secondary education and Tertiary education. The resultant data was imported into StataMP 13. Microsoft Excel was used to summarize continuous variables into means with standard deviations and reported. StataMP 13 was used to summarize categorical variables into percentages and proportions. Chi-square test was performed to test for associations between IPTp, ITN use, demographic variables and the outcome variables (stillbirth, pre-term birth, low birth weight and anaemia). Logistic regression was done to obtain Odds Ratio (OR). The OR was used to compare low birth weight, pre-term birth and stillbirth among the various IPTp uptake and no IPTp as reference group to determine whether associations exist between IPTp uptake and birth outcomes. A p-value of <0.05 was considered to be

significant. Other independent variables were controlled for to determine whether a significant association still existed between IPTp-SP and the outcome variables.

3.8 Ethical Issues

Ethical clearance was obtained from the Ghana Health Service (GHS) Ethics Review Committee (ERC) on 14th March 2017 (protocol number: GHS-ERC: 23/12/2016). Administrative authorization was obtained from the Regional Director of Health Services, Brong Ahafo as well as the Municipal/District Directors of Health Service of the respective participating Municipalities/Districts. Permission was sought for from The Hospital Management Teams (HMTs) of the participating facilities. The labour wards staff of the sampling sites (hospitals) were officially informed as stakeholders. Informed consent were obtained from the participating subjects before interviewing them. Personal identifiers such as name and phone numbers of participants were not recorded.

3.9 Pre-testing of Questionnaire

The questionnaire was administered to ten women who had delivered at a clinic (Joefel Clinic) in Yeji to ensure clarity and understanding of the questions. Questions which seemed to be ambiguous were rephrased and those which they found uncomfortable answering were either eliminated or rephrased. Out of 10 respondents, six of the questionnaires were fully completed by respondents giving a non-response rate of 20%. The pre-testing was done on 20th of March, 2017 after obtaining the ethical clearance.

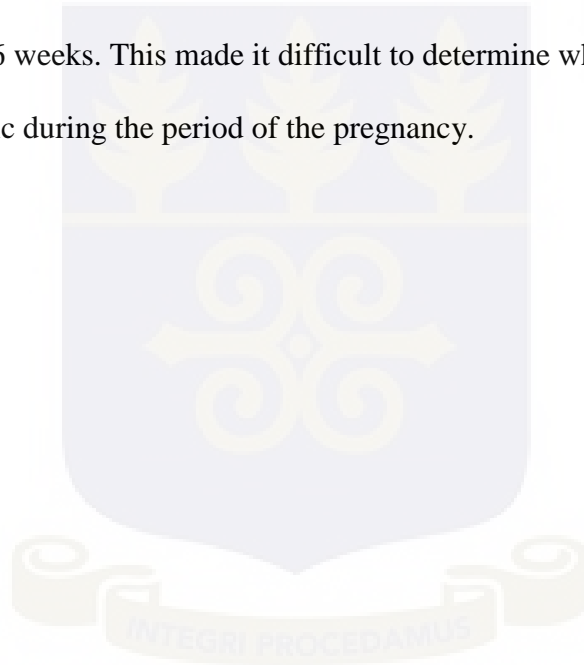
3.10 Study Limitation

Every good decision is taken based on information from a good quality data. Data is judged by its completeness, accuracy and timeliness of reporting it. Some of the antenatal care

(ANC) records card and the delivery registers were not completely filled resulting in many missing values.

Glucose-6-phosphate Dehydrogenase (G6PD) test was not performed for some of the pregnant women participating in the study. Some of the facilities lacked capacity to perform this test for every pregnant woman before administering IPTp-SP as required. This could induce hemolytic anaemia in women with a reduced G6PD activity.

Haemoglobin (Hb) level at first antenatal care visit was not done for some of the participants. Also, Hb level at 36 week for some of participants the participants were not checked at exactly 36 weeks. This made it difficult to determine whether those participants were actually anaemic during the period of the pregnancy.



CHAPTER FOUR

RESULTS

The summary of findings from the research are elaborated in this chapter. Socio-demographic variables described in this chapter are maternal age, marital status, educational level and occupation. Others include gravidity and trimester of first ANC attendance. Results of IPTp-SP uptake and birth weight as well as anaemia, preterm birth and stillbirth are also shown here.

Some respondents declined to answer some of the questions thereby resulting in some missing values.

4.1 Study Sites and Subjects

The total number of respondents were 443 from all the sampling sites. Holy family hospital (HFH) representing the urban hospital in the region had 107 (24.2%) respondents whereas Tain district hospital (TDH) and Mathias catholic hospital (MCH) representing the rural based hospitals in the region had 336 (75.8%) respondents.

4.2 Socio-Demographic Factors of Participants

The ages of participants ranged from 15 – 44 years. The mean age was 27.2 (standard deviation, SD= 6.65). The median age was 27 years. The mean number of antenatal care (ANC) visits was 6 times per pregnancy (SD=2.42), while the median was also 6 (Range: 0 to 11). The household size ranged from 2 – 40 members with mean 6.4 (SD=3.93) and the median household size was 6. Of the 397 respondents who had their haemoglobin (Hb) checked at 36 weeks, the mean Hb was 10.2g/dl (SD=2.71). The mean birth weight of the babies was 3.0kg (SD=0.48).

Overall, 79.2% of women were married while 20.8% were single. Likewise, 75.8% were from rural setting while 24.2% were from urban setting. Figure 3 shows the uptake of IPTp-SP and ITN use as stratified by rural and urban setting

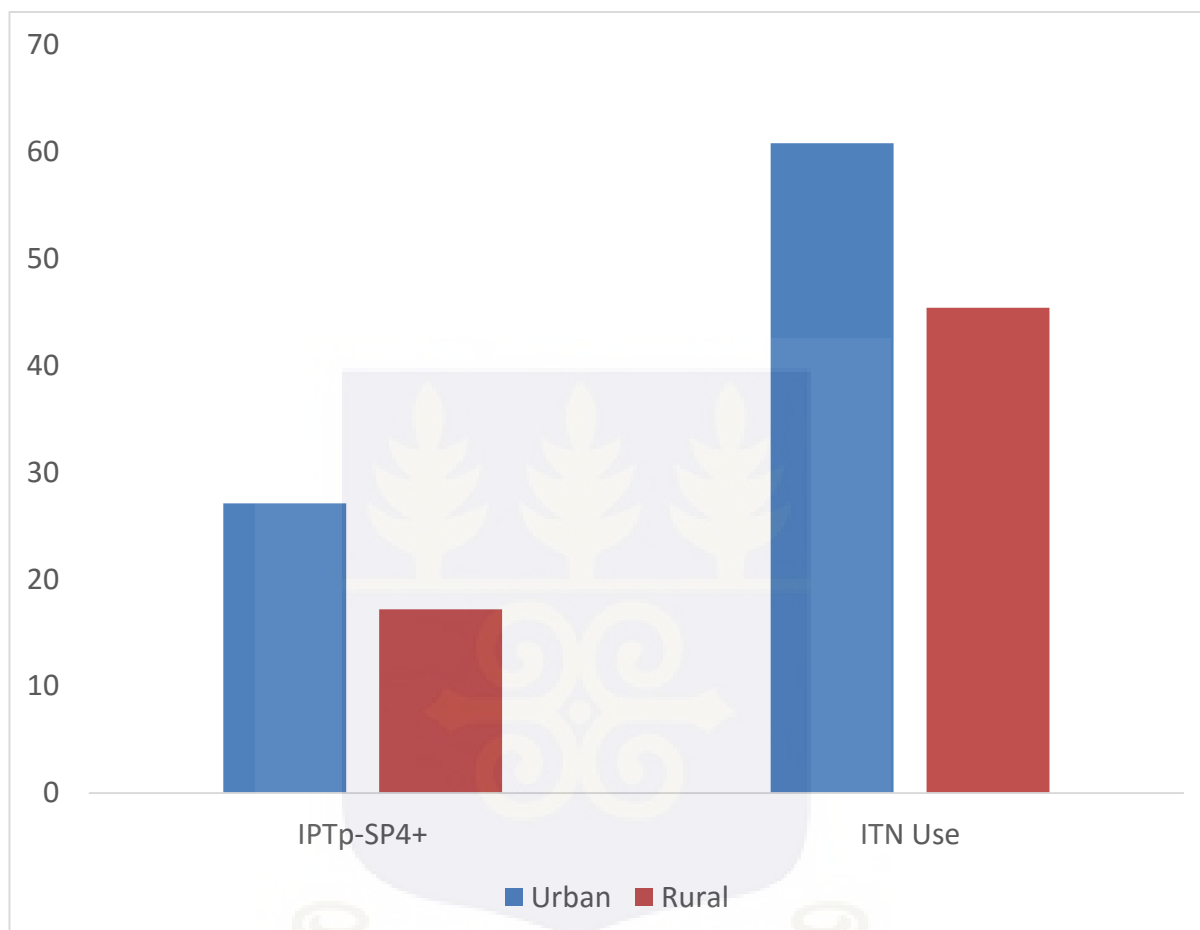


Figure 3: Uptake of IPTp-SP and ITN Use among Urban and Rural Dwellers

Comparing urban and rural dwellers, mothers in urban areas had a higher IPTp-SP4+ uptake of 27.1% compared to 17.3% ($\chi^2 = 15.6$, $P = < 0.01$). With respect to insecticide treated mosquito net use, urban dwelling mothers still had a higher proportion 60.7% compared to 45.4% ($\chi^2 = 7.7$, $P = 0.01$). For mother giving birth to low birth weight babies, rural dwelling mothers however had a higher proportion (14%) than urban dwelling mothers (6.7%) ($\chi^2 = 4.0$, $P = 0.05$) as shown in figure 4 below.

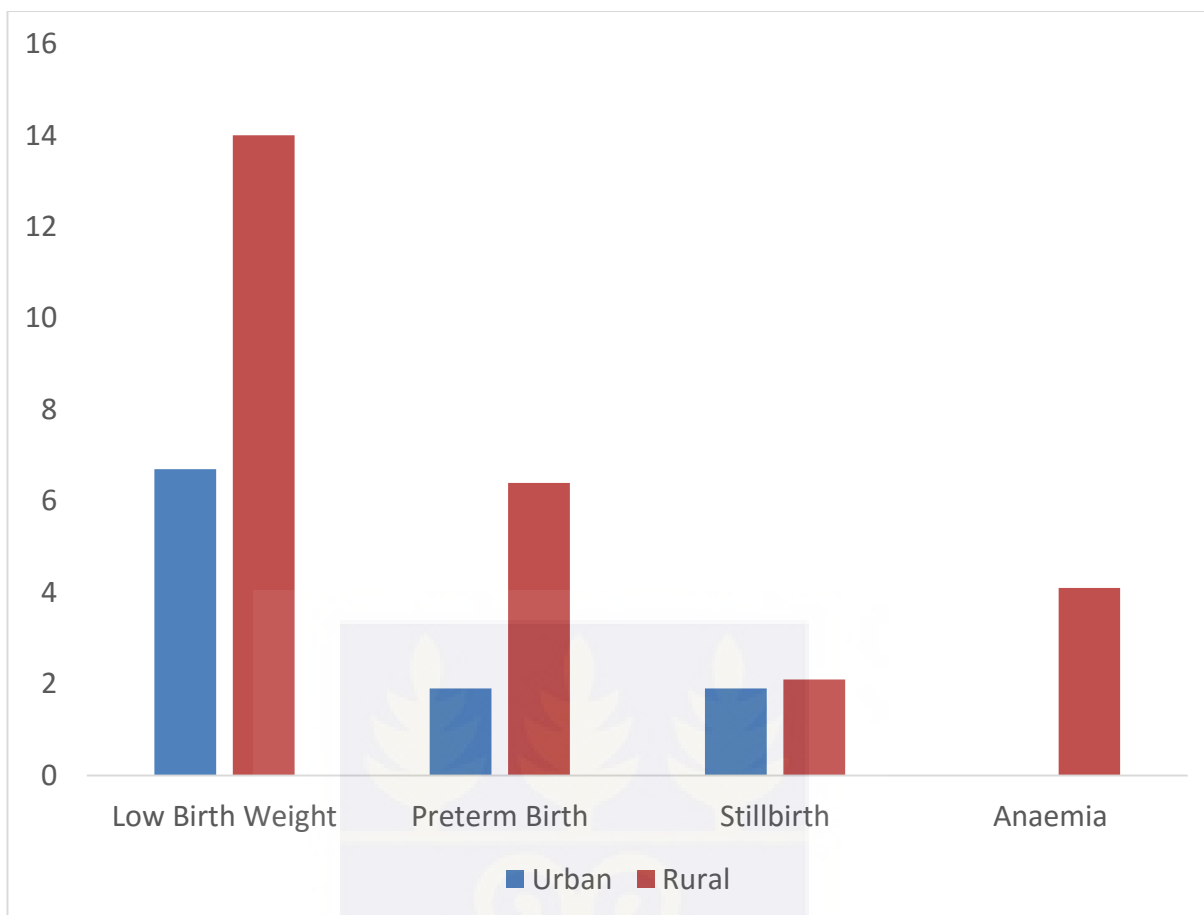


Figure 4: Proportion of Outcomes among Urban and Rural Dwellers

Occupation of mother and the number of antenatal care (ANC) visits by mothers during pregnancy showed statistically significant difference between mother of urban and rural dwelling. Occupation had a chi square and p-value of 146.5 and <0.01 respectively while number of ANC visits had 86.3 and <0.01 respectively.

For the level of education, rural dwelling mothers had higher proportions of no formal education which dropped consistently towards tertiary education. However, urban dwelling mothers had higher level of tertiary education which also dropped towards no formal education. This phenomena is shown in Figure 5.

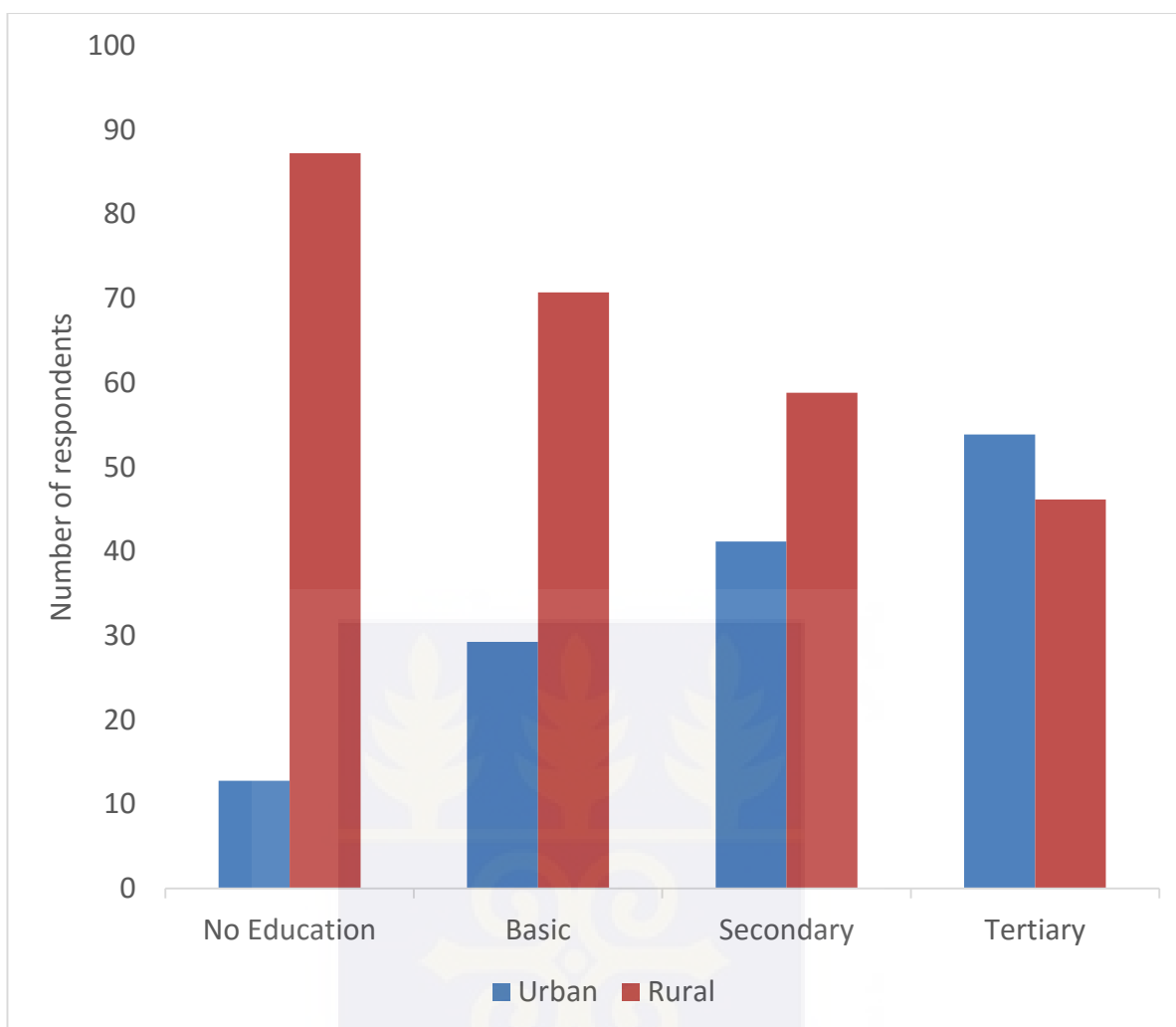


Figure 5: Educational Levels of Respondents among Urban and Rural Dwellers

4.3 ITN Coverage and IPTp Uptake

Of 434 respondents, the majority 317 (73.0%) owned insecticide treated mosquito nets (ITN). However, those who regularly slept under ITN during pregnancy were 216 (49.8%). Pregnant women aged 25-34 years were most likely to report ITN use (48.2%) while those aged less than 18 years were the least likely to report use (6.0%). This association was statistically significant ($\chi^2 = 9.2$, $P = 0.03$).

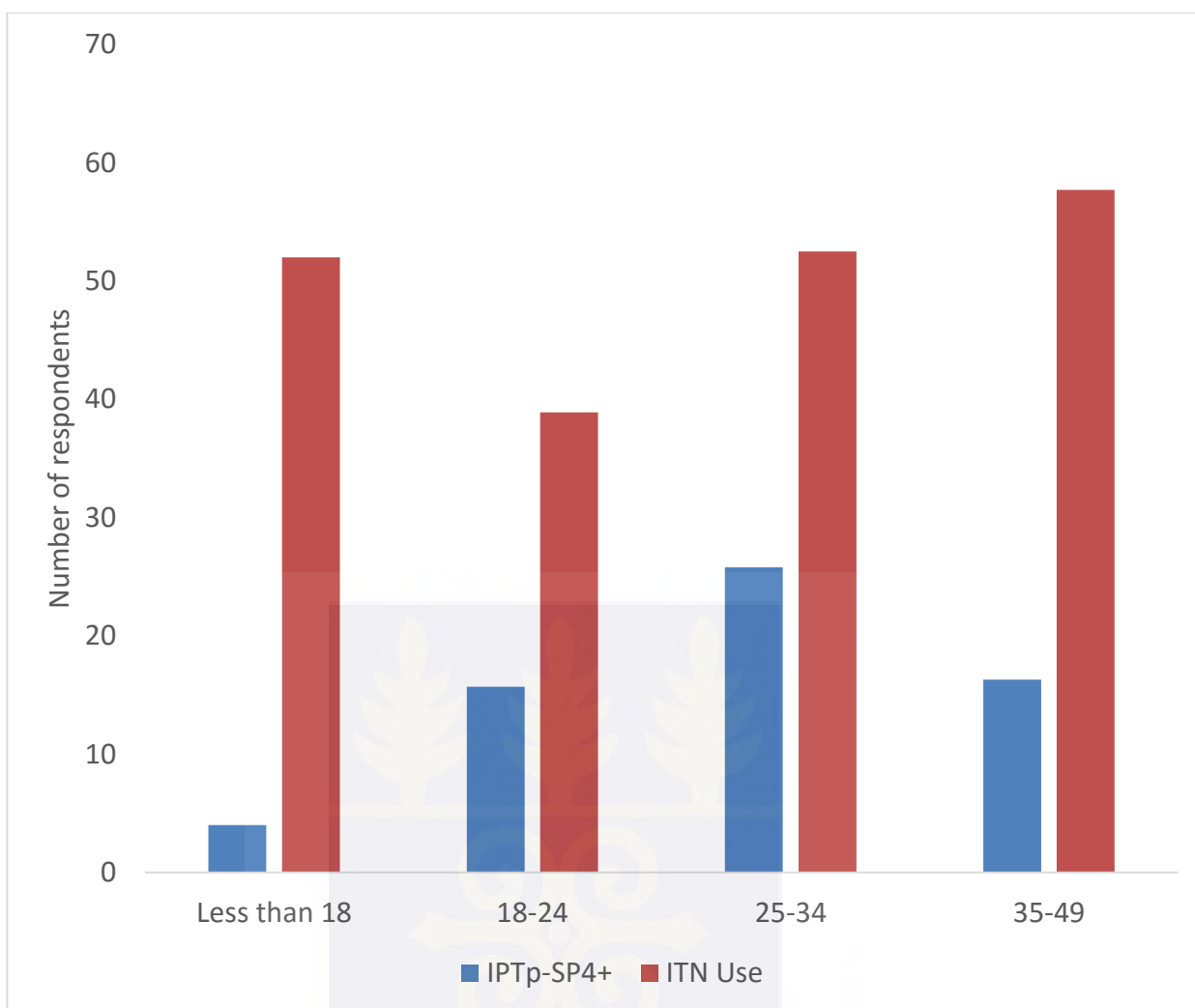


Figure 6: Distribution of IPTp-SP Uptake and ITN Use by Age Groups

Among participants surveyed, the uptake of IPTp-SP1, IPTp-SP2, IPTp-SP3 and IPTp-SP4+ were 80.9%, 66.1%, 47.6% and 19.8% respectively. Of those who took at least one dose of IPTp-SP, pregnant women aged 24-35 years constituted the majority (45.9%) while those age below 18 years (5.1%) were the least.

Among mothers who took four or more doses of intermittent preventive treatment, mother aged less than 18 years consisted of 1.2% (the least proportion) while mother aged 25-34 years made up the highest proportion (58.6%). This association was however not significant ($\chi^2 = 17.9$, $P = 0.12$).

Comparing urban dwelling mothers to rural dwelling mothers, urban dwellers were more likely to take “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP) than rural dwellers ($\chi^2 = 12.43$, $P < 0.01$). With respect to IPTp-SP4+, the strength of association was stronger ($\chi^2 = 15.60$, $P < 0.01$). Adjusting for age, education and occupation, urban dweller had 2.85 times the odds of taking IPTp-SP compared to rural dwellers (AOR=2.85, 95%, CI; 1.306.24).

4.4 Birth Outcomes

Among respondents, the prevalence of stillbirths was low 9 (2.0%). Prevalence of preterm births and low birth weight were 23 (5.3%) and 53 (12.2%) respectively.

A distribution of the birth outcomes and anaemia by the socio-demographic factors are shown in Table 2 below.

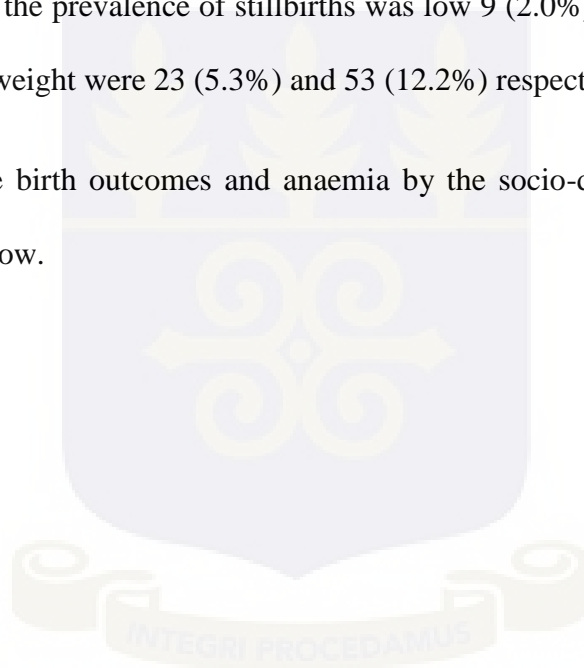


Table 2: Distribution of Birth Outcomes and Anaemia by Socio-Demographic Factors

Variable	Percentage LBW	Percentage Preterm	Percentage SB	Percentage Anaemia
Age Group	N=53(12.2%)	N=23(5.3%)	N=9(2.0%)	N=12(3.2%)
<18	15.1	13.1	0.0	16.67
35-49	37.7	26.1	22.2	50.00
18-24	30.2	47.8	55.6	33.33
25-34	17.0	13.0	22.2	0.00
Marital status	N=51(11.9%)	N=22(5.1%)	N=9(2.0%)	N=12(3.2%)
Not Married	27.5	18.2	22.2	33.3
Married	72.5	81.8	77.8	66.7
Education	N=51(11.9%)	N=22(5.1%)	N=9(2.0%)	N=12(3.2%)
No education	49.0	63.6	66.7	58.3
Basic	39.2	18.2	33.3	33.3
Secondary	11.8	18.2	0.0	8.4
Tertiary	0.0	0.0	0.0	0.0
Occupation	N=50(11.6%)	N=21(4.9%)	N=9(2.0%)	N=12(3.2%)
Student/Unemployed	34.0	28.6	0.0	33.3
Farmer/House wife	42.0	33.3	88.9	50.0
Business/Civil servant	16.0	19.1	0.0	16.7
Petty Trading	8.0	19.0	11.1	0.0
Gravidity	N=50(11.6%)	N=21(4.9%)	N=9(2.0%)	N=12(3.2%)
Primigravid	38.0	23.8	22.2	25.0
Secundigravid	18.0	23.8	0.0	33.3
Multigravid	44.0	52.4	77.8	41.7
Trimester (1st ANC)	N=45(10.8%)	N=18(4.3%)	N=9(2.0%)	N=12(3.2%)
1 st Trimester	48.9	50.0	44.4	41.7
2 nd Trimester	37.8	44.4	44.4	50.0
3 rd Trimester	13.3	5.6	11.2	8.3

Data is presented as frequency and percentage, N=Number of respondents, ANC=Antenatal Care, LBW=Low Birth Weight, SB=Stillbirth

Age of mothers and their occupation were grouped into categories. The summary of participants socio-demographic characteristics by birth weight of the infant are shown in Table 3. Maternal age, occupation and gravidity were the only factors which had a statistical significance with birth weight of infant.

Compared to women older than 18 years, those less than 18 had the highest proportion of low birth weight (32%) and association was statistically significant ($\chi^2 = 12.6$, $P = 0.01$).

With respect to occupation, students and unemployed mothers had the highest prevalence of low birth weight (19.3%) followed by farmer and house wives (15%). Test of significance for the association ($\chi^2 = 13.7$, $P = <0.01$).

Primigravid mothers had a low birth weight prevalence of 22.6% compared to secondigravid and multigravida mothers who had 8.4% and 9.2% respectively. Test of significance for this association was ($\chi^2 = 12.3$, $P = <0.01$).



Table 3: Summary of Socio-Demographic Factors of Study Participants by Babies Birth

Weight

Variable	LBW	No LBW	Total	P
	N (%)	N (%)	N (%)	
Age (years)				0.01
<18	8 (32.0)	17 (68.0)	25 (5.8)	
18-24	20 (14.5)	118 (85.5)	138 (31.8)	
25-34	16 (8.3)	177 (91.7)	193 (44.5)	
35-49	9 (11.5)	69 (88.5)	78 (18.0)	
Marital status				0.21
Not Married	14 (15.7)	75 (84.3)	89 (20.8)	
Married	37 (10.9)	302 (89.1)	339 (79.2)	
Education				0.46
No education	25 (13.7)	157 (86.3)	182 (42.2)	
Basic	20 (10.8)	165 (89.2)	185 (42.9)	
Secondary	6 (11.8)	45 (88.2)	51 (11.8)	
Tertiary	0 (0.0)	13 (100.0)	13 (3.0)	
Occupation				<0.01
Student/Unemployed	17 (19.3)	71 (80.6)	88 (20.5)	
Farmer/House wife	21 (15.0)	119 (85.0)	140 (32.6)	
Business/Civil servant	8 (7.8)	95 (92.2)	103 (24.0)	
Petty Trading	4 (4.0)	95 (96.0)	99 (23.0)	
Gravidity				<0.01
Primigravid	19 (22.6)	65 (77.4)	84 (19.5)	
Secundigravid	9 (8.4)	98 (91.6)	107 (24.9)	
Multigravid	22 (9.2)	217 (90.7)	239 (55.6)	
Trimester (1st ANC)				0.69
1 st Trimester	22 (10.1)	197 (89.9)	219 (52.6)	
2 nd Trimester	17 (10.9)	139 (89.1)	156 (37.5)	
3 rd Trimester	6 (14.6)	35 (85.4)	41 (9.9)	

Data is presented as frequency (percentage), p-values are estimated when low birth weight babies are compared to normal birth weight using chi square test, p-value <0.05 is considered statistically significant. ANC=Antenatal Care, LBW=Low Birth Weight

In Table 4, the summary of participants socio-demographic characteristics by preterm births are illustrated. Chi square test did not show significant association between preterm birth and any of the socio-demographic factors.

Table 4: Summary of Socio-Demographic Factors of Study Participants and Preterm Birth

Variable	Preterm	No Preterm	Total	P
	N (%)	N (%)	N (%)	
Age (years)				0.41
<18	3 (12.0)	22 (88.0)	25 (5.8)	
18-24	6 (4.4)	132 (95.7)	138 (31.8)	
25-34	11 (5.7)	182 (94.3)	193 (44.5)	
35-49	3 (3.9)	75 (96.2)	78 (18.0)	
Marital status				0.76
Not Married	4 (4.5)	85 (95.5)	89 (20.8)	
Married	18 (5.3)	321 (94.7)	339 (79.2)	
Education				0.06
No education	14 (7.7)	168 (92.3)	182 (42.2)	
Basic	4 (2.2)	181 (97.9)	185 (42.9)	
Secondary	4 (7.8)	47 (92.2)	51 (11.8)	
Tertiary	0 (0.0)	13 (100.0)	13 (3.0)	
Occupation				0.78
Student/Unemployed	6 (6.8)	82 (93.2)	88 (20.5)	
Farmer/House wife	7 (5.0)	133 (95.0)	140 (32.6)	
Business/Civil servant	4 (3.9)	99 (96.1)	103 (24.0)	
Petty Trading	4 (4.0)	95 (96.0)	99 (23.0)	
Gravidity				0.88
Primigravid	5 (6.0)	79 (94.0)	84 (19.5)	
Secundigravid	5 (4.7)	102 (95.3)	107 (24.9)	
Multigravid	11 (4.6)	228 (95.4)	239 (55.6)	
Trimester (1st ANC)				0.73
1 st Trimester	9 (4.1)	210 (95.9)	219 (52.6)	
2 nd Trimester	8 (5.1)	148 (94.9)	156 (37.5)	
3 rd Trimester	1 (2.4)	40 (97.6)	41 (9.9)	

Data is presented as frequency (percentage), p-values are estimated when preterm births are compared to births of normal gestation using chi square test, p-value <0.05 is considered statistically significant. ANC=Antenatal Care

A summary of the distribution of stillbirths by the socio-demographic characteristics of mothers are listed in Table 5. Occupation of mothers was the only socio-demographic factor which had a significant association with stillbirth ($\chi^2 = 12.8$, $P = 0.01$).

Table 5: Summary of Socio-Demographic Factors of Study Participants and Stillbirth

Variable	Stillbirth	No Stillbirth	Total	P
	N (%)	N (%)	N (%)	
Age (years)				0.78
<18	0 (0.0)	25 (100.0)	25 (5.6)	
18-24	2 (1.4)	138 (98.6)	140 (31.6)	
25-34	5 (2.5)	193 (97.5)	198 (44.7)	
35-49	2 (2.5)	78 (97.5)	80 (18.1)	
Marital status				0.92
Not Married	2 (2.2)	89 (97.8)	91 (20.8)	
Married	7 (2.0)	339 (98.0)	346 (79.2)	
Education				0.43
No education	6 (3.2)	182 (96.8)	188 (42.7)	
Basic	3 (1.6)	185 (98.4)	188 (42.7)	
Secondary	0 (0.0)	51 (100.0)	51 (11.6)	
Tertiary	0 (0.0)	13 (100.0)	13 (3.0)	
Occupation				0.01
Student/Unemployed	0 (0.0)	88 (100.0)	88 (20.1)	
Farmer/House wife	8 (5.4)	140 (94.6)	148 (33.7)	
Business/Civil servant	0 (0.0)	103 (100.0)	103 (23.5)	
Petty Trading	1 (1.0)	99 (99.0)	100 (22.8)	
Gravidity				0.22
Primigravid	2 (2.3)	84 (97.7)	86 (19.6)	
Secundigravid	0 (0.0)	107 (100.0)	107 (24.4)	
Multigravid	7 (2.9)	239 (97.1)	246 (56.0)	
Trimester (1st ANC)				0.89
1 st Trimester	4 (1.8)	219 (98.2)	223 (52.5)	
2 nd Trimester	4 (2.5)	156 (97.5)	160 (37.7)	
3 rd Trimester	1 (2.4)	41 (97.6)	42 (9.9)	

Data is presented as frequency (percentage), p-values are estimated when stillbirths are compared to live births using chi square test, p-value <0.05 is considered statistically significant. ANC=Antenatal Care

4.5 Anaemia and IPTp-SP Uptake

Mothers' haemoglobin (Hb) level at 36 weeks of gestation was recorded from the antenatal care records card. Maternal anaemia was determined by an Hb level of less than 8.0g/dl. Among 378 participants, 12 (3.2%) had maternal anaemia. None of the socio-demographic factors examined showed a significant association with anaemia during pregnancy.

Table 6: Summary of Socio-Demographic Factors of Study Participants and Anaemia

Variable	Anaemia	Anaemia	Total	P
	N (%)	N (%)	N (%)	
Age (years)				0.06
<18	2 (10.0)	18 (90.0)	20 (5.3)	
18-24	6 (5.3)	108 (94.7)	114 (30.2)	
25-34	4 (2.3)	171 (97.7)	175 (46.3)	
35-49	0 (0.0)	69 (100.0)	69 (18.2)	
Marital status				0.20
Not Married	4 (5.6)	67 (94.4)	71 (94.4)	
Married	8 (2.6)	296 (97.4)	304 (81.1)	
Education				0.64
No education	7 (4.5)	150 (95.5)	157 (41.5)	
Basic	4 (2.5)	157 (97.5)	161 (42.6)	
Secondary	1 (2.1)	46 (97.9)	47 (12.4)	
Tertiary	0 (0.0)	13 (100.0)	13 (3.5)	
Occupation				0.10
Student/Unemployed	4 (6.1)	62 (93.9)	66 (17.4)	
Farmer/House wife	6 (4.8)	119 (95.2)	125 (33.1)	
Business/Civil servant	0 (0.0)	94 (100.0)	94 (24.9)	
Petty Trading	2 (2.2)	91 (97.8)	93 (24.6)	
Gravidity				0.60
Primigravid	3 (4.3)	67 (95.7)	70 (18.5)	
Secundigravid	4 (4.2)	92 (95.8)	96 (25.4)	
Multigravid	5 (2.4)	207 (97.6)	212 (56.1)	
Trimester (1st ANC)				0.56
1 st Trimester	5 (2.4)	201 (97.6)	206 (56.0)	
2 nd Trimester	6 (4.6)	126 (95.4)	132 (35.9)	
3 rd Trimester	1 (3.3)	29 (96.7)	30 (8.1)	

Data is presented as frequency (percentage), p-values are estimated when anaemic mothers are compared to non anaemic mothers using chi square test, p-value <0.05 is considered statistically significant. ANC=Antenatal Care

4.6 Associations between IPTp-SP Uptake, Pregnancy Outcomes and Anaemia

There was a significant difference between the doses of IPTp-SP and birth weight of babies ($\chi^2 = 24.4$, $P = <0.01$). Women who took IPTp-SP4+ had reduced odd of low birth weight (LBW) as compared to those with IPTp-SP doses less than four (OR=0.59, CI = 0.47-0.74). After controlling for insecticide treated mosquito net (ITN) use, the strength of IPTp-SP association with LBW remained statistically significant (OR=0.59, CI = 0.47-0.75). Further analysis controlled for occupation, gravidity and age in addition to ITN use and the results

still showed significant association between IPTp-SP dose and odds of having a LBW baby as shown in Table 6. For instance, women who had four or more doses of IPTp-SP had 38% less chances of having a baby less than 2.5kg as compared to women who had less than four IPTp-SP doses (AOR=0.62, CI = 0.49-0.79).

Table 7: Association between LBW and IPTp-SP Uptake

LBW	Odds Ratio	[95% Conf. Interval]	P> z
IPTp-SP	0.62	0.49 - 0.79	<0.01
ITN Use	0.51	0.26 - 1.00	0.05
Occupation	0.68	0.47 - 0.97	0.04
Gravidity	0.66	0.39 - 1.10	0.11
Age	1.15	0.68 - 1.94	0.60
_cons	1.14	0.39 - 3.34	0.81

Data is presented as odds ratio, p-values and confidence interval, p-value <0.05 is considered statistically significant. IPTp-SP=Intermittent Preventive Treatment, ITN=Insecticide Treated Mosquito Net

From Table 8, a significant association was observed between IPTp-SP and preterm birth ($\chi^2 = 16.98$, $P < 0.01$). After controlling for ITN use, occupation, gravidity and age, women who took IPTp-SP4+ were less likely to have preterm births as compared to those who did not take IPTp-SP4+ (AOR=0.63, CI = 0.45-0.89).

Table 8: Association between Preterm Birth and IPTp-SP Uptake

Preterm	Odds Ratio	[95% Conf. Interval]	P> z
IPTp-SP	0.6345441	0.4507252 0.8933296	0.009
ITN Use	0.5562705	0.2146551 1.4415540	0.227
Occupation	0.9486224	0.5900895 1.5249970	0.828
Gravidity	0.9484805	0.4514130 1.9928870	0.889
Age	0.9846604	0.4728703 2.0503640	0.967
_cons	0.1835922	0.0377042 0.8939605	0.036

Data is presented as odds ratio, p-values and confidence interval, p-value <0.05 is considered statistically significant. IPTp_SP=Intermittent Preventive Treatment, ITN=Insecticide Treated Mosquito Net

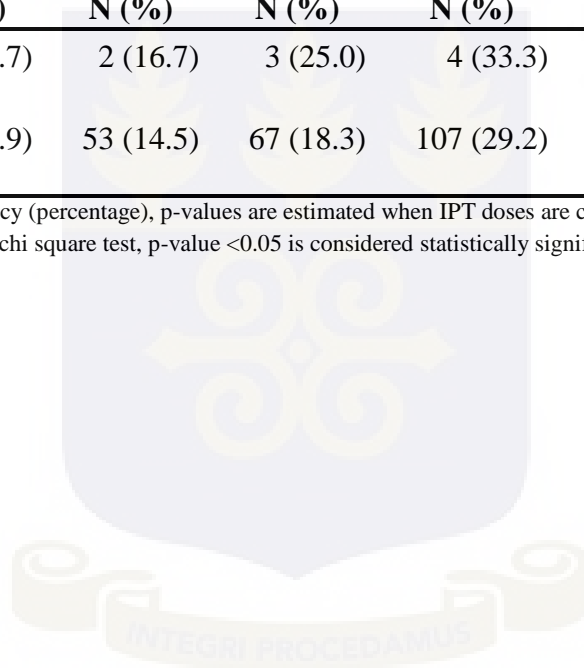
The association observed between IPTp-SP and stillbirth was not statistically significant ($\chi^2 = 2.21, P=0.70$). This association suggests that women who took IPTp-SP and those who did not take IPTp-SP had no difference in the likelihood of having stillbirths (OR = 1.0, CI = 0.63-1.61).

Proportion of anaemia did not also differ by IPTp-SP uptake (Table 9).

Table 9: Association between Anaemia and IPTp-SP Uptake

Anaemia	No IPT	IPT1	IPT2	IPT3	IPT4+	Total	P
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	
Yes	2 (16.7)	2 (16.7)	3 (25.0)	4 (33.3)	1 (8.3)	12 (3.2)	0.84
No	58 (15.9)	53 (14.5)	67 (18.3)	107 (29.2)	81 (22.1)	366 (96.8)	

Data is presented as frequency (percentage), p-values are estimated when IPT doses are compared among anaemia and non anaemia mothers using chi square test, p-value <0.05 is considered statistically significant. IPT=Intermittent Preventive Treatment



CHAPTER FIVE

DISCUSSION

Although there is a global decrease in the incidence and mortality rates of malaria from 2010 to 2015, malaria still remains a public health problem, especially in sub Saharan Africa. To maintain therapeutic drug levels in the blood of vulnerable populations throughout the period of which they are at greatest risk, intermittent preventive treatment in pregnancy (IPTp) is one of the interventions to achieve this objective in pregnant women. This study sought to add to knowledge on IPTp-SP4+ uptake and birth outcomes in the region. It will help health authorities to come out with innovative ways of improving the uptake of IPTp-SP in order to improve birth outcomes.

5.1 IPTp-SP Uptake

The WHO 2012 updated recommendation on “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP) policy require all pregnant women to make at least four antenatal care (ANC) visits during the period of the pregnancy. During each visit, IPTp-SP should be administered as directly observed therapy (DOT) from the second trimester onwards. This implies that, the recommended dose of IPTp-SP is IPTp-SP4+.

From the study, uptake of IPTp-SP1, IPTp-SP2, IPTp-SP3 and IPTp-SP4+ was 80.9%, 66.1%, 47.6% and 19.8% respectively. According to the Ghana National Malaria Control Programme (NMCP) periodic bulletin, uptake of IPTp-SP1, IPTp-SP2, IPTp-SP3 and IPTp-SP4+ reported for Ghana in 2016 were 64.1%, 51.6%, 36.7% and 16.7% respectively (NMCP, 2016b). The uptake of IPTp-SP4+ in the study and the national uptake were statistically different using one sample test of proportions ($p \geq 0.167$; $p\text{-value} = 0.049$). The prevalence of IPTp-SP1 in the Brong Ahafo region was 55% in 2015. Comparing the

proportion of IPTp-SP1 from this study and the 2015 reported prevalence for Brong Ahafo region using one sample proportion test, the difference between the two prevalence was significant ($p \geq 0.55$; $p\text{-value} < 0.01$). Figures reported in this study shows significant improvement in the coverage compared to the 2015 regional uptake.

According to a study by Chepkemoi, intermittent preventive treatment, IPT2, uptake was 56.5% in Bungoma East District, Kenya (Chepkemoi Ng'etich-Mutulei & Odhiambo, 2014). Amoran reported a lower uptake of IPT2 (14.6%) in a rural town, Western Nigeria (Amoran et al., 2012). Although Antwi, in a study conducted in the Bosomtwe District of Ghana, reported higher uptake of IPT1 and IPT2 (95% and 77%), IPT3 uptake was lower (44%) compared to what is reported in this study (Antwi, 2010). In a study conducted in a suburban area of coastal Ghana, IPT3 uptake was reported to be 38.3% (Stephens et al., 2014). This current study has reported a higher IPTp-SP uptake compared to these previous studies mentioned. This is common with surveys conducted in health facilities as compared to population surveys. Respondents tends to give favorable answers when a survey is being conducted in the healthcare facility.

The increase in uptake of intermittent preventive treatment (IPT2) and (IPT3) over the years and subsequent appreciable uptake of IPT4+ could be as a result of numerous interventions to scale up IPTp-SP uptake both locally and globally (WHO, 2012a).

“Intermittent preventive treatment in pregnancy using Sulfadoxine-Pyrimethamine” (IPTp-SP) uptake was not different with the trimester of first ANC visit. This can be due to the fact that IPTp-SP administration is expected to commence from the second trimester onwards (WHO, 2012b).

This study found that primigravid mothers had a significantly higher risk of low birth weight (LBW). This is consistent with the findings of Valea et al. that, the risk of LBW was

significantly different between those who received IPT1 (41.4%), IPT2 (25%) and IPT3 (13.6%), p -value = 0.012 (Valea et al., 2010). Mother with higher doses of “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP) usually have lower risk of LBW.

Intermittent preventive treatment in pregnancy using Sulfadoxine-Pyrimethamine (IPTp-SP) uptake, the main intervention, was least among women aged less than 18 years (5.07%) and highest, among women aged 25-34 (45.92%). This could account for the higher proportion of low birth weight attributed to women age less than 18 years. Agbozo and others reported an increased risk of LBW among mothers aged less than 20 years compared to those aged 20-30 years (RR; 1.46, CI; 1.11-1.93, $p=0.007$). Mothers who took one dose also had an increased risk of LBW in their study compare to those who took three or more doses (RR; 1.57, CI; 1.24-1.98, $p<0.0001$) (Agbozo et al., 2016). Teenage motherhood is usually frowned upon in society thereby making these mothers feeling shy in seeking care whenever the need arises.

Amidst all the campaigns to scale up the uptake of “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP4+), challenges such as stock-out of sulfadoxine-pyrimethamine (SP) contribute to low uptake (NMCP, 2016b).

There are demand side issue such as awareness of “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP), safety of the SP and reported side effects. Late initiation of antenatal care is another issue as reported by Rassi and others (Rassi et al., 2016).

Another significant factor which determined the uptake of “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” was whether a mother was a rural or urban dweller. Mother of urban setting had a 3.7 times the odds of taking IPTp-SP

compared to those from a rural setting (OR=3.7, 95%, CI; 1.71 -7.89). This could be as a result of access and awareness as alluded by other researchers (Mubyazi et al., 2005).

5.2 ITN Coverage

Insecticide treated mosquito net (ITN) ownership by pregnant women from the study was 73% compared to a higher coverage of 82% in Kenya and as low as 29% in Zimbabwe (Singh, Brown, & Rogerson, 2013). Singh and others found knowledge of malaria, level of education, socio-economic status and community involvement as factors which contributed to the ownership of ITNs by mothers. In this study however, occupation which largely determines socio-economic status, was the only factor which had a significant association with ITN ownership ($\chi^2 = 12.05$, $P=0.01$).

Proportion of women who slept under ITN (usage) was 49.8%. This was far below ($p \leq 0.85$; p -value < 0.01) the target set by Ghana National Malaria Control Programme (NMCP) to increase the number of pregnant women sleeping under ITN to 85% (NMCP, 2013).

As far back as 2012, a household survey estimated an encouraging insecticide treated mosquito net (ITN) ownership of 86% as reported by the Ghana National Malaria Control Programme (NMCP, 2013). Reports for the NMCP suggests that, health facility reports usually show decrease in uptake of these interventions which is contrary to population surveys (NMCP, 2016a).

The National Malaria Communication Strategy recommends a universal ITN coverage. This means every pregnant woman in Ghana receives an ITN during her first antenatal care (ANC) visit, therefore the ITN coverage could have been much higher since only 1.6% of the respondents were non ANC attendants.

Similar to intermittent preventive treatment in pregnancy (IPTp), women aged less than 18 years were the least (6%) users of insecticide treated mosquito nets (ITNs) whereas those aged 25-34 years were the most users (48.2%). This could also be the reason why mother of age less than 18 years had higher proportions of low birth weight attributed.

5.3 Birth Outcomes

The proportion of low birth weight (LBW) was 12.2% among the study population. A study in north-eastern Nigeria reported LBW of 37% (Muhammad et al., 2016). This was a cross sectional study of women who were attending antenatal care clinic in a tertiary hospital. Analysis of these prevalence using one sample test of proportion showed that the difference in prevalence was statistically significant ($p \leq 0.37$; p -value < 0.01). Pregnant women who took higher doses of IPTp-SP had less association with LBW. IPTp-SP has the potency of clearing malaria parasite from the blood stream, thereby supporting this findings.

Insecticide treated mosquito net (ITN) use, age, occupation and gravidity were all factors which had a lower risk of resulting in low birth weight (LBW). These associations were all statistically significant. In a logistic regression of intermittent preventive treatment in pregnancy using Sulfadoxine-Pyrimethamine (IPTp-SP) uptake on LBW, the association was still significant while controlling for other factors. The strength of association between IPTp-SP and LBW was weaker, adjusting for ITN use (AOR=0.59, CI: 0.47-0.75), compared to age, occupation and gravidity.

The study suggests that uptake of four or more doses of “intermittent preventive treatment in pregnancy using Sulfadoxine-Pyrimethamine” (IPTp-SP) will have 38% reduced chances of having a baby weighing less than 2.5kg compared to IPTp-SP uptake of less than four doses. Adjusted odds ratio=0.62 and confidence interval is 0.49 - 0.79.

The proportion of preterm birth in the study was 5.3%. Analysis of the data showed no significant association with all the independent factors except “intermittent preventive treatment in pregnancy using Sulfadoxine-Pyrimethamine” (IPTp-SP) (OR=0.63, 95% CI: 0.45-0.89). Among women who did not take IPTp-SP, the proportion of preterm birth was 12.2%. Dow and others also found preterm birth prevalence of 23.6% among pregnant women who did not take intermittent preventive treatment in pregnancy (IPTp) (Dow et al., 2013). This difference in the prevalence of preterm birth was statistically significant ($p \leq 0.236$; p -value < 0.01).

With respect to preterm birth in the study and after adjusting for insecticide treated mosquito net use, occupation, gravidity and age; mothers who took four or more doses of “intermittent preventive treatment in pregnancy using Sulfadoxine-Pyrimethamine” (IPTp-SP) were less likely to have preterm births as compared to those who took less doses or who did not take IPTp-SP at all. Adjusted odds ratio=0.63 and confidence interval = 0.45-0.89.

Stillbirth also had a proportion of 2.03%. The observed association suggesting that there was not difference between pregnant women who took “intermittent preventive treatment in pregnancy using Sulfadoxine-Pyrimethamine” (IPTp-SP) and those who did not with respect to the risk of stillbirth was not statistically significant ($\chi^2 = 2.21$, $p = 0.70$). Data from other researchers to refute or buttress this claim was scanty.

The prevalence of maternal anaemia at 36 weeks of gestation was 3.7% compared a 14% reported by Nwali et al. among pregnant women in a northeastern Nigeria health facility (Nwali, Ejikeme, Agboeze, Onyebuchi, & Anozie, 2015). These anaemia prevalence are statistically different ($p \leq 0.14$; p -value < 0.01). Among a cross section of pregnant women in Nigeria, Muhammad reported a higher prevalence of 41% (Muhammad et al., 2016).

The mean haemoglobin level of participants was 10.2g/dl. This was low compared to 11.8g/dl reported among pregnant women in Nigeria (Miri-Dashe et al., 2014). The difference in mean haemoglobin was however not significant using one-sample t-test analysis ($p \leq 0.118$; p-value =1.00).

The proportion of placenta samples taken in the study was 6.8%. Analyzing such a proportion of sample to make a generalization could be misleading hence the placenta samples were not analyzed to establish the prevalence of placental malaria and its association with IPTp-SP in the study area.

Finding from this research are mostly pointing to the fact that the World Health Organization (WHO) recommendation of four or more doses of “intermittent preventive treatment in pregnancy using Sulfadoxine-Pyrimethamine” (IPTp-SP) results in improved birth outcomes (WHO, 2012b). A study in Malawi by Gutman and others supports this claim that IPTp-SP is associated with improved birth outcomes (Gutman et al., 2013).

Some of the antenatal care (ANC) records card and the delivery registers were not completely filled resulting in many missing values. This affected the number of responses for some of the variables during analysis. This could have affect the proportions and associations determined in the study.

Glucose-6-phosphate Dehydrogenase (G6PD) test was not performed for most of the respondents. Analysis on G6PD was not done due to high number of missing values.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

The uptake of four or more doses of “intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine” (IPTp-SP 4+) in the selected districts of the Brong Ahafo region was 19.8%.

The proportion of stillbirth, preterm birth and low birth weight was 2.03%, 5.3% and 12.2% respectively among mothers in the selected healthcare facilities in the Brong Ahafo region. There was appreciable reduction in the proportions of these indicator compared to figure reported by the region in previous years.

The proportion of maternal anaemia among pregnant women in the Brong Ahafo region was found to be 3.2%.

Pregnant women who took “intermittent preventive treatment in pregnancy using Sulfadoxine-Pyrimethamine” (IPTp-SP) for malaria had a lower risk of low birth weight compared with those who did not take IPTp-SP and those who took fewer doses. This association was very significant after adjusting for insecticide treated mosquito net (ITN) use and other socio-demographic factors. The higher the doses of IPTp-SP, the lesser the risk of having low birth weight babies.

Intermittent preventive treatment in pregnancy using Sulfadoxine-Pyrimethamine (IPTp-SP) for malaria also had a lower risk of giving birth to preterm babies. Controlling for the same factors as in low birth weight, the association was stronger but not significant.

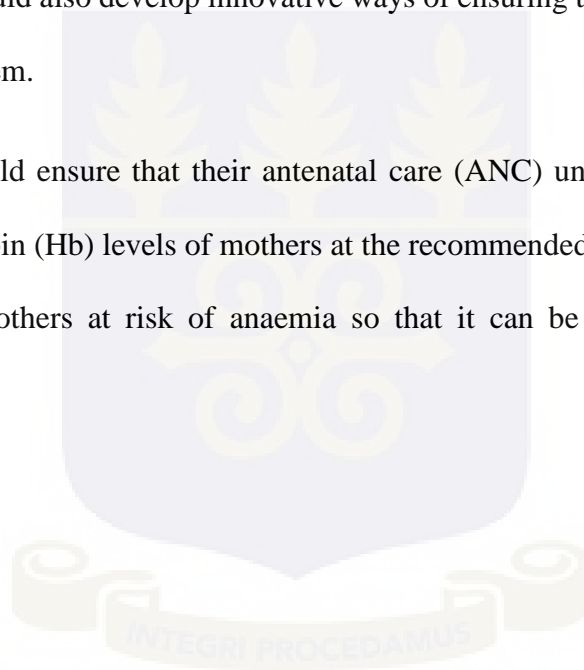
IPTp however, showed no significant association with stillbirth. None of the other factors also had a significant association with SB.

6.2 Recommendations

The uptake of intermittent preventive treatment in pregnancy using sulfadoxine-pyrimethamine in the study was low especially IPTp-SP4+. Antenatal care providers in the three study sites should take steps to increase the uptake of IPTp-SP4+ in their facilities.

The health facilities (especially Holy Family Hospital and Mathias Catholic Hospital) should manage their stock of insecticide treated mosquito net (ITN) well in order to avoid stock outs. They should also develop innovative ways of ensuring that pregnant women use the ITNs given to them.

The study sites should ensure that their antenatal care (ANC) units should endeavour to check the haemoglobin (Hb) levels of mothers at the recommended interval. This may help to identify early, mothers at risk of anaemia so that it can be controlled to avoid its complications.



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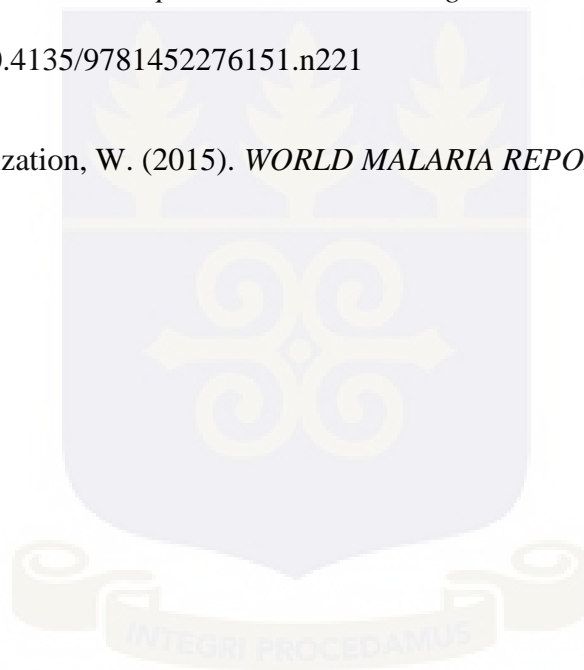
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APPENDICES

Appendix 1: Informed Consent

PROJECT TITLE: Uptake of Intermittent Preventive Treatment for Malaria and Birth Outcomes among Pregnant Women in the Brong Ahafo Region of Ghana

The purpose of this study is to assess uptake of “intermittent preventive treatment for malaria” and birth outcomes among pregnant women in the Brong Ahafo region of Ghana. The result of this study is expected to be use in planning health care delivery in the region with respect to IPTp-SP administration. You have been selected to help obtain information for this study. Before agreeing to participate, it is important that you read the following:

Voluntary participation: Participation is voluntary and you are free to withdraw from the study at any stage without any consequence.

Possible Risks and Discomforts

The research will not pose any risks to you. You may however experience some minor discomfort when answering certain questions. You may refuse to answer any question if you feel uncomfortable about it. A sample of your placental blood will be taken for analysis.

Possible Benefits

Participants will benefit from an incentive package (soap and Dettol) as well as malaria treatment for participants who will test positive. The findings would benefit the region and the Ghana Health Service as a whole in planning health delivery services. Your participation may therefore be helping in improving IPTp-SP uptake in the Brong Ahafo region.

Confidentiality

All the information obtained from this study will be confidential and used for the purpose indicated for the study. The information will be securely stored without your name, in a file which will be only be accessible to the research team. A number linked to your name will be kept confidential. The results of this study will be disseminated in such a way that no information will be linked to your identity.

Contact Numbers

In case of any queries/difficulties you may contact the following:

Dr. Adolphina Addo-Lartey

Tel: 0544132970/0504522987

E-mail: aaddo-lartey@ug.edu.gh
samuel_dapaa@yahoo.com

Mr. Samuel Dapaa

Tel: 0205159359

E-mail:

Ms. Hannah Frimpong

Tel: 0302681109/0302679323

E-mail: ghserc@gmail.com



Appendix 2: Participant Agreement

I have read the written information (or have had the information read and adequately explained to me) for the study “**Uptake of Intermittent Preventive Treatment for Malaria and Birth Outcomes among Pregnant Women in the Brong Ahafo Region of Ghana**”

I have been given ample opportunity to ask any questions I have. All questions have been answered to my satisfaction. I have also been given time and opportunity to consider taking part in this study. I therefore agree to participate in this study.

.....

Signature of Participant

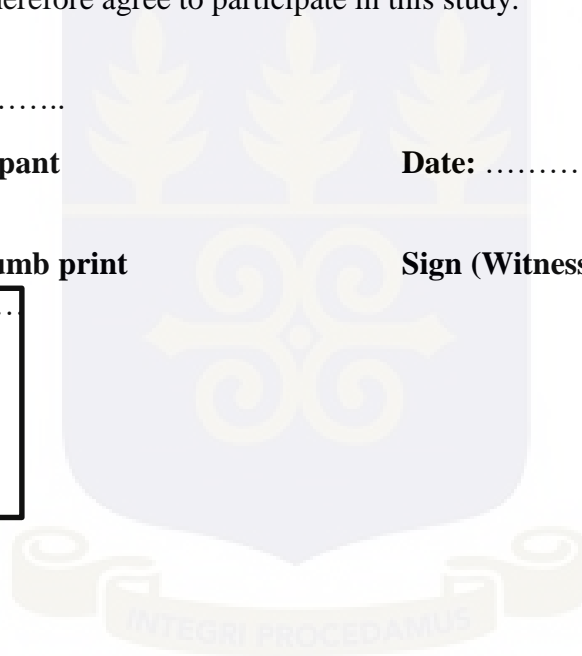
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Sign (Witness):

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RTP



Form filled by:

Signature:

Date:

Appendix 3: Questionnaires

**Uptake of Intermittent Preventive Treatment for Malaria and Birth Outcomes
among Pregnant Women in the Brong Ahafo Region of Ghana**

You have been selected to assist in this study by responding to this questionnaire. The information you provide for the purpose of this research will be strictly confidential. Kindly tick the appropriate box that correspond to your response and write appropriately where a spaces have been provided.

Unique Number: **Date of Delivery:**/2016

- SAMPLING SITE:
- MATERNAL AGE :.....(years)
- MARITAL STATUS: Single[] Married[] Divorced[] Separated []
 Widowed []
- EDUCATIONAL LEVEL: None [] Primary [] Middle School [] JHS []
 SHS [] Tertiary []
- ETHNICITY:
- RELIGION: Christianity [] Islam [] African Traditional []
 Others []
- OCCUPATION: Student/Unemployed [] Farmer/House wife[]
 Business or Civil servant[] Petty Trading []
- GRAVIDITY: Primigravid[] Secundigravid[] Multigravid[]
- HOW MANY PEOPLE LIVE IN YOUR HOUSEHOLD?
- NUMBER OF ANC VISITS DURING PREGNANCY:
- WHICH TRIMESTER DID YOU ATTEND YOUR 1ST ANC:
 1ST [] 2ND [] 3RD []
- HAVE YOU EVER DRUNK ALCOHOL? Yes[] No[]

13. DO YOU STILL DRINK ALCOHOL? Yes[] No[]
14. HAVE YOU EVER SMOKE CIGARETTE? Yes[] No[]
15. DO YOU STILL SMOKE CIGARETTE? Yes[] No[]
16. DO YOU HAVE ANY OF THESE DISEASES? Hypertension[]
Diabetes[] Sickle Cell
Disease[] G6PD[]
17. HAEMOGLOBIN AT 1st ANC:(g/dl)
18. HAEMOGLOBIN AT 36 week:(g/dl)
19. DO YOU HAVE AN INSECTICIDE TREATED MOSQUITO NET? Yes[] No[]
20. DID YOU SLEEP UNDER INSECTICIDE TREATED MOSQUITO NET WHILE PREGNANT? Yes[] No[]
21. DID YOU TAKE IPT_p-SP DURING THE PREGNANCY? Yes[] No[]
22. IF YES TICK ALL THAT APPLY: IPT1[] IPT2[] IPT3[]
IPT4[] IPT5[]
23. PREGNANCY OUTCOME: Stillbirth[] Live birth[]
24. BIRTH OUTCOME: Pre-term[] No Pre-term[]
25. BIRTH WEIGHT OF BABY:(kg)
26. SEX OF BABY: Male[] Female[]
27. DOES THE BABY HAS ANY CONGENITAL ANOMALY? Yes[] No[]
28. IF YES, STATE THE ANOMALY:

THANK YOU

Appendix 4: Ethical Approval Letter

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

My Ref: GHS/RDD/ERC/Admin/App/17/336
Your Ref. No.



Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghserc@gmail.com

Samuel Dapaa
School of Public Health
University of Ghana
P. O. Box LG 13
Legon

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	GHS-ERC: 23/12/2016
Project Title	"Uptake of Intermittent Preventive Treatment for Malaria and Birth Outcomes among Pregnant Women in the Brong Ahafo Region of Ghana"
Approval Date	14 th March, 2017
Expiry Date	13 th March, 2018
GHS-ERC Decision	Approved

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report **after completion** of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
DR. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

Appendix 5: Letter of Introduction to the Brong Ahafo Regional Health Directorate



UNIVERSITY OF GHANA
DEPARTMENT OF EPIDEMIOLOGY AND DISEASE CONTROL
SCHOOL OF PUBLIC HEALTH

Ref. No.:

7th November, 2016

The Regional Director of Health Services
Ghana Health Service
Sunyani
Brong Ahafo Region

Dear Sir/Madam,

LETTER OF INTRODUCTION – SAMUEL DAPAA

We wish to introduce to you, *Samuel Dapaa*, an MPhil student in the Department of Epidemiology and Disease Control of the School of Public Health, College of Health Sciences, University of Ghana, Legon.

He is conducting a research on “Uptake of intermittent preventive treatment for malaria and pregnancy outcomes in the Brong Ahafo Region of Ghana”.

It will be appreciated if you could provide him with the necessary support to undertake his research work in your institution.

We thank you for your cooperation.

Yours faithfully,

Dr. Bismark Sarfo
Ag. Head

CC: *School Administrator, SPH*
The Medical Superintendent, Municipal Hospital, Sunyani
The Medical Superintendent, Holy Family Hospital, Techiman
The Medical Superintendent, Sene District Hospital, Kwame Danso
The Medical Superintendent, Tain District Hospital, Nsawkaw

COLLEGE OF HEALTH SCIENCES

• Telephone: +233 (0) 289 109 008 P. O. Box LG 13, Legon, Accra, Ghana.
• Email: sph-epdc@ug.edu.gh • Website: www.publichealth.ug.edu.gh

Appendix 6: Permission Letter to Conduct Research in the Brong Ahafo Region

DEPARTMENT OF EPIDEMIOLOGY
SCHOOL OF PUBLIC HEALTH
UNIVERSITY OF GHANA

9TH NOVEMBER, 2016

THE REGIONAL DIRECTOR
GHANA HEALTH SERVICE
BRONG AHAFO

Dear Sir,

PERMISSION TO CONDUCT RESEARCH IN THE REGION

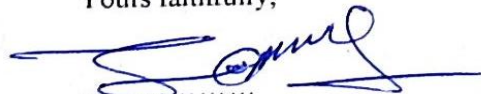
I am a second year resident of the School of Public Health, University of Ghana. I write to request for permission to conduct a research titled “**Uptake of Intermittent Preventive Treatment for Malaria and Pregnancy Outcomes in the Brong Ahafo Region**”

This study is a quantitative cross-sectional study which seeks to assess the uptake of IPTp-SP for malaria and pregnancy outcomes in selected health facilities in the region. Four health facilities which conduct deliveries have been selected to participate. These are Sunyani Municipal Hospital, Techiman Holy Family Hospital, Sene West District Hospital and Tain District Hospital.

The Research proposal as well as other relevant documents will be submitted to the Ghana Health Service Institutional Review Board for ethical clearance before commencement of the research. This research is a requirement for the award of Master of Philosophy in Applied Epidemiology and Disease Control by the University.

Thank you for your anticipated cooperation.

Yours faithfully,



Samuel Dapaa
(0205159359)