EFFECT OF INTERMITTENT PREVENTIVE TREATMENT (IPTp) USING SULPHADOXINE PYRIMETHAMINE (SP) ON BIRTH WEIGHT LINDI REGION, 2009

BY

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CERTIFICATION

The undersigned certifies that they have read and hereby recommends for examination of Dissertation entitled **EFFECT OF INTERMITTENT PREVENTIVE TREATMENT (IPTp) USING SULPHADOXINE PYRIMETHAMINE (SP) ON BIRTH WEIGHT LINDI REGION, 2009**

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DECLARATION

I, Salma Masauni Yussuf declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other award.

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ABSTRACT

Introduction

Malaria is a major problem in pregnancy in Tanzania and is associated with maternal anaemia, premature delivery, and intrauterine growth retardation resulting in delivery of low birth weight (LBW) infants. The World Health Organization (WHO) recommends that all women living in sub-Saharan Africa with stable malaria transmission to receive Intermittent Preventive Treatment during pregnancy (IPTp). The first dose of IPTp (IPTp-I) is administered between 20-24 weeks of gestational age; the second dose of IPTp (IPTp-II) should be administered at 28-36 weeks. Increase SP resistance, little is known about the effects of IPTp also the SP has been changed as the first line treatment but still has been used. This study intends to look into the effects of IPTp on a number of malaria indicators.

Methodology

It was a cross- sectional analytical study of pregnant women delivering at Sokoine hospital Lindi Region between November 2009 and January 2010 were recruited into the study. The hospital was conveniently selected due to high number of pregnant women delivering at the hospital. Data regarding their pregnancies were collected at maternity ward on admission and after complete routine examinations. Data collected included information on maternal social demographic characteristics, mosquito net use, reproductive information, previous delivery outcomes and HIV status of pregnant women. Estimated sample size was 246 pregnant women. Data was double entered and checked for errors before being analysed by Epi Info version 2: 5: 1: software.

Results

The overall mean age of this study population was 26.2 years, with median 25 years and range 14 – 47 years. In these study 246 pregnant women 50% had not taken IPTp (SP) during their entire pregnancy. Total of 50% were gravida 3 and beyond and 98% pregnant women was GA above 36wks and 46% did not attended any form of education. For HIV status 4% pregnant women were HIV infected. A total of 35% had not attended ANC

during this pregnant. And 40% of newborns were delivered below 2.5 kg. The prevalence of venous parasitaemia was 9% and placenta was 4%.

Recommendations

To improve health educations to the pregnant women to attended ANC.

Education is important; in this study only 7 pregnant women were secondary level of education. To encourage mothers at ANC visit and to encourage maternity nurses to do counselling and HIV test.

MoH&SW and (NMCP) should revisit the IPTp policy, even though the IPTp policy was recommended and adopted in 1998 based on limited data, evidence has confirmed that the burden of malaria is decreased with several ways of malaria intervention and not through IPTp only.

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ABBREVIATIONS

LBW	Low birth weight
PTD	Preterm delivery
IUGR	Intra-uterine growth retardation
IPTp	Intermittent Preventive Treatment
Hb	Haemoglobin
MOH&SW	Ministry of Health and Social Welfare
NMCP	National Malaria Control Programme
DOT	Direct Observed Therapy
ACT	Artemisinin Combination Therapy
LLITNs	Long Lasting Insecticide Treated bed Nets
ITNs	Insecticide Treated bed Nets
SP	Sulphadoxine-Pyrimethamine
HIV	Human Immuno virus
DEET	Diethyl-*meta*-polyamides
ALU	Artemerther Lumefantrine
RBMs	Roll Back Malaria
GDP	Gross Domestic Product
OPD	Out Patient Department
AIDs	Acquired Immuno deficiency syndrome
WHO	World Health Organization
RDTs	Rapid Diagnostic Test
IRS	Indoor Residual Spraying
ANC	Antenatal Clinic
KG	Kilogram
CDC	Centre of Disease Control and prevention

OPERATIONAL DEFINITIONS

Malaria infection is defined as the presence of asexual *Plasmodium falciparum* parasites of any density in a blood smear.

Parasitaemia (in peripheral, placental, or cord blood) is defined as the presence of asexual-stage parasites in thick blood films.

Low birth weight is defined as birth weight less than 2500 g.

Premature labour or premature birth is defined as birth occurring before 37 completed weeks of pregnancy.

An abortion is the termination of a pregnancy by the removal or expulsion from the uterus of a fetus/embryo, resulting in or caused by its death. An abortion can occur spontaneously due to complications during pregnancy or can be induced, in humans and other species.

Still-birth is when foetal death occurs after the 20th week of pregnancy.

IPTp1 is the 1st dose of SP administered between 20-24wks

IPTp2 is the 2nd dose administered between 28-36wks

CHAPTER I

1.0. Introduction

Malaria is a disease caused by the presence of the protozoan *Plasmodium* in human or other vertebrate erythrocytes. It is transmitted to humans by the bite of an infected female mosquito of the genus Anopheles that is infected with malaria parasits. Human infection begins with the exoerythrocytic cycle in liver parenchyma cells, followed by a series of erythrocytic schizogenous cycles repeated at regular intervals. Production of gametocytes in other erythrocytes provides future gametes for another mosquito infection. This cycle of activities is characterized by episodic severe chills and high fever, prostration, occasionally death (NIAD, 2009).

1.1. Types of malaria

The following are four types of malaria parasite

Plasmodium vivax (P. vivax) – This is a milder form of the disease, generally not fatal; however, infected people still need treatment because if untreated, it can progress and cause a host of health problems. This type has the widest geographic distribution globally (NIAD, 2009). About 60% of infections in India are due to *P. vivax*. This parasite has a liver stage and can remain in the body for years without causing sickness. If the patient is not treated, the liver stage may re-activate and cause relapse malaria attacks after months, or even years without symptoms.

Plasmodium malariae (P. malariae) – Is a milder form of the disease, generally not fatal, however, the infected human still needs treatment because absence of treatment can also lead to a host of health problems. This type of parasite has been known to stay in the blood of some people for several decades.

Plasmodium ovale (P. ovale) – Is a milder form of the disease, generally not fatal, however, the infected human still needs to be treated because it may progress and cause a host of health problems. This parasite has a liver stage and can remain in the body for years without causing sickness. If the patient is not treated, the liver stage may re-activate and cause relapse malaria attacks after months, or even years without symptoms.

Plasmodium falciparum (P. falciparum) - The most serious form of the disease, it is the commonest in Africa, especially in sub-Saharan Africa. Current data indicates that cases of *P. falciparum* are now being reported in areas where this type of infection was thought to have been eradicated.

P. falciparum during pregnancy is the sequestration of the parasite in the placenta which is most common among the primigravidae; infected erythrocytes frequently sequester in the intervillous space of the placental and cause pathological alteration which is associated with a variety adverse perinatal outcome including a significant decrease in infant's birth weight (NIAD, 2009).

1.2. Global Burden of malaria

Malaria is a major public health problem worldwide; 300-500 million people each year are diagnosed with Malaria (WHO, 2001). (90% of them in Sub-Saharan Africa, two thirds of the remaining cases occur in six countries-India, Brazil, Sri Lanka, Vietnam, Colombia and Solomon Islands), the remaining 1/3 to the other countries. Over 1 million people worldwide die from malaria each year with most malaria deaths occurring in sub-Saharan Africa. Most affected group who die of malaria is children (Parsons, 2009).

1.3. Malaria in Africa

Most malaria infections in Africa south of the Sahara are caused by *Plasmodium falciparum,* the most severe and life threatening form of the disease. In Africa today, malaria is understood to be both a disease of poverty and a cause of poverty. Annual

economic growth in countries with high malaria transmission has historically been lower than in countries without malaria.

One of the greatest challenges facing Africa in the fight against malaria is drug resistance. Resistance to Chloroquine and sulfadoxine-pyrimethamine (SP) is also increasing dramatically in East and Southern Africa. As a result of these trends, many countries were found to change their treatment policies and use drugs which are more expensive, including Arthemisin combinations of drugs, with the hope to slow development of resistance. The Abuja Declaration endorsed Roll Back Malaria's (RBM's) goal and established a series of interim targets for the number of people having access to treatment, protective measures or, in the case of pregnant women, receiving Intermittent Preventive Treatment to ensure that progress would be made towards the goal and malaria-endemic countries (WHO, 2001).

In sub-Saharan Africa malaria continues to be the largest single component of the burden of disease even though simple, effective treatment exists. Malaria associated morbidity and high mortality persist because of failed transactions between those at risk of malaria transmission and available preventive and curative health system (De Savigny *et. al.*, 2004).

Annual economic growth in countries with high malaria transmission has historically been lower than in countries without malaria. Economists believe that malaria is responsible for a growth penalty of up to 1.3% per year in some African countries. When compounded over the years, this penalty leads to substantial differences in Gross Domestic Product (GDP) between countries with and without malaria and severely restrains the economic growth of the entire region. Malaria also has a direct impact on Africa's human resources. Not only does malaria result in lost life and lost productivity due to illness and premature death, but malaria also hampers children's schooling and social development through both absenteeism and permanent neurological and other damage associated with severe episodes of the disease (WHO, 1998).

1.4. Malaria in Tanzania

Malaria continues to be a major public health burden in Tanzania, a country with the world's third largest population at risk of stable malaria after Nigeria and Democratic Republic of Congo. About 35.0 million Tanzanians are at risk, pregnant women and children's are the most vulnerable groups. The National Malaria Control Program's (NMCP) Mid-term Strategic Plan for 2002–2007 reported that malaria accounts for an approximately 1.3% reduction in national economic growth and contributes to 30% of the national disease burden. (Mubyazi *et. al.,* 2005).

In 2004 malaria diagnosis in children less than five years of age accounted for 43% of all out patient department (OPD) attendances and 40% of deaths recorded in health facilities. Tanzania changed its malaria treatment policy from Chloroquine to Sulfadoxine pyrimethamine (SP) monotherapy as the first line drug for the treatment of acute malaria episodes in August 2001 due to Chloroquine resistance. And from June 2008 Tanzania changed its malaria treatment policy from Sulfadoxine pyrimethamine (SP) to Artemerther Lumefantrine (ALU). Malaria and HIV infections are both endemic in Tanzania and co-infection is common. The two diseases are most important health problems in the country being the leading cause of morbidity and mortality (MOH&SW, 2006).

1.5. Study area (Lindi Region)

Lindi Region is located in the south of Tanzania, bordering with Rufiji and Mtwara, Lindi is divided into 5 districts and 95% of its population is rural. The health condition of women is poorer than the average of mainland Tanzania and this difference is gender related due to relatively high maternal mortality (Chavasse *et. al.*, 1999b). In Lindi, there are 39 health facilities in Kilwa, 49 in Lindi rural, 24 in Liwale, 18 in Ruangwa and 27 in Nachingwea. The top ten cause of morbidity in Lindi are malaria, acute respiratory infections, HIV/AIDS, Tuberculosis, Diarrhoea diseases, Malnutrition, Anaemia, Intestinal worms, Trauma, Accidents and skin infections (Chavasse *et al.*, 1999b).

There are 1/25,000 Doctors to Patients ratio in Lindi region, and 1/45,000 Doctors to population ratio. Fifty four percent of the population has pit Latrines, and 44% has access to safe water. Infant Mortality Rate is estimated to be 130/100,000 under 5 mortality rates is 150/100,000. Life expectancy for female is 50 years and 45 for males. Crude Birth rate is 42. Twelve percent of the population is malnourished and more than half of the population in 1991 had an income of less than one US dollar per day per person, more than 42% had an income of less than 75 cents per day (Pohjonen, 1998).

1.6. Role of vector

Female mosquitoes feed on blood to get the extra protein they need during their egg-laying phase, and thereby transmit Plasmodium from one infected vertebrates to another vertebrate. A person gets malaria from the bite of an infected female mosquito (Parsons, 2009).

The mosquito bite injects sporozoites into the person's blood. Within half an hour sporozoites enter into liver cells, where they grow to their next stage of development. In 6 to 9 days, the parasites leave the liver and enter the bloodstream again. They invade the red blood cells, and begin to multiply asexually. The number of parasites increases until the red blood cells burst, releasing thousands of merozoites into the person's bloodstream. The parasites attack other red blood cells, and the cycle of infection continues, causing the common signs and symptoms of malaria. When a non-infected mosquito bites an infected person, the mosquito sucks up gametocytes from the person's blood. The mosquito is then infected with the malaria parasites. The parasites go through several stages of growth in the mosquito and when the mosquito bites someone else, that person will become infected with malaria parasites, and the cycle will begin again (NIAD, 2009).

1.7. Malaria Transmission

The female *Anopheles* mosquito transmits the parasite to a human when it takes a blood meal. Only the female *Anopheles* mosquito can transmit malaria, and it must have been infected through a previous blood meal taken from an infected human. When the mosquito

bites an infected person a minute quantity of the malaria *(plasmodium)* parasite in the blood is taken. Approximately one week later that same infected mosquito takes its next blood meal. The *plasmodium* parasites mix with the mosquito's saliva and are injected into the host (human being).

1.8. Human-to-human transmission of Malaria

As the parasite exists in human red blood cells, malaria can be passed on from one person to the next through organ transplant, shared needles/syringes, and blood transfusion. An infected mother may also pass malaria on to her baby during delivery (birth); this is called 'congenital malaria'. One cannot catch Malaria by just sitting next to an infected person, or breathing in next to them when they cough and sneeze.

1.9. Malaria in pregnancy

In sub-Saharan Africa, pregnant women are more likely than their no-pregnant counterparts to become infected with *Plasmodium falciparum* malaria and have a higher density of parasitaemia (Parise *et. al*, 1998). Asymptomatic cases of malaria in pregnant women lead to parasite sequestration and altered placental integrity. Forty-five percent of pregnant women in Sub Sahara Africa have malaria infection during pregnancy and about half of the women who are pregnant for the first time will be parasitaemic on their fist antenatal clinic. In primigravidae, malaria tends to be more frequent and even the attack will be more severe (Parise *et. al.*, 1998).

In areas of low or unstable malaria transmission, pregnant women have little or no immunity to malaria, and their risk of developing severe disease as a result of malaria infection is two to three times greater than that of none pregnant women living in the same area (WHO, 2004).

1.10. Signs and symptoms and diagnosis of malaria in pregnancy

Presentation of malaria during pregnancy is often hidden, with some women presenting with the typical features of uncomplicated malaria like fever, headache, joint pains, malaise, body weakness, vomiting, diarrhoea, chest pains and poor appetite. Anaemia may be the only recognizable clinical feature of severe malaria in pregnancy, and at times also presents with high fever, hyperparasitAemia, low blood sugar, severe haemolytic anaemia, cerebral malaria and pulmonary oedema. In high transmission area, it is fairly common to have a positive blood slide for detection of *Plasmodium parasities* (MOH&SW, 2006). Study by Parise *et. al.,* (1998) in Kenya showed that fever in pregnancy is not a sensitive parameter to predict placental parasitaemia.

1.11. Diagnosis of malaria during pregnancy

1.11.1. Clinical

The clinical feature of malaria vary from mild to severe, according to the species of the parasite present, the patient's state of immunity, the intensity of the infection and the presence of accompanying conditions such as malnutrition, anaemia and other disease.
Cerebral malaria is a more common presentation of severe malaria where transmission is low. Clinical diagnosis of malaria is difficult and misdiagnosis is frequent when laboratory confirmation is not available. Microscopy remains an important tool for diagnosis, but laboratory diagnosis in clinics without microscopy has now become possible due to the development of Rapid Diagnostic Tests (RDTs) (Brabin *et. al.,* 2008).

1.11.2 Laboratory diagnosis of malaria

Laboratory diagnosis of malaria include thick blood film for malaria parasites (finger prick) by using Gemsa or field stain and Rapid Diagnostic Test (RDT): RDT requires no additional infrastructure and do not require extensive training for appropriate use, nor labour intensive (Singer *et. al.,* 2004).

1.12. Risk factors for malaria infection during pregnancy

Over 50 million women are exposed to risk of malaria in pregnancy every year (Rogerson *et. al.,* 2007). And peripheral infection during pregnancy may be a particularly important risk factor for placental infection, due to lower immune protection at the beginning of pregnancy. In highly endemic areas, primigravidae and secundgravidae are more affected than other parities (Menendez *et. al.,* 2000); younger maternal age for example adolescence is also an independent risk factor for malaria in pregnancy, younger primigravidae and multigravidae are at greater risk of malaria and its adverse effects than older primigravidae or multigravidae respectively (Desai *et. al.,* 2007).

Women who are Human Immunodeficiency Virus (HIV) positive have a higher prevalence of malaria infection; with HIV positive multigravidae having similar risk of placental infection to HIV negative primegravidae (Parise *et al.,* 1998). The presence of placental malaria in HIV positive women may also increase the risk of vertical transmission, and HIV infection may diminish a pregnant women's capacity to control *P. falciparum* infection and may decreased efficacy of ant malarial interventions.

1.13. Complications of malaria during pregnancy

Plasmodium falciparum infections in pregnancy may cause parasite sequestration in the maternal placental vascular space with resultant maternal anaemia, low birth weight (LBW), prematurity and intrauterine growth retardation (IUGR). Furthermore, increased suppression of the immunity in HIV infection in pregnancy, may cause higher frequency and higher density of malaria during pregnancy (Steketee *et. al.,* 2001).

1.14. Prevention and treatment of malaria during pregnancy

1.14.1 Vector control - i.e. reducing contacts between people and vectors of disease. Controlling mosquitoes can significantly reduce malaria incidence, as well as other

mosquito-borne diseases. Getting rid of malaria in a region does not necessarily mean eliminating all the *Anopheles* mosquitoes that might transmit the disease. *Anopheles* mosquitoes still exist in North America and Europe - however, the parasite is not longer there.

Improvements in people's standard of living, such as the installation of screened windows, air conditioning, together with strategies to reduce vector populations are very effective, and have led to the total elimination of malaria without completely getting rid of the mosquito (Nordqvist *et. al.*, 2009).

1.14.2 ITNs (Insecticide-Treated Bed Nets)

Insecticide-Treated Bed Nets (ITNs) can reduce the incidence of malarial infection, and also mortality, in an endemic area considerably. Untreated nets are significantly less effective because the mosquito can bite the host through the net if the person is standing next to it. Also, even tiny holes in the netting are usually enough for the mosquito to find a way in. Nets that have been treated with insecticide are much more protective. Not only does the insecticide kill the mosquito and other insects, it is also a repellent - fewer mosquitoes are likely to enter the room(s).

If ITNs are widely used in an endemic area, the mosquito population may drop dramatically, as will their lifespan. This further protects those in that area who have no ITNs.

Preventing disease using anti-malarial medications does not prevent the parasite from entering patients' bloodstream, but they stop it from developing in the blood. This type of prevention is also known as 'suppression' (Nordqvist *et. al.*, 2009).

A successful regime of Intermittent Preventive Treatment in pregnancy could decrease exposure to malaria in pregnancy leaving women more susceptible to postpartum malaria.

The most recent WHO recommended schedule for antenatal care includes a total of four antenatal visits, including three after quickening, at least three instead of two doses would

have the practical advantage that SP (Menendez *et. al.,* 2007). Prophylaxis is not effective when administered for less than one month (Cot *et. al.*, 1992).

1.15. Intermittent Preventive Therapy in pregnancy

The policy of malaria prevention and control during pregnancy in areas of stable transmission emphasizes a package comprising Intermittent Preventive Treatment (IPTp) and insecticide treated net (ITNs), and effective case management of malaria illness and anaemia. IPTp is the administration of drug therapy in full therapeutic doses at predetermined intervals during pregnancy even if individuals have no signs of malaria (WHO, 2004).

IPTp is thus a form of chemoprophylaxis to prevent malaria infection by taking SP. The drug of choice for IPTp is sulfadoxone pyrimethamine (SP). All pregnant women in areas of stable malaria transmission should receive at least two doses of IPTp after quickening. The WHO recommends a schedule of four antenatal clinic visits, with three visits after quickening (WHO, 2004).

It is recommended for pregnant women in malaria-endemic areas to receive at least two doses of sulphadoxine-pyrimethamine in the second and third trimesters of pregnancy. The first IPTp dose is administered between 20-24 weeks (IPTpI) of gestational age. The second IPTp dose should be administered at 28-36 weeks (IPTpII) and it should be administered as direct observed therapy (DOT) during the antenatal care visits. Additional IPTp ensure that the placenta is cleared of parasites at the time of rapid foetal growth (MOH&SW, 2006).

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1.16. Other preventive tools

Insecticide treated nets (ITNs) were shown to reduce morbidity and mortality from malaria in numerous settings. One programmatic issue affecting ITNs programmes is the necessity to re-treat regularly all nets (Tami *et. al.,* 2004). Insecticide- treated nets, compared with no nets, reduced the risk of placental malaria in all gravidae and reduce the risk of low birth weight and stillbirth and abortion (Menendez *et. al.,* 2007) .

Indoor residual spraying (IRS) is recommended in specific situations such as in malaria epidemics. The role of indoor residual spraying in the prevention of malaria in pregnancy has not been evaluated. Safety of insecticides is a key challenge. Pyrethroids are the only class of insecticides that have been used to treat nets. Insect repellents, Diethyl-*meta*-toluamide (DEET), can reduce exposure to mosquito bite, the risk of accumulation in the foetus is low and DEET is safe in pregnancy. Increase of SP resistance in Africa has raised concerns about its use as IPTp (Menendez *et. al.,* 2007).

1.17. Treatment of malaria in pregnancy

According to WHO in endemic areas, treatment should start within 24 hours after the first symptoms appear; a person with uncomplicated malaria can be treated as an outpatient, while those with severe malaria need to be hospitalized. In non-endemic areas, WHO recommends that patients with uncomplicated or severe malaria should be kept under clinical observation if possible.

A person who is infected with *P. falciparum* and has severe symptoms, but cannot take oral medications, should be given treatment intravenously. In uncomplicated malaria, quinine is a drug of choice and is safe in pregnancy. In therapeutic doses, it does not induce labour, uterine contractions or foetal distress. Artemisinin and artemerther lumefantrine (ALU) is not recommended in the first trimester, but are the drugs of choice in uncomplicated malaria in pregnancy in the second and third trimesters of pregnancy.

Treatment of severe malaria in pregnancy does not differ from the treatment of severe malaria in other adult patients. The drug of choice for treatment of severe malaria is intravenous quinine. The doses is 10mg quinine dihdrochloride salt/kg body weight given by infusion in 5% dextrose over four hours, repeated after every eight hours (MOH&SW, 2006).

1.18. Statement of the problem

Malaria treatment policy changed in 2001 from CQ to SP. Simultaneously IPTp was introduced country wide for first time to reduce malaria in pregnancy. The program distributed SP at no cost to all pregnant women who attended ANC facility. Initially the coverage of IPTp was 65% for 2 doses (Mugittu *et. Al.,* 2004).

In 2007 the treatment policy changed again SP was relapsed by ALU as first line anti-malaria, however for IPTp, SP still continued. The change of policy was become of increasing SP resistance (Mugittu *et. Al.,* 2004).

The increasing SP resistance may have caused SP to be less effective when used in IPTp, but there was also an observation that the coverage rate was much lower than the initial 65%.IPTp1 and 2 doses the coverage was found to be 55% and 22% (2005 demographic health survey) respectively. There was also negative media coverage regarding the use of SP focusing on coetaneous side effects especially in HIV positive patient thus acceptance of SP in IPTp was affected. This reduced coverage compiled with resistance may be having a direct impact on making SP less useful to prevent malaria in pregnancy.

1.19. Study justification

Antenatal clinics are entry point for malaria control. Pregnant women are made aware of the problem of malaria in pregnancy through ANC visits and supported to take steps to protect themselves. Schedule of antenatal care include a total of at least four ANC visits

but some of pregnant women attend once or twice. Because of this low ANC visits, not all pregnant women received a full course of IPTp.

Pregnant women who have not had IPTp during their pregnancy may still have placental parasitaemia. If they do not, it is a good indication that IPTp may no longer be a necessary in malaria prevention in pregnant women. If they do have placental parasitaemia, it may indicate a need to continue IPTp uptake as part of the malaria control policy in Tanzania. Increase of SP resistance has raised concerns about its use as IPTp. We examine IPTp in prevention of placental malaria for women who received IPTp I and II and those who did not receive IPTp.

The use of this finding is to encourage health workers to increase health education to pregnant women on IPTp use

We examine the prevalence of placental and venous parasitaemia for those pregnant women who took IPTp and not took IPTp, the study hypothesis IPTp related with Birth weight?

1.20. Objectives

1.20.1. Broad objective

To determine effect of IPTp as a preventive strategy against malaria infection among pregnant women in Lindi Region

1.20.2. Specific objectives

1. To assess the prevalence of SP and anti-malaria intake during pregnancy.

2. To determine the relationship between IPTp use during the pregnancy and the birth weight of the newborn.

3. To determine the haemoglobin status of the pregnant women at the time of delivery.

4. To explore the prevalence of placental and venous parasitaemia among pregnant women with IPTp use.

CHAPTER 2

2.0. Literature review

2.1. Global malaria

Approximately 40% of the total global population is at risk of Malaria infection, and 80% of the burdens exist in sub-Saharan Africa (Ghosh *et. al.,* 2006). The *anopheles* mosquito exists in most tropical and many sub-tropical countries of Latin America and the Caribbean, Africa, Oceania, and Asia (Ghosh *et. al.,* 2006).

During pregnancy malaria causes both fetal and maternal morbidity and mortality in the country, including the deaths of an estimated 100,000 infant each year because malaria related low birth weight. The WHO recommended that women living in Sub Saharan Africa receive at least doses of IPTp with SP to prevent malaria and improve pregnancy outcome (Hiringoton *et, al,.* 2009).

Malaria is especial dangerous during pregnancy when some of the immunity acquired by adults as a result of repeated infections is lost in areas of low transmission, malaria in pregnancy may lead death of the fetus, abortion of the fetus and stillbirth. In area of high malaria transmission, heavy parasitisation of the placenta with *P. Falciparum* may occur especially in early pregnancies (Greenwood *et. al.,* 2002)

Malaria accounts for 2.6 percent of the total disease burden of the world and ranks third among the major deadly infectious diseases after Pneumococcal, acute respiratory infections and tuberculosis (Kakkilaya, 2006). It is expected that by the turn of the century, malaria would be the number one infectious killer disease in the world if current trend continues. It is responsible for the loss of more than 35 million disability-adjusted life-years each year (Kakkilaya, 2006). Every year approximately 30,000 visitors to endemic areas develop malaria and 1% of them may die (Kakkilaya, 2006). Estimated global annual cost (in 1995) for malaria is put at US$ 2 billion (direct and indirect costs, including loss of

labour). Estimated worldwide expenditure on malaria research is US$ 58 million, one thousandth of the US$ 56 billion spent globally on health research annually. Estimated annual expenditure on malaria research, prevention and treatment is $84 million. Estimated worldwide expenditure per malaria fatality is $ 65; as compared to $ 3274 for HIV/AIDS and $ 789 for asthma (Kakkilaya, 2006). That is to say, one HIV/AIDS death is equal to about 50 malaria deaths! Malaria was nearly eliminated from most parts of the world by the early 60's, owing largely to concert anti malarial campaigns world over under the guidance of the World Health Organization (Kakkilaya, 2006).

2.2. Anaemia with parasitaemia.

More than 30 million African women in malaria endemic areas become pregnant and are at risk of infection with P*lasmodium falciparum* each year (Marchesini *et. al.*, 2004). In Africa, 5 to 10% of these pregnant women may develop severe anaemia. The proportion of severe anaemia among pregnant women of all gravidities attributable to malaria is estimated to be 26%. The estimate is higher in women in their first or second pregnancies (Desai *et. al.,* 2007).

2.3. Maternal morbidity and mortality.

The data, from hospital records and community surveys, does not cover all deaths because about half of all deliveries between 1990 and 1996 happened outside the official health care systems and without any trained help. In rural areas, since more children are born at home than in urban areas, the risk of maternal mortality, in case of complications remaining high (Pohjonen, 1998).

During pregnancy the naturally acquired partial immunity to malaria decline especially for the first and second pregnancy making malaria in pregnancy an important cause of morbidity and mortality for the pregnant women, foetus and the new born, malaria in pregnancy is associated with intra-uterine growth retardation (IUGR), abortion, still birth, severe anaemia and premature deliveries (MOH&SW, 2006).

Findings from West Africa indicate that IPTp with SP was found to be protective against maternal anaemia .The effect of placental malaria and severe anaemia on birth weight confirm among HIV negative multigravidae, placental malaria infection was associated with both an increased risk of severe anaemia and low birth weight, there are interaction between severe anaemia and placental malaria (Shulman *et. al.,* 2001).

The observation on immune adults and found that the haemoglobin level was actually lower in those with a lower degree of parasitaemia In clinical practice, it has been found that anti-malarials given after 20^{th} to 28^{th} week's gestation will not correct established anaemia unless folic acid is given as well (Brabin *et. al.,* 1983).

2.4. Venous and placental Parasitaemia

To prevent effect of malaria in pregnancy, WHO is recommended Intermittent Preventive Treatment (IPTp) with sulphadoxine-pyrimethamine (SP) after first trimester and has been found to be effective in reducing maternal anaemia, venous and placental malaria in improving pregnancy outcome and low birth weight. Giving SP as a treatment dose at the first antenatal clinic visit and at the beginning of the third trimester is highly effective in reducing venous and placental malaria parasitaemia (Challs *et. al.,* 2004).

Women with smear negative at delivery of their babies probably have the placental malaria infection that associated with low birth weight and other outcome (Brabin *et. al.,* 1983).

2.5. Fever during pregnancy.

Study in Kenya has shown that history of fever during pregnancy does not identify all pregnant women with placental malaria as several reported no fever at any time during pregnancy (Parise *et. al.*, 1998). In pregnancy, patients with haemolysis and splenomegaly characteristically present between the 16^{th} and 24^{th} weeks of gestation following the period of acute infection in the first trimester. In areas where Malaria is endemic people may have immunity or semi-immunity, and therefore have either no symptoms or few symptoms.

Pregnancy is a state of immune suppression thus despite high immunity in non- pregnant state, one can suffer severe malaria in pregnancy (Brabin *et. al.,* 1983).

2.6. Relationship between Low birth weight and IPTp

Low birth weight are greatest risk of neonatal mortality and a major contribution to infant mortality, Mother who received IPTp-SP were less likely to deliver pre-term babies than those who did not take IPTp-SP (Menendez *et. al.,* 2007).

Increase number of SP doses was seen in all women, and babies born to women who had used >2 doses of IPTp were average 128g heavier than babies of women who had attended an ANC but had not received IPTp (Eijik *et. al.,* 2000).

Increase incidence of low birth weight in mothers with malaria, several studies has confirmed this observation, with the highest incidence occurring in infected primigravidae (Brabin *et. al.,* 1983).

CHAPTER 3

3.0. Materials and methods

3.1. Study design

It was analytical cross –sectional study of pregnant women delivering at Sokoine Regional hospital, Lindi Region between November 2009 – January 2010 Lindi Region.

Map of Tanzania showing Lindi Region



3.2. Study area

This study was carried out between November, 2009 and January 2010 in Lindi region southern Tanzania. Lindi is a coastal town located at the far end of the Lindi Bay, on the Indian Ocean in south-eastern Tanzania. The town is 450 kilometres south of Dar es Salaam and 105 kilometres north of Mtwara, the southern most coastal town in Tanzania, and gives its name to the surrounding Lindi Region. It is one of the most sparsely populated regions of the country. According to the National census conducted in 2002, total population in Lindi Region was estimated to be 905,480.

Lindi is located at the mouth of the Lukuledi River. Its port facilities are still rudimentary, allowing one or two small cargo and passenger boats at a time, and cannot accommodate ocean-going ships; the region was once an important sisal-producing plantation area, especially in Kikwetu, surrounding the Lindi airstrip, 25 kilometers north of town. During the rainy season, Lindi is accessible only by air and sea, with roads open during the dry season. An old tarmac road connects Lindi town to Mtwara, passing through Mikindani, an important Arab business settlement for explorers sailing along the east coast from Muscat, Oman, Malindi or Mombasa to Sofala.

Lindi is a fairly cosmopolitan town with Arab and Indian merchants owning the bulk of businesses, and Islam is the predominant religion. The town has a market, a bus station, a post office, an airstrip (2 flights a week), primary and secondary schools, several banks (2 with ATMs), an Internet cafe and many guest houses. The locals, known as Swahilis, are mainly engaged in fishing in Lindi Bay and some farming on the outskirts of the town. Employment opportunities are unfortunately very limited, as Lindi lacks any kind of major industry. From the coast the land rises sharply to the escarpment hills of Mtanda, once a residential area for colonial civil servants, with striking views of Lindi Bay.

During the colonial era, a transfer to Lindi amounted to a re-appraisal or demotion.
There are two main rainy seasons, November to December and February to May, but rain is not uncommon in any month. Malaria is endemic and transmission occurs all year round.

The study area has a wide mix of ethnic groups, including the Makonde, Mwera, Yao and many others. Although most people speak the language of their own ethnic group, Swahili is the lingua franca.

The most common occupations are subsistence farming, fishing and small scale trading. Cashew nuts, sesame and groundnuts are the major cash crops. The main food crops are cassava, maize, sorghum and rice. Most people live in mud-walled and thatched-roof houses; a few houses have corrugated iron roofs.

Common water supplies are handdug wells that rely on seasonal rain, communal boreholes, natural springs and river water. Most rural roads are unpaved: some are not passable during rainy seasons while others are too steep for vehicles to pass.

The public health system comprises a network of dispensaries, health centres and hospitals offering a varying quality of care. Nursing staffs are generally responsible for preventive services such as antenatal care, and visits for weighing and vaccination (Pool, *et al*, 2008).

3.3. Study population

The study population included all pregnant women that had delivered at Sokoine Regional Hospital between November 2009 and January 2010.

3.4. Sampling procedure

Sokoine Regional hospital was conveniently selected due to high prevalence of malaria in its catchments area. Study subjects were selected from the list of all pregnant women, admitted in the maternity ward between November and January 2010. All pregnant women who meet inclusion criteria were enlisted into the study until sample size was reached.

3.5. Data collection tools

Data regarding pregnancy were collected at maternity ward soon after admission. Data collection forms were used to collect maternal social demographic information, history of Bed net use, and reproductive Health information from ANC card, delivery outcome and HIV status of the pregnant women.

3.6. Data collection procedure

Informed consents were sought from eligible women as part of the consenting process. Women who elected to join the study were asked to sign an informed consent form before joining the study. Data collection forms were administered during data collection process as per protocol.

I explained informed consents was done in Swahili language and those pregnant women who did not know how to read and write used finger print to sign the consent, Nurses and Nurse attendants from maternity ward were trained how to take placental and venous blood samples for those pregnant women who attended at maternity ward for Microscopic examination in the laboratory.

Before delivery 5mls of the maternal venous blood sample was drawn by venous puncture technique into sterile EDTA container for estimating haemoglobin level, which was measured by using Hemoque machine and recorded in the data form. Irrespective of age, parity and gestational age, haemoglobin concentration of <11g haemoglobin /dl were considered as anaemia and < 8g haemoglobin/dl as severe anaemia.

Immediately after child birth, the placental of each woman was collected and it was voided into a transparent sterile plastic container. Placental blood was collected into EDTA incising the clean maternal surface of the placental by surgical bladder and by using sterile syringe aspirating blood from the incision. Both were used to prepare thick blood smears.

for each pregnant women after delivery the baby, a maternity nurse weighed newborns accurate to the nearest gram soon after birth, I recorded the findings of birth weight for each new born baby in to data collections tool, then at the same time, maternity nurse were recorded the same birth weight in the maternity registration book, birth weight were determine in kilogram (kg) using an electronic weighing machine immediately after child birth. Newborns babies weighing less than 2,500g were classified as low birth weight.
Data collection forms were developed which accompanied the samples. The placental and venous sample were labelled and taken to the laboratory for processing.

Placental and venous parasitaemia was defined as the identification of any parasites in a placental or venous blood slide by microscopy.

3.7. Laboratory procedure

Blood films were examined a very well trained laboratory scientists using microscopy, and were classified as either containing malaria parasites or not. Two readers for improved accuracy of results examined placental and venous slide. Thick blood films from the placental and venous vessels were collected in order to detect placental/venous parasitaemia, and to compare placental blood results with venous blood results among women delivering in selected hospital.

Thick smears were prepared for all samples and stained and according to standard quality control procedure with 10% Gemsa stain for 10 minutes, washed in tap water, air dried and examined under oil immersion for malaria parasites using light microscopy at 1003 magnification.

A thick blood smear was considered to be negative if 100 oil- immersion microscopic fields revealed no parasites. Parasite densities were expressed per microlitre using an assumed count of 800 white blood cells per microliter of blood. For each positive thick smear, the level of parasitaemia was estimated by counting asexual stages against 200 leucocytes. A second microscopist, who is unaware of the results of the earlier microscopist, checked the entire thick smears for quality assessments.

3.8. Inclusion criteria

Pregnant women delivering at Sokoine Hospital between November2009- January 2010 who did not receive anti-malarials two weeks before presentation in labour were selected and enrolled into the study. This included both normal varginal deliveries and deliveries through caesareans section

3.9. Exclusion criteria

Women who received anti- malaria treatment within two weeks before beginning of labour

3.10. Sample size

Sample size was calculated using the following formula

$$n = \frac{z_{1-\alpha}^2 p(1-p)}{d^2}$$

$$\mathbf{n = \frac{Z_{1-x}\, p\,(1-p)}{d^2}}$$

This formula is used in sample size calculation of cross sectional studies

Where:

p= anticipated population prevalence

Z^2 = confidence interval 1.96

D = margin of error

Prevalence of malaria in pregnant women 22%- (NMCP 2008)

Sample size calculation:

$$= \frac{\{(1.96)^2 \times \{0.2\}\ (1-0.2)\}}{0.05^2} = \frac{3.8416 \times 0.16}{2.5 \times 10^{-3}} = 245.8624$$

Therefore 246 pregnant women were selected for the study.

3.11. Ethical clearance

Ethical clearance was obtained from the Research ethics committee of the Muhimbili University College of Health and Allied Science. Permission to conduct the study was sought and obtained from the District Medical Officers before the beginning of the study.

All individuals eligible for the survey were informed of the aims and objectives of the study, benefits and possible untoward effects and thereafter asked to complete and sign a consent form. Cases with significant parasitaemia were referred to attending physicians for further management.

3.12. Data management and analysis

Data collected were recorded in to data forms and then entered into a computer database and all data collection forms were counter checked by other personal before being analysed using Epi Info 3.5.1 Software. Descriptive statistics such as frequency distributions of gravidity (primegravidae, secundgravidae and multigravidae), gestation age (GA) at delivery, marital status (Married, Single), education status (None, Primary, Secondary), HIV status (Positive and Negative cases), and ANC visit (Attended and not attended), placental and venous parasitaemia cross tabulation, means of the different variables were used to summarize quantitative variable.

Bivariate analysis and Logistic regression were used to assess the association between dependent and other independent variables to all statistical significant and non statistical significant variables, logistic regression were able to identify variables which were remain significant statistically.

CHAPTER 4

4.0. Results

4.1. Social demographic characteristic

This study was conducted between November 2009 and January 2010. During this period 246 pregnant women presented at the Lindi Regional Hospital in the labour ward for delivery were selected in the study.

The characteristic of these 246 pregnant women is shown in table 1 below. The overall mean age of the study population was 26.2 years, with median 25 years, and range was 14 to 47 Years.

Of the interviewed 246 pregnant women 123 (50%) had not taken IPTp (SP) during their entire pregnancy and 87 (35%) women did not attended antenatal clinic for their entire period of pregnancy

There were a total of 122 (50%) women who were gravida 3 and beyond, the rest were primegravida and multigravida.

The level of education in the study population was also determined. A total of 113(46%) women did not attended any form of education

The HIV status of the women was also determined and 11 out of 246 (4%) were found to be positive for HIV infection

Table 1: Characteristics of study populations by IPTp intake

Characteristics	No IPTp n = 123	50%	IPTp1 n =35	14%	IPTp2. n = 88	36%
$\bar{x}$ age	27.2		24.3		25.5	
Gravida						
1	39	31.7	154	2.9	25	28.4
2	19	15.4	51	4.3	21	23.9
≥3	65	52.8	15	42.9	42	47.7
GA at delivery						
<36	1	0.8	2	5.7	1	1.1
36-38	40	32.5	10	28.6	28	31.8
≥ 3	82	66.7	23	65.7	59	67.0
Marital status						
Married	97	78.9	23	67.6	70	79.5
Single	26	21.1	11	32.4	18	20.5
Educ. Status						
None	70	56.9	14	40.0	29	33.0
Prim.	49	39.8	20	57.1	57	64.8
Sec.	4	3.3	1	2.9	2	2.3
HIV status						
Positive	3	2.4	3	8.6	5	5.7
Negative	22	17.9	32	91.4	83	94.3
ANC visit						
Visit 1	18	14.6	6	17.1	1	1.1
Visit 2	11	8.9	5	14.3	10	11.4
Visit 3	5	4.1	18	51.4	46	52.3
Visit 4	2	1.6	6	17.1	31	35.2
Not Visit	87	35	0	0.0	0	0.0

4.2. Relationship between IPTp use birth weight

For each newborn, birth weight was immediately measured after deliveries soon after the complete process of weighing babies by using weighing machine. The overall mean birth weight was found to be 2.6 kg. There were 99 out of (40%) newborns whose body weight was below 2.5 kg which indicated low birth weight.

4.3. Relationship IPTp use and birth weight.

The association between birth weight and IPTp use was found to be not significant as shown in the table 2 below.

Table 2: Relationship IPTp use and birth weight

BWT	IPTp-0	IPTp1& IPTp2	OR	95% CI	P-value
<2.5 kg	55	44	0.5	0.84-2.50	0.15
>2.5 kg	68	79			

4.4: BWT stratified by IPTp intake

The results of birth weight by IPTp intake are shown in table 3.

Table 3: BWT stratified by IPTp intake

BWT (kg)	**IPTp-0 (%)**	**IPTp1 (%)**	**IPTp2 (%)**	**Total**	**X^2**	P-value
<2.5	55 (44.7)	18 (51.4)	26 (29.5)	99	4.47	0.03
>2.5	68 (55.3)	17 (48.6)	62 (70.5)	147		
Total	123(50)	35 (14.2)	88 (35.8)	246		

P-value = 0.03 which is statistically significant and X^2 for linear trend =4.47.

4.5. Venous and placental parasitaemia stratified by IPTp intake

Table 4: Prevalence of Venous and Placental parasitaemia for IPTp intake

Parasitaemia prevalence	0-dose (%)	1st-dose (%)	2nd-dose (%)	Total Positive (%)	P - value
Venous Parasitaemia	7 (5.7)	4 (11.4)	11 (12.5)	22 (8.9)	0.4
Placental Parasitaemia	6 (4.9)	1 (2.9)	3 (3.4)	10 (4.1)	0.8

Total prevalence of venous parasitaemia was 22 (8.9%) and placental parasitaemia 10 (4.1%).

Table 5: Relationship between IPTp and Hb

Hb	IPTp-0	(%)	IPTp	(%)	Total
Severe	12	9.7	10	8.1	22
Anaemia	68	55.3	69	56.1	137
Normal	43	34.9	44	35.8	87
Total	123	50	123	50	246

For normal Hb both two groups shows less difference

Table 6: Hb stratified by IPTp use

Hb	IPTp-0	%	IPTp-1	%	IPTp-2	%	Total	X^2	P-value
Severe	12	9.7	5	14.2	5	5.6	22	3.5	0.5
Anaemia	68	55.2	16	45.7	53	60 .2	137		
Normal	43	34.9	14	40.0	30	34.0	87		
Total	123	50	35	14.2	88	35.8	246		

Hb not statistical significant with IPTp use

Table 7. ITNs with IPTp use

	Stratified by IPTp use					
ITNs	**0 doses**	**%**	**1 doses**	**%**	**2 doses**	**%**
Yes	118	95.9	27	77.1	80	90.0
No	5	4.0	8	22.9	8	9.1
Total	123	50	35	14.2	88	35.7

P-value- 0.002 statistically significant, x^2- 12.4

4.6. Bivariate analysis

Bivariate analysis was done with two IPTp groups (IPTp-0, IPTp1&2).

In table 8 below shows bivariate analyses of dependent variables Hb and Malaria parasitaemia with IPTp group as dependent variables.

Table 8: Bivariate analysis by IPTp groups

Variable		**No IPTp**	**Use IPTp**	**OR**	**95% CI**	**P-Value**
Hb	Normal	31	56			
	Anaemia	50	74	0.82	0.45-1.50	0.49
Malaria parasitaemia	+ve	7	15	0.47	0.17-1.30	0.111
(Venous)	-ve	116	118			

Two dependent variable shown in this two-way table above Hb and venous parasitaemia were not statistical significant with P- value 0.49 and 0.11 respectively.

Table 9: Dependent variables are IPTp and independent variables were Gravidity, gestation age, Level of education and age group

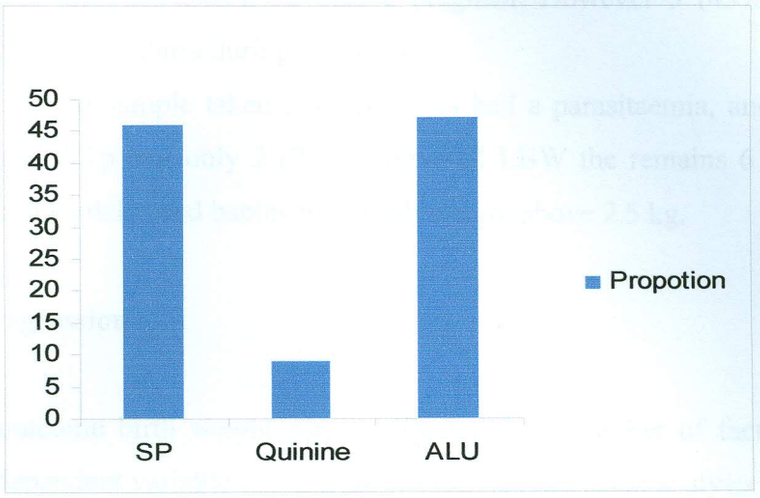
Variable		No IPTp	Use IPTp	OR	95% CI	P-Value
Gravidity	Primgravida	39	40	0.96	0.54.1.70	0.89
	Multigravida	84	83			
GA	30-35	1	3	0.33	0.013.59	0.313
	36-41	120	145			
Level of Edu.	Not attended	70	53	1.99	1.18-3.39	0.006*
	Attended school	53	80			
Age group	10-29.9	79	99	0.44	0.23-0.81	0.004*
	30-49.9	44	24			

Two variable Level of education and Age group were statistical significant with P- value 0.006, 0.004 respectively. The higher the level of education of the mother, the more likely to use two dose of IPTp, another variable associated was age group; those who complete a full dose of IPTp were the lower aged

4.7. Prevalence of SP and anti-malaria intake during pregnancy

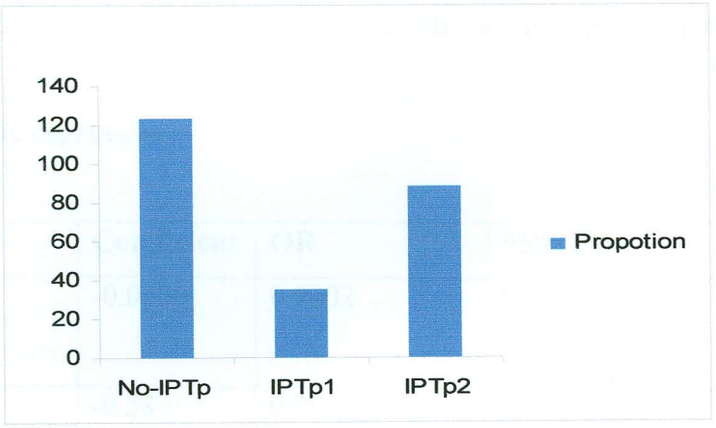
Through interviewed we found pregnant women were received anti-malaria treatments as shown in figure 1 below. Of the total 246 pregnant women interviewed, 176 (72%) received anti-malaria during their pregnancy, total number of pregnant women who received only SP was 46 (26.1%), Quinine 9 (5.1%) and 47(27%) for ALU.

Figure 1: prevalence of SP and other anti-malaria intake during pregnancy



Large group of pregnant women were received ALU during pregnancy

Figure 2: Shows IPTp intake during pregnancy



IPTp1 group were only 14%

4.8. IPTp and parasitaemia

A total of 22 (9%) pregnant women were found to have venous parasitaemia after taking sample from venous blood out of these 15 (68%) had taken IPTp and only 2 (13%) out of 15 delivered LBW babies. In addition to this there were 7 pregnant women with venous

parasitaemia who did not take IPTp during pregnant. However 3 (43%) of them were treated with other Antimalaria during pregnancy.

A total of 10 (4.1%) sample taken from placenta had a parasitaemia, and out of these 4 (40%) had taken IPTp and only 2 (20%) delivered LBW the remains 6 (60%) not took IPTp and all women delivered babies with birth weight above 2.5 kg.

4.9. Logistic regression

The primary outcome birth weight can be affected by a number of factors. In order to analyse the independent variable causing LBW logistic regression analysis was done. Independent variable included Age, gravidity, gestation age, marital status, education level, HIV status, ANC visit, ITNs, IPTp, Age group, Malaria treatment, Hb. The results of the regression analysis show that only 3 variable, namely- Age of the mother, IPTp dose intake and intake of ALU were significantly associated. The results are shown in table 8.

Table 10: logistic regression

Term	Coefficient	OR	95% CI	P-Value
Age	-0.0406	0.9602	0.9241-0.9979	0.0386
Gravida	-0.58	0.99	0.874-1.286	1.286
Gestation age	-0.016	0.103	0.804-1.205	0.8997
IPTp 2nd-dose	-0.8930	0.4094	0.2213-0.7575	0.0044
Haemoglobin	-189	0.080	0.708-0.968	0.968
ITNs	-0.313	0.274	0.800-2.336	2.336
Malaria treatment	-0.8244	2.2804	1.3013-3.9963	0.0040

The risk is lower with those mothers who took 2 doses of IPTp. Those mothers who at some point during their pregnancy took ACT/SP had lower risk of LBW (P=0.004)

CHAPTER 5

5.0 Discussion

This study was looking at effectiveness of IPTp using SP as per national guidelines. Specifically the study was assessing the impact of SP on birth weight and Haemoglobin status of the mother.

5.1. Prevalence of SP and anti-malaria intake during pregnancy

Use of anti malaria drugs in pregnant women is the main cause of reduction of parasitaemia in the blood, some pregnant women had taken anti-malaria during pregnant suggests that decrease parasitaemia in venous and placenta blood. In this study we found that 176 (72%) of pregnant women were received anti-malaria rather than IPTp as prophylaxis.

5.2. Relationship between IPTp and birth weight

Low birth weight is the greatest risk factor for infant mortality and a major contributor to infant mortality. In this study, babies born to pregnant women who received 2- doses of IPTp were found to have higher mean birth weight than those born to mothers who used only 1-dose or who did not any dose (P-value = 0.003).
Study done in Blantyre, Malawi, found that IPTp use was associated with an increase in mean birth weight of 195g in infants of women receiving $\geq$ 2 doses IPTp (Eijk *et. al.*, 2004). Our study was able to show this association.

There is evidence within the country indicating increasing SP resistance thus the change in treatment policy to Arthemisinin combination treatment (ACT) (Kefas *et. al.*, Sara *et. al.*, 2004). These researches showed triple mutation of parasite against SP and this indicates that resistance is high. However, for pregnancy prevention SP is still recommended in our country. This study shows despite the level of resistance those who took 2 doses still had a

better birth weight outcome. On the other hand Hb status has not shown any association IPTp use. The major cause of maternal mortality is associated with haemorrhage and low Hb. The aim of IPTp programme is also to improve Hb status which in this study has not shown improvement. In Malawi, a program evaluation showed that IPTp was associated with reductions in anaemia, placental parasitaemia, and LBW (comparing 2 doses of SP with no dose) (Sirima *et. al.,* 2006).

5.3. Haemoglobin status of the pregnant women

There was no impact on Hb status partly because those who took IPTp-0 (58%) and IPTp1 & IPTp2 (59%) also had high intake of ALU during their gestation period. Perhaps this could explain the marginal or no impact of IPTp strategy.

Also further analysis was done on Hb in this study, the Hb was stratified with two groups of IPTp use (IPTp-0 & IPTp) the results shows P- value was 0.49, this indicated that no any association between IPTp use and Hb. when stratified by IPTp intake (IPTp-0 & IPTp1 & 2) also the results shows no statistical significant P-value was 0.5.

5.4. Prevalence of Venous and placental parasitaemia

In terms of venous and placental parasitaemia, the findings of this study were consistent with other reports in East and Southern African countries. The prevalence of venous and placental parasitaemia in this study was 9.0% and 4.1% respectively, while it was 10.4% and 10.5% respectively in Ibadan South-Western Nigeria; which is holoendemic for malaria. Similarly to our results, a study of effectiveness of IPTp conducted in Blantyre, Malawi, an area with seasonal transmission, showed a significant decrease of placental malaria in women who had use one or more dose of IPTp (Eijik et. al., 2004). Another study in Ethiopia (Parice *et. al.,* 2003) also found a low level of placental parasitaemia of 2.5% in an unstable area and 6.5% in a stable transmission area.
In West Africa during the peak malaria season Uneke *et. al.,* 2008 showed high prevalence of placental parasitaemia, in Senegal it was 9.5% in Sierra Leone 18.5%, Cameroon 19.9%

and Gambia 37.1%. However, the study did not document concomitant use of ITNs. In Burkina Faso, where ITNs coverage was high and IPTp coverage up to 3 doses was also high Hommerich *et al.,* 2007 showed in one district a significant reduction of Placental parasitaemia and LBW.

In our study found that the prevalence of venous and placental was extremely low, one is the basic reason is number of pregnant women were low due to the number of sample size were low for coming to conclude on significant.

Another reason due to other interventions for example ITNs use, during the study there was high coverage of ITNs use reason is NMCP has provided free bed nets
Seasons are one of the reasons why prevalence of venous and placental was low, during the time period was dry season causes low transmission of malaria. And the time in 2008-2009 here was low rain. However, the risks associated with venous and placental parasitaemia are not thought to be seasonally dependent and therefore should no bias results.
One of the major factors in this findings of low prevalence of placental parasitaemia is technique used for diagnosis was microscopy, the sensitive methods to diagnose placental parasitaemia is histological methods and PCR. Another reason of low placental parasitaemia, the study done in urban, pregnant women in urban area used self protection of malaria.

5.5. Use of ITNs

Another possible confounder is the high coverage of ITNs. For IPTp-0, IPTp-1 and IPTp-2, more than half of women reported to use insecticide treated bed net with prevalence of 95.9%, 77.1% and 90.9% respectively. Just before the study free nets were given by NMCP. The use of ITNs also has significant impact on birth outcomes (Mendez *et. al* 2007). Insecticide treated bed nets reduced the risk of LBW in the 1st few pregnancies, up to the second or fourth pregnancy (Mendez *et. al* 2007). In this study, women delivering at Sokoine Regional hospital in Lindi Region in Southern Tanzania after receiving ITNs had significantly less placental malaria and anaemia and babies of higher birth weight, it shows Insecticide treated nets (ITNs) are suitable and effective option.

5.6. ANC visit

Compliance and hence coverage is a problem; majority of pregnant women did not take IPTp (50%) but they had high use of ACT/ALU. This indicates overall deficiency in ante-natal care in the country.

5.7. Microscope detection

The use of conventional Microscopy to detect parasites was one of the limitations of the study. It would have been better to use histological methods to detect parasites.

Finally, this assessment indicates that the enrolled pregnant women had high coverage rates with ITNs, had high use of ALU and their pregnancy outcomes were not that bad despite low coverage of IPTp.

5.8. IPTp2 higher than IPTp1

In this study found that IPTp2 higher than IPTp1, the study was done at Regional hospital Urban area where by pregnant women were well educated they know how to use IPTp, 54% of pregnant women in this study were received primary and secondary level of education and only 46% did not attended any form of education

CHAPTER 6

6.0. Conclusion

1. The prevalence of SP and anti- malaria intake was found to be high. More than 70% of the pregnant women used SP or anti- malaria at one time during their pregnancy

2. There was relationship between IPTp use and birth weight of the newborns from the study population most of the newborns with the birth of more than 2.5kg were born with mothers who took complete dose of IPTp

3. There were no associations between the levels of Haemoglobin and IPTp use. However most of the interviewed pregnant women were anaemia and normal group

4. The prevalence of parasitaemia was not high, however when compare the placental parasitaemia and peripheral parasitaemia the association was not statistical difference

5. There was high coverage of ITNs use for those pregnant women recruited in this study

6.1. Recommendation

1. To do a much bigger study to evaluate IPTp to the different areas in the country, some areas within the country transmission of malaria is very low but still they use IPTp.

2. To improve ANC attendance, the results of this study are potentially important to promote health education in pregnant women to encourage taking 2 doses of IPTp at ANC and encouraging health workers to put more effort on health education at ANC.

3. There is need for effective linkages between hospital leaders and antenatal care programmes in order to improve the success of efforts to malaria during pregnancy.

4. The results of this study are potentially important to

-Promote health education in pregnant women

-Encourage taking 2 doses of IPTp at ANC and

-Encouraging health workers to put more effort on health education at ANC.

5. There is a need to review the Health Education package and improve on ANC attendance.

6. To improve methods of diagnose placental parasitaemia, in this study maternal venous malaria infection and placental malaria was found not statistical significant

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