EFFECTIVENESS OF INTERMITTENT PREVENTIVE TREATMENT OF FULL COURSE OF SULPHADOXINE-PYRIMETHAMINE IN CLEARANCE OF PLACENTAL MALARIA PARASITES IN PREGNANCY IN KAFUE DISTRICT

By

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ABSTRACT

Malaria infection during pregnancy is a major public health problem in the tropical and subtropical regions of the world. Pregnant women in developing countries are the worst affected. Malaria in pregnancy has serious consequences both to the mother and her baby. It leads to abortion, prematurity, low birth weight, foetal death, neonatal death, severe anaemia and maternal death. The current stratagem in the prevention of malaria in pregnancy includes use of ITNs and IPT/SP. The purpose of this study was to determine the effectiveness of IPT/SP in clearing placental malaria parasites in pregnant women in Kafue District.

A case-control study was conducted in two health centres in Kafue District. The cases were the postnatal women whose placentas had malaria parasites. The controls comprised of postnatal women whose placentas had no malaria parasites.

The study was conducted in two health centres in Kafue District. Data was analyzed using SPSS software. Chi-Squared [x^2], Fisher's exact test and Odds Ratio (OR) were used. Multivariate logistic regression analysis was used to control for confounding factors. Statistical significance was achieved if $p<0.05$.

Totals of 25 cases and 146 controls were enrolled into the study. Compared to the age at which the woman started attending ANC [booking] of above 20 weeks, those who started at gestational age of 12-20 weeks were 49% [p=0.002] less likely to be cases. Compared to the gestational age when the woman had her last dose of IPT of more than 36 weeks, those who had the last dose at less than 36 weeks of gestational period/age were 4.46 [p=0.001] times more likely to be cases. Compared to HIV negative women, those who were positive were 1.73 [p=0.014] times more likely to be cases.

In conclusion, the study revealed that the effectiveness of IPT/SP in clearance of placental malaria parasites in pregnancy in Kafue District is affected by three factors. These include timing for antenatal booking, frequency of antenatal visits as well as the HIV status of the antenatal woman.

DEDICATION

To all those women who have died from Malaria in Pregnancy and all those who are working tirelessly to combat the disease and conquer it.

COPYRIGHT DECLARATION

I hereby declare that this study is entirely the result of my own independent investigation. The various sources to which I am indebted are clearly indicated in the paper and in the references. I also declare that the work presented in this dissertation for the Master's Degree in Public Health is my own work and has not previously been submitted at this or any other institution.

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Kakonkanya-Kambole Namunji Gertrude

Supervisors:

We the undersigned have read this dissertation and approve it for examination.

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APPROVAL

This dissertation by **Kakonkanya-Kambole Namunji Gertrude** is approved in partial fulfillment of the requirements for the award of the Master's Degree in Public Health by the University of Zambia.

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immuno-Deficiency Syndrome
ANC	Ante-Natal Care
CBOH	Central Board of Health
CSO	Central Statistical Office
DOTS	Directly Observed Therapy Short Course
HIV	Human Immuno-Deficiency Virus
IEC	Information Education and Communication
IPT	Intermittent Preventive Treatment
ITN	Insecticide Treated Net
JHPIEGO	John Hopkins Program for International Education in Gynecology and Obstetrics
KDHMB	Kafue District Health Management Board
LBW	Low Birth Weight
LMP	Last Menstrual Period
MNH	Maternal and Neonatal Health
MOH	Ministry of Health
NMCC	National Malaria Control Centre
PF	*Plasmodium falciparum*
RBM	Roll Back Malaria
SP	Sulfadoxine-Pyrimethamine
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
UNFPA	United Nations Population Fund
US	United States

VCT	Voluntary Counselling and Testing
WHO	World Health Organization
ZDHS	Zambia Demographic and Health Survey
MPs	Malaria Parasites
IURG	Intrauterine Retardation Growth
PHC	Primary Health Care
NGOs	Non-Governmental Organisations
KD	Kafue District

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CHAPTER 1. INTRODUCTION

1.1 BACKGROUND INFORMATION

1.1.1 Health priorities and programmes

Malaria in Pregnancy is one of the health problems faced by women and infants in Zambia. Malaria is an illness caused in Man by infection with protozoa of the *genus plasmodiu*m. There are four (4) human *plasmodia*, namely *falciparum*, *ovale*, *malariae*, and *vivax*. Of all malaria cases in Zambia, 95 per cent are caused by *plasmodia falciparum* (CBoH 2002). The word *malaria* is a derivation from Italian *mala aria*, meaning "bad air". It was once a popular belief that malaria was caused by poisonous swamp air (New Standard Encyclopaedia).

In 1991 the Government of the Republic of Zambia passed medical health policy reforms. An important component was the restructured Primary Health Care (PHC). The reformulated PHC programme aims at, amongst other activities, dealing with the main health problems in the community, focusing on the needs of the undeserved high risk and vulnerable groups. Emphasis was on maternal and childcare, family planning, nutrition, control of communicable diseases, immunization, and environmental sanitation in order to secure adequate health care for all Zambians (MOH & CBoH 2002).

Malaria is defined as an infection which may be acquired wherever there are human hosts carrying the parasites and a sufficiency of suitable *anophelene* mosquitoes, together with conditions of temperature and humidity that favour the development of the parasite in the mosquito. Malaria may also be transmitted by blood transfusion or inoculation of infected blood and rarely transplacentally (Macleod 1998). Malaria in Pregnancy is that which is contracted while a woman is pregnant.

Upon gaining entry into the body, the plasmodium finds its way into the bloodstream, destroying the red blood cells. The pathophysiology of malaria in pregnancy is largely due to the altered immunity and the presence of a new organ, the placenta. There is a marked breakdown of acquired immunity during pregnancy, especially during the state of

primigravidae. Sequestration of malaria parasites (MP) in the placenta and long-standing placental malaria occur, and peripheral blood may be negative for MP (Kakkilaya 2004).

The infection manifests itself through such symptoms as generalized body aches, headache, vomiting, nausea, chills, malaise, fever, and diarrhoea. This makes it difficult to distinguish it from other infectious diseases. In pregnant women, malaria infection is mostly asymptomatic, that is, the pregnant women may have serious malaria but not feel ill. Even their blood tests may not show the presence of MP (CBoH 2002; JHPIEGO 2004). In pregnancy, the morbidity of women due to malaria includes anaemia, fever, hypoglycemia, cerebral malaria, pulmonary oedema and puerperal sepsis. Mortality can also occur as a result of severe malaria and haemorrhage. Problems in new-born infants include low birth-weight, prematurity, Intrauterine Growth Retardation (IUGR), malaria illness and mortality (MNH 2004).

Table 1. Malaria in Pregnancy: Double Trouble

More common	Pregnant women are more susceptible to malaria as compared to the rest of the population. This may be due to immuno-suppression and loss of acquired immunity to malaria.
More atypical	In pregnancy, malaria tends to be more atypical in presentation. This could be due to hormonal, immunological and haematological changes of pregnancy.
More severe	Due to hormonal and immunological changes, the parasitaemia tends to be 10 times higher. As a result, all the complications of *falciparum* malaria are more common in pregnancy as compared to the non-pregnant population.
More fatal	Because *Placimodiae falciparum* malaria is more severe in pregnancy, the incidence of mortality is double that of the non-pregnant population (13%).
Selective treatment	Some anti-malarials are contra-indicated in pregnancy while others may cause severe adverse effects. Therefore, the treatment may become difficult, especially in cases of severe *Placimodiae falciparum* malaria.
Other problems	Management of complications of malaria may be difficult due to the various physiological changes that occur during pregnancy. Careful attention must be paid to fluid management and temperature control. Decisions about induction of labour may be difficult and complex. Foetal loss, IUGR and premature labour are also common.

Source: Kakkilaya et al. 2004

1.1.2 The vector

The plasmodium is transmitted from one person to another by mosquitoes of the Anopheles species, the two most notorious being the *Anopheles Gambie* and *Anopheles fluviatilis*. These vectors breed in freshwater bodies such as ponds, ditches, dambos and swamps, as well as road quarries and agricultural fields (Park 2002).

1.1.3 Control measures

Critical public health roles in reducing the burden of malaria in pregnancy include the following:

1.1.3.1 Chemotherapy and chemoprophylaxis

This involves the use of drugs that eliminate the malaria parasite in the human body and also clear the parasite from the placenta during pregnancy. Destruction of the plasmodia also reduces the morbidity and mortality of the disease among humans (Dave 1972). The disadvantage of this control measure is that it is costly not only in terms of the cost of drugs but also administration of the drug. Up until 2 years ago, *Chloroquine* was the drug that was widely used and depended upon in Zambia. However, the parasites have since become resistant to this drug. In Zambia, like in other Roll Back Malaria (RBM) countries, chemoprophylaxis is confined to pregnant women and is being given as Intermittent Presumptive Treatment or IPT (WHO 1998). *Sulphadoxine-Pyrimethamine* (SP) or *Fansidar* is administered in 3 adult dosages starting from the Second Trimester, with at least one month apart. It is given by Directly Observed Therapy short course (DOTS) in the antenatal clinics.

1.1.3.2 Destruction of the vector

This entails the elimination of the vector as well as the mosquito larva and eggs. This can be achieved commonly by the use of chemicals such as insecticides and larvicides.

The use of insecticides and larvicides in the destruction of the malaria vector is a very effective method of malaria control. Household residual spraying must be done using an

approved and effective insecticide at least annually or during the hot and rainy seasons when malaria is common. Otherwise, residual spraying may not be effective. Residual spraying should be a community activity that involves households, local authorities, private businesses as well as local expertise (CBoH 2002).

1.1.3.4 Biological control

This involves the use of fish, most notably the species *Gambusia* that feed on mosquito larva. This measure has been used considerably in East Africa. The major advantage of this method is that it is environmentally friendly and relatively cheaper. This method also has a huge potential of sustainability in that once the fish is introduced in the body of water, it multiplies by itself and is able to maintain itself. Seed fish can then be collected and introduced into other bodies of water. The main disadvantage of this method is its limited utility due to the general lack of knowledge of aquaculture by most people.

1.1.3.5 Environmental management

This refers to the whole range of activities and practices that should be observed and carried out in order to create an environment where mosquitoes cannot breed or thrive. Such activities include conscious removal of all stagnant water where mosquitoes might breed, clearing of vegetation around dwelling homes, promoting of mosquito-proofing of buildings, careful construction of roads, dams, farms and canals so as to minimize the breeding of mosquitoes (Park 2002).

1.1.3.6 Blocking of contact between people and mosquitoes

This involves putting in place effective barriers between mosquitoes and the potential bite victim. The most popular method is the use of the insecticide treated mosquito nets (ITNs). The strengths of this method are many. They protect individuals from lethal bites as they shield the individual from the vector mosquitoes. The treated mosquito nets kill not only the vector mosquitoes but also vermin such as bed bugs. Use of ITNs is highly applicable as it individual based and therefore easy to adopt. The ITNs are provided to antenatal women free of charge. Where the ITNs are bought or sold, they are relatively

cheaper because manufacturing of ITNs is heavily subsidized by Government, NGOs and the co-operating partners. Whereas treated bed nets may reduce deaths due to malaria by 63 per cent, untreated nets are only half as effective. Since pregnant women and children under 5 years of age are at highest risk of serious illness and death from malaria, they should be encouraged to sleep under ITNs every night regardless of the weather (CBoH 2002).

The main disadvantage of using ITNs in Zambia is that of attitude. There is a marked lack of culture to use mosquito nets. People will give the cost of mosquito nets as a hindrance but this cannot be true. The malaria control partnerships heavily subsidize the production of ITNs. The head of an average Zambian household spends at least K20,000 a week. This is more than the cost of an ITN (NMCC 2002).

1.1.3.7 Other methods

Various other personal behaviours and products provide some protection. While they may be recommended, they are expensive and will not play an important role in reducing the burden of malaria. These include the use of mosquito repellent coils, aerosols, liquids and creams. Dressing up against mosquito bites has also proved to have little impact.

1.1.4 Previous efforts on control of malaria in pregnancy

Safe motherhood means creating the circumstances within which a woman can choose to become, and if she does, ensuring that she receives care for the prevention and treatment of pregnancy complications, has access to trained birth assistance, essential obstetric care, and care after birth, including information about family planning.

Control of malaria in pregnancy is a Public Health concern in the tropical and sub-tropical regions. In Zambia, chemoprophylaxis with Chloroquine for school children, Under-Five Clinics and antenatal mothers was introduced in 1975 (MOH 1993). Until 2003, Chloroquine was the drug of choice but it has since been proven that malaria has become resistant to Chloroquine. Antenatal women now receive Fansidar. Some antenatal women willingly welcomed this change while others still have misconceptions about the

effects of Fansidar on pregnancy. Depending on their stronghold, the antenatal women will take the course or somehow do without it. A woman's attitude towards a drug will affect compliance (Helitzer-Allen et al. 1993). Concern has been expressed about the use of Fansidar for chemoprophylaxis during the First Trimester and close to term, because of possible *teratogenicity*, *hyperbilirubinaemia* and *kernicterus* (Cook 1992).

The use of mosquito nets is also backed by a long history and had even been documented in ancient Egypt, Rome, India and other early civilizations (Barger 2001). In Zambia antenatal mothers have been encouraged to sleep under ITNs. Other than the chemoprophylaxis, other malaria control efforts had been encompassing antenatal women.

Efforts to prevent and control malaria in Zambia can be traced as far back as 1932. The most notable effort was the passing of the Mosquito Extermination Act of 1944 and the Residual Household Spraying with DDT in the late 1950s (Boyd 1949). From 1940 to 1970 malaria was almost eliminated along the line of rail, but remained a notifiable disease in the urban areas.

1.1.5 Current stratagem

The battle against malaria in pregnancy is again taking an aggressive turn. In 1998 the Roll Back Malaria (RBM) campaign was set in motion. RBM is a global partnership aimed at reducing by half the world's cases of malaria by the year 2010. It was funded by the governments of malaria affected countries, the World Health Organisation, UNICEF, UNDP and the World Bank (Park 2002).

Since 1998 Zambia has been involved in international efforts to control malaria. Her own strategies aim at ensuring that by the year 2005 at least 60 per cent of those at risk of malaria, especially pregnant women and children under the age of five benefit from community protective measures such as ITNs and other affordable and accessible interventions which prevent infection and suffering. The other strategy is that at least 60 per cent of pregnant women who are at risk of malaria, especially those in their pregnancy should have access to chemoprophylaxis, i.e. IPT.

1.1.6 Chemoprophylaxis in pregnancy

Malaria remains potentially fatal to both mother and foetus, and all pregnant women who remain in malaria infested areas during their pregnancy. They should be protected by means of chemoprophylaxis. This is therefore a critical part of antenatal care in areas of high transmission of malaria.

1.1.7 Choice of anti-malarials for chemoprophylaxis

Chloroquine remains the safest anti-malarial drug during pregnancy. It should therefore be the drug of choice. 500mg should be administered once every week. However, use of Chloroquine may be restricted in these countries due to widespread resistance to the drug. In areas of known resistance to Chloroquine, Sulfadoxine Pyrimethamime (SP) or Mefloquine can be used. But these drugs should be started in early Second Trimester. Doses of Mefloquine may have to be increased in the last trimester, in view of the accelerated clearance of the drug (Kakkilaya 2004).

1.2 PROBLEM STATEMENT

Malaria is a parasitic infection that poses a threat to the health of pregnant women.

Pregnancy and malaria are mutually aggravating conditions. The physiological changes of pregnancy and the pathological changes due to malaria have a synergistic effect on the course of each other, thus threatening the life of the mother and the child on one hand, and making things difficult for the treating physician on the other (Kakkilaya 2004).

Pregnant women constitute the main adult risk group for malaria. Most of the deaths due to malaria in Africa occur in pregnant women and children below the age of five (JHPIEGO 2004). More than 45 million women – 30 million of them in Africa – become pregnant in malaria endemic areas each year.

The World Health Organization (WHO) has set out recommendations in its strategic framework for malaria control during pregnancy in the WHO Africa Region, the Maternal and Neonatal Health (MNH) programme. This programme promotes the use of

Intermittent Preventive Treatment (IPT) and Insecticide Treated Nets (ITNs) for the prevention of malaria. The programme also supports effective case management for treatment of malaria during pregnancy (WHO 2003).

The programme promotes these interventions as part of its focused antenatal care (ANC) approach. Since the majority of women in the developing countries visit an antenatal care (ANC) unit at least once during pregnancy, the ANC is an obvious platform for implementing interventions for preventing and managing malaria during pregnancy.

In Zambia, pregnant women are expected to make four antenatal visits when they have no problems as follows:

Table 2. Antenatal Visits in Zambia

Weeks of gestation			
1st visit at <16 weeks	2nd visit at 20 – 24 weeks	3rd visit at 28 – 32 weeks	4th visit at 36 weeks

Source: Integrated Technical Guidelines, 2002.

In pregnancy, malaria poses great danger to expecting mothers and their unborn babies. This is why it has been considered a priority area in the RBM strategy (JHPIEGO, 2004). Malaria can be prevented, reduced and managed with appropriate low-cost interventions during pregnancy.

The Kafue District Profile on the prevalence of malaria shows that it has been on the increase from as far back as 2001. In the past, preventive measures such as spraying, sale of ITNs, and Information Education and Communication (IEC) have been implemented without any significant change in malaria incidence. Despite a staggering expenditure of up to K200 million over a period of two years on malaria preventive activities, the prevalence has continued to increase. For example, the target was to reduce the malaria incidence in Kafue District to 17 per cent in 2003. But the actual performance was 27 per

cent, showing a discrepancy of 10 per cent by the end of the same year (KDHMB Action Plan and Budgeting 2004).

The major factors contributing to the increase in malaria incidence in Kafue include inadequate vector control measures, inadequate trained staff, not completing SP courses, late bookings for antenatal clinic, not sleeping under ITNs, negative community participation and lack of collaboration with co-operating partners in implementation of malaria prevention and control programmes.

In Kafue District, the total number of females of all ages constitutes 48.6 per cent of the population. Of these, expected pregnancies are at 5.4 per cent while expected deliveries are at 5.2 per cent (KDHMB 2004). Women who are infected with PF, the type of malaria that is prevalent in Kafue District, may experience maternal anaemia and impaired foetal growth. Both these conditions contribute to LBW in new-borns (Shulman et al. 1999). Malaria can also cause miscarriage, stillbirth, premature birth as well as intrauterine growth restriction (Menendez et al. 2001).

This shows that malaria in pregnancy is a major problem and can lead to complications resulting into poorer chances of infant survival and serious consequences for the mother, including death.

For this reason, the Ministry of Health (MOH) through the Central Board of Health (CBoH) has introduced Intermittent Preventive Therapy (IPT), previously known as Intermittent Presumptive Treatment. This therapy is designed to clear the malaria parasites from the placenta of the expecting woman (MOH & CBOH 2004).

The drug chosen for IPT is Sulfadoxine-Pyrimethamine (SP), commonly known as *Fansidar*. The Government has made it mandatory for all pregnant women to receive repeated preventive treatment for malaria with SP. Intermittent Preventive Therapy means that the dosage of SP is administered at specific intervals, starting at least four months from the Last Menstrual Period (LMP). It is then repeated two more times at an interval of one month. IPT is preventive because it assumes that all pregnant women need to be protected from malaria even when they do not manifest any symptoms (MOH,

CBOH & NMCC 2004). As such, women and babies are protected and prevented from the consequences of malaria in pregnancy.

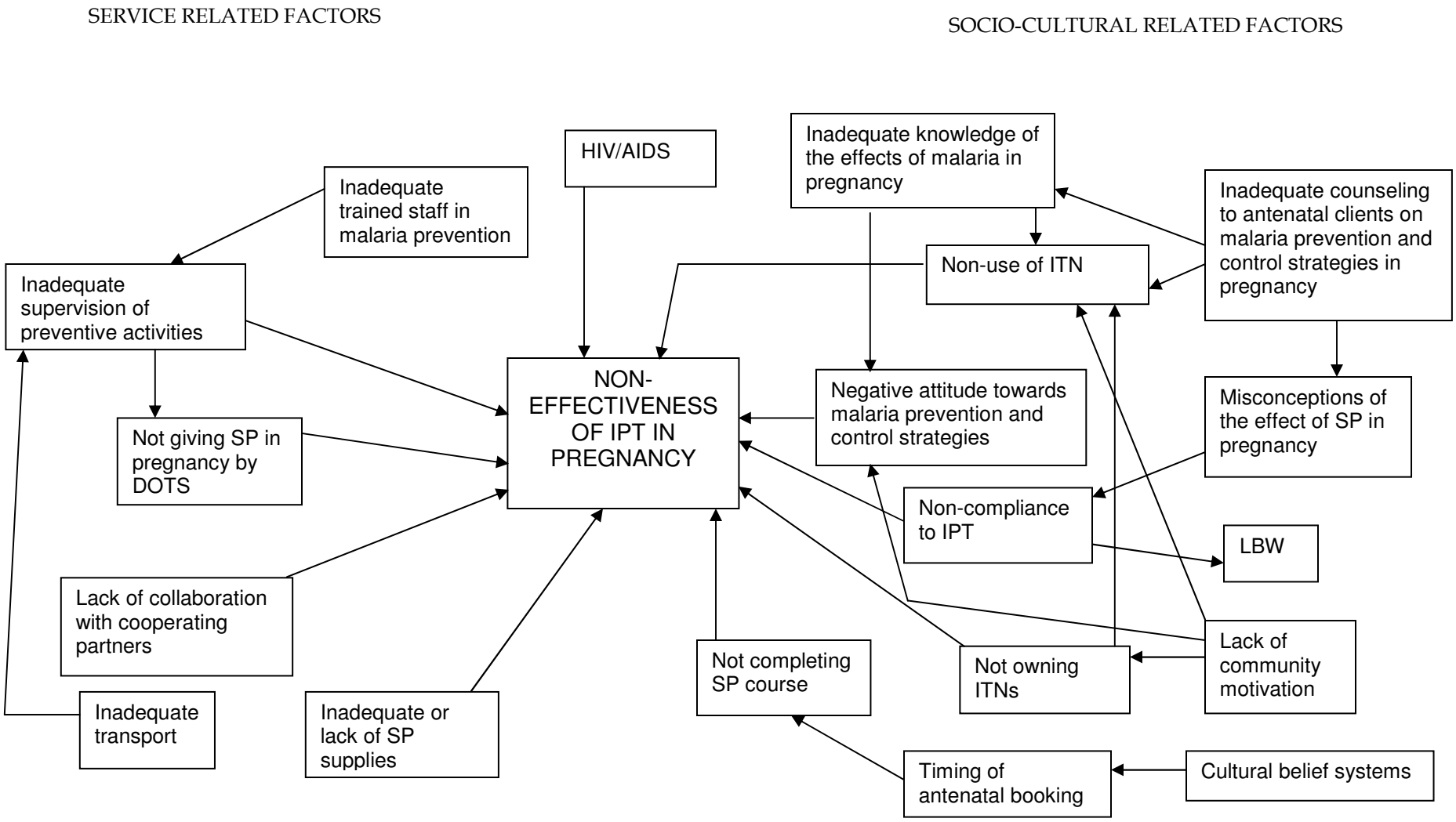
The SP is to be given as Directly Observed Therapy Short course (DOTS) at the antenatal clinic. There is the possibility of some women skipping some antenatal visits because of misconceptions about the drug and still yet others taking it for granted that since they take SP there is no need for them to sleep in ITNs.

Since the *Anopheles* mosquito bites primarily from 22:00 hours to 06:00 hours, the ownership and use of mosquito nets is the primary health intervention for reducing malaria transmission and morbidity in communities prone to malaria-carrying mosquitoes (CSO 2003). The NMCC has embarked upon an integrated approach. It is providing ITNs at subsidized prices, making it possible for all antenatal women to own ITNs. The NMCC is also providing IPT to all pregnant women at antenatal clinics. ITNs may also be obtained through a voucher process and are often supplied freely to the vulnerable. Even with good preventive measures in place, many pregnant women will still get malaria (Saphira et al. 2004). This is especially so, with the high HIV disease load in the region. This makes it imperative to monitor the preventive, control, prophylaxis and malaria therapies being implemented in Zambia. It is also important to find out the health attitudes of antenatal women towards IPT.

To my knowledge, no research has been carried out in this area. It is important to conduct this study in Kafue District in order to get an understanding of the effectiveness of the SP/IPT among the antenatal women. Some of the factors have been illustrated in the problem analysis framework. These factors are grouped into two, i.e. the service related factors, as well as the social-cultural and economic factors (Figure 1).

At the end of the research, we will be able to assess the effectiveness of our malaria prevention strategies among the antenatal women in Kafue District. In addition, the information obtained will be used to make recommendations on what level such measures are effective.

Figure 1. Problem analysis diagram



1.3 ASSUMPTIONS OF FACTORS CONTRIBUTING TO EFFECTIVENESS OF IPT

1.3.1 Knowledge of the consequences of malaria in pregnancy

The antenatal women might not know the consequences of malaria in pregnancy. Knowledge in this area would enhance preventive measures of malaria in pregnancy. Antenatal women need to be educated on the dangers of malaria in pregnancy for them to appreciate the IPT and adhere to it.

1.3.2 Compliance to IPT by pregnant women

Some antenatal women have a negative attitude towards the use of chemoprophylaxis in pregnancy. They may demonstrate resistance to change from Chloroquine to Fansidar and wish to continue their pregnancy without it. Other women may not complete the course of 3 doses due to ignorance about the importance of it. There ought to be time to counsel the antenatal women, especially the adolescent primigravidae on the importance of IPT, when, and how to take it so that they can comply with it.

1.3.3 Timing for antenatal booking

Some pregnant women may not understand the significance of early antenatal booking and thus start the antenatal booking late, so that they reach delivery time before completing the IPT course.

1.3.4 Frequency of ANC visits

Pregnant women are expected to make at least four antenatal visits from the time of their booking. These ANC visits are scheduled to coincide with the administration of IPT doses. The pregnant woman who fulfills these ANC visit schedules would be able to complete the IPT course before delivery time.

1.3.5 HIV and AIDS infection prevention

The emergency of HIV infection has worsened the burden of malaria in endemic areas. In the study done by Steketee et al. (1996) in Malawi, the findings suggested that HIV infection

reduces a pregnant woman's capacity to control PF parasitaemia, placental and newborn infection. Broek, et al. (1998) also conducted a study among pregnant Malawian women. The study revealed that asymptomatic HIV infection was related to increased prevalence of malaria. HIV infection is therefore an added challenge to the control of malaria. The need for more HIV and AIDS prevention programmes is therefore paramount.

1.3.6 Trained staff levels

The shortage of trained medical staff, particularly midwives, is a serious problem in Zambia. Given that IPT is to be given by DOTS, this entails careful and individualized observation, counselling and making records of the antenatal care given to the pregnant women by the midwives. When the midwives are few, they are over-stretched. When there are many antenatal women to be managed by few midwives, it becomes impossible to administer SP by DOTS or provide individualized care, let alone maintain useful records. Thus, the need for a good staff (midwife) levels during each antenatal visit is paramount.

1.3.7 Availability of ITNs

IPT goes well with ITNs. ITNs have to be made available to all antenatal women so that they are protected from the vectors of malaria. Every antenatal woman must own an ITN and sleep under it throughout her pregnancy. Where possible, all members of the family, especially children below the age of five, should also sleep under ITNs.

CHAPTER 2. LITERATURE REVIEW

2.1 INTRODUCTION

To reduce the complications associated with malaria in pregnancy, WHO (1996) recommended that all pregnant women in areas endemic with malaria should be given initial anti-malarial treatment followed by chemoprophylaxis. In the past 37 years, the results of several studies in Sub-Sahara Africa have demonstrated the beneficial effects of anti-malarial use in pregnancy. These have been a reduction of parasitaemia and the prevalence of anaemia in the mothers and an increase in the mean birth weights of their infants (Morley et al. 1964; Greenwood et al. 1989; Nyirjesy et al. 1993; Menendez et al. 1995; Ganer and Brabin 1994; Cot et al. 1995).

Chemoprophylaxis during pregnancy in many countries in Sub-Sahara Africa is based on Chloroquine. But the emergency and spread of Chloroquine resistance, especially in East Africa, has greatly reduced the drug's protective efficacy (Steketee et al. 1987; McDermott et al. 1988; Heymann et al. 1990; Mutabingwa et al. 1993). In a study conducted in primi and secundi-gravidae in a lakeshore area of Malawi, Schulz et al. (1994) showed that treatment with Sulfadoxine-Pyrimethamine (SP) at first antenatal visit and again at 28-34 weeks of gestation reduced peripheral and placental parasitaemia and the risk of low birth weight (LBW). As a consequence of this observation, Malawi and Kenya replaced Chloroquine treatment for malaria control in pregnancy with a regimen of two treatment doses of SP in 1993 (Anon 1997; Brabin et al. 1997a). As more countries in Sub-Sahara Africa consider changing their own anti-malarial programmes during pregnancy, evaluation of the effectiveness of this new policy in women of all parities is essential.

In a study in Malawi, the effectiveness of two doses of SP in reducing parasitaemia at delivery was limited, especially in HIV infected women who showed increased risk of placental and peripheral parasitaemia (Brabin 1997). The timing of the second treatment dose of SP may be critical, as women in areas of intense malaria transmission taking this treatment at 28 weeks could be at high risk of re-infection before delivery. More frequent doses given at 34-35 weeks may be more beneficial. Another study was conducted to evaluate the effects of SP treatment in pregnancy on parasite clearance and risk of LBW in rural Malawi. In this study the parasite prevalence in Malawian mothers who received one, two, or three doses of SP during pregnancy and the incidences of LBW in the infants they delivered were evaluated and

compared. The results showed an improvement in the weights of babies with an increase from one to three SP dose treatments (Verhoeff et al. 1997).

Before advocating an increase in the frequency of SP dosing during pregnancy, the acceptability and side-effects of such a regimen need to be evaluated. A woman's attitude towards a drug will affect compliance (Helitzer-Allen et al. 1993). Concern has been expressed about the use of SP for chemoprophylaxis during the first trimester and close to term because of possible *teratogenicity* and *hyperbilirubinaemia*, as well as *kernicterus* (Cook 1992).

Although two doses of SP may have little effect on maternal parasitaemia at delivery, there is some evidence they may be effective in reducing the risk of LBW infants being born to the women treated. This evidence was provided by Schultz et al. (1994), and more recently, in an analysis of birth weight data collected in health centres in Malawi before and after 1993, the year when SP replaced Chloroquine (Imam 1995). As foetal growth retardation relates to reduction of parasitaemia during pregnancy, intermittent control with SP should improve foetal growth even in those women who become re-infected in late pregnancy.

The WHO and UNICEF are working with national malaria control programmes to update malaria policies and guidelines. Technical agencies in Europe and the US are working together to ensure effective implementation of the new policies (JHPIEGO 2003).

In April 2000, the African Heads of State and Government meeting in Abuja, Nigeria recognized that malaria was a serious issue, particularly to pregnant women and children under the age of five. They developed the Abuja Declaration.

The Abuja Declaration states the following goals for prevention and control of malaria during pregnancy:

- At least 60 per cent of pregnant women will have access to and use effective preventive measures.
- At least 60 per cent of children under five will have access to prompt and effective treatment.

The international health community is responding to this challenge (MNH 2003). Often, countries develop their own strategies to implement national policies and guidelines, without the benefit of knowing what has already been done and what has proved effective (MNH 2004). Linking prevention and treatment of malaria with focused antenatal care could improve maternal and newborn outcomes in malaria endemic areas.

Studies suggest that in malaria endemic areas malaria during pregnancy contributes 3-5 per cent of maternal anaemia, 8-14 per cent of LBW, and 3-8 per cent of infant mortality (Steketee et al. 2001). Zambia is among the countries in Africa with the highest malaria-related maternal mortality. Women and infants in Zambia are dying at unacceptably high rates as a result of pregnant-related complications. Zambia's maternal and infant mortality rates are among the highest in the world (MOH et al 1998).

While many know of the dangers of malaria in infants and young children, malaria in pregnant women is one of the less well known contributing factors. Like infants and children under the age of five, pregnant women are especially susceptible to malaria because of the changes their bodies go through during pregnancy. This puts their own lives at risk, and it greatly affects the chances of survival of their babies (Safe motherhood 2004).

A study conducted at the University Teaching Hospital in 1993 showed that 14 per cent of all maternal deaths were caused by malaria. Further, the 1998 report on maternal mortality in Zambia cited malaria as the leading cause of death for women who died before delivery, accounting for 24 per cent of antenatal deaths (MOH et al 1998).

Even when a woman has malaria without any symptoms, or the symptoms are mild, which is most likely in areas where malaria is common, the malaria contributes to maternal and, especially, to infant death. For one, malaria is strongly associated with anaemia, which puts both the woman and the developing baby at risk. The National Food and Nutrition Commission Survey of 1999 cited that almost half of all the pregnant women in Zambia were anaemic.

It has been documented that women with anaemia are more prone to death if they have severe bleeding or haemorrhage during their pregnancy. In addition, anaemia contributes to LBW babies, who are much more likely to suffer from diseases and even die. And if the malaria is

living in the placenta, it will also directly affect the flow of nutrients to the foetus, thus contributing even more to LBW.

The Kafue District Action Plan and Budgeting cites malaria as the number one disease on both the lists of the Top Five Causes of Morbidity – All Ages and the Top Five Causes of Morbidity – Under Five.

Malaria during pregnancy can be prevented, reduced and managed with appropriate low-cost interventions. The MNH strategic framework for malaria control during pregnancy in WHO Africa Region promotes the use of Intermittent Preventive Treatment (IPT) and insecticide treated bed-nets (ITNs) for the prevention of malaria, and supports effective case management for treatment of malaria during pregnancy (WHO 2003).

2.2 MALARIA CONTROL IN ZAMBIA

The battle against malaria has again taken an aggressive turn. In 1998 the Roll Back Malaria (RBM) campaign was set in motion (WHO).

The RBM campaign has six elements, namely:

- Evidence-based decisions using surveillance, appropriate responses and building community awareness.
- Rapid diagnosis and treatment.
- Multiple prevention and better multi-pronged protection using insecticide treated mosquito nets and environmental management to control mosquitoes and making pregnancies safer.
- Focused research to develop new medicines and vaccines, as well as insecticides, and to help epidemiological and operational activities.
- Co-ordinated action for strengthening existing health services, policies and providing technical support.
- Harmonized actions to build a dynamic global movement.

2.3 CONTROL OF MALARIA IN PREGNANCY IN ZAMBIA

With the RBM strategy in place, the Ministry of Health (MOH) through the Central Board of Health (CBoH) has introduced Intermittent Preventive Treatment (IPT) which is designed to clear malaria from the pregnant woman's placenta. The drug chosen for IPT is *Sulfadoxine-*

Pyrimethamine (SP), commonly known as *Fansidar*. Under this programme, all pregnant women without exception must be given three treatment doses of SP at least four months after the LMP (during her 2nd and 3rd trimesters) with at least a period of four weeks in between.

IPT greatly improves the chances of a healthy, positive pregnancy outcome for both mother and child. It is safe and effective.

According to the Maternal and Neonatal Health programme manager dealing with malaria in pregnancy, a number of pregnant women have malaria and all pregnant women are exposed to it (MNH 2004).

IPT is safe and effective and has been in use for more than seven years in the sub-region and thousands of women have benefited from it. Countries such as Kenya and Malawi have both reported very good results. Some of the facts about the use of SP in implementing IPT are:

- SP has proved safe for use in women in the second and third trimesters of pregnancies..
- Large scale use has demonstrated safety and effectiveness in pregnant women.

In addition, IPT has proved safe and effective in reducing malaria parasitaemia in the placenta; reducing anaemia; reducing the risk of premature birth, and reducing the chances of LBW (JHPIEGO 2004).

2.4 SOCIAL-ECONOMIC PROFILE OF KAFUE DISTRICT

The commercial and agricultural activities in Kafue, especially in areas around Mwembeshi and Chiawa, which embrace the irrigation system, contribute greatly to the breeding of mosquitoes throughout the year. There is no corresponding investment from these farms in malaria preventive programmes.

Right in Kafue Urban are sugarcane fields flourishing in the areas drained by effluent from the town's industries, notably Kafue Textiles, Nitrogen Chemicals, Lee Yeast, Bata Shoe Company and Zambia Concrete. These canefields are an excellent breeding ground for mosquitoes.

There has been a rapid expansion of what were once very small and insignificant settlements. Notable among these are Soloboni and Zambia Compound in between the industrial area to

the north and east, the railway line to the east, and the Kafue River to the west, and Kabuchende across the road from Shikoswe Site and Service.

The type of housing in these areas has compounded the poor health status since most are poorly ventilated and are over-crowded with compromised waste disposal facilities that promote mosquito breeding.

The shallow wells and broken sewer pipes also provide a favourable environment for mosquito breeding which increase the incidences of malaria in the district.

2.5 CONCLUSION

Malaria has commanded the attention of Public Health Workers throughout the world, ever since Ross demonstrated its transmission a century ago. Following the end of the Second World War, the availability of residual insecticides and new anti-malarial drugs heightened interest in control measures. Over the past 35 years, the fight against malaria has claimed a greater share of the world's scientific and financial resources than any other disease. Yet today, malaria remains the major health hazard. Its ability to strike back in devastating fashion during eradication campaigns when pressure against it is relaxed is now well known. It is now well recognized that such eradication campaigns must only be planned in light of detailed knowledge of its epidemiology and the area under consideration.

Zambia was using Chloroquine as prophylaxis for antenatal mothers until two years ago when it was phased out. This was after research proved beyond doubt that malaria had become resistant to Chloroquine.

Even with good preventive measures in place, many pregnant women will still get malaria. In the current circumstances in Zambia, with such high rates of malaria and other complicating factors such as high rates of anaemia and HIV-AIDS, the CBOH and NMCC are recommending that all pregnant women receive IPT during their pregnancy for malaria, even if they don't have symptoms (NMCC 2004).

The biggest hope is the RBM initiative. RBM is in essence a movement that aims at bringing everybody on board in the control of malaria. The collaborated effort also aims at tapping the resources and relative advantages of the various partners towards malaria control. RBM has

started gathering momentum from the highest offices (the President's Office) in malaria affected countries to partners in the capitals and down to the grassroots (WHO 1999).

Our mothers need to be protected for the health of the unborn child and a healthy nation at large.

2.6 GAPS IN THE LITERATURE

Malaria in pregnancy is a major threat to maternal health. It has adverse consequences to both the mother and her child. It contributes to intrauterine foetal growth retardation and intrauterine foetal death, prematurity, neonatal death, low birth weight, maternal death, maternal anaemia and reduced physical capacity.

Unfortunately not much research has been done in this area in Kafue District. There is no data that reflects the levels of efficacy of SP in pregnant women.

Most of the studies on IPT are descriptive in nature. This study will be a case-control study. It is analytical in nature and will try to shed light on the strength of association between factors and effectiveness of IPT.

2.7 JUSTIFICATION FOR THIS STUDY

Malaria is a high risk disease burden. This has prompted many advocacy campaigns to educate not only pregnant women but also the general public on the importance of preventing malaria during pregnancy. However, results from the 2001-2002 ZDHS indicate that less than one in five pregnant women (18 per cent) sleeps under a mosquito net, and only 8 per cent sleep under an ITN. The data indicates that pregnant women are no more likely than other women to sleep under a mosquito net or an ITN.

Execution of any strategy would therefore be best done with proper understanding of what is involved and practised. All other things being equal, antenatal mothers should not have malaria parasites present by delivery time. At least 60 per cent of all pregnant women who may be at risk with malaria should have access to chemoprophylaxis or IPT. 60 per cent of pregnant women should be seen to benefit from the best combination of personal and community protective measures such as ITNs and other interventions which are accessible

and affordable in order to prevent infection and suffering. Babies should be born with weights of more than 2.5 kg.

This study is vital in the sense that its major focus is to establish the effectiveness of the chemoprophylaxis and ITNs as well as community-based preventive measures for and by the antenatal mothers. The results and recommendations will assist policy-makers to allocate or divert resources where they are beneficial and effective. As they say, the health of a mother entails the health of a nation.

2.8 RESEARCH QUESTION

It is the national health policy that all pregnant women take SP through IPT in order to treat malaria and prevent the consequences of malaria in pregnancy. But how effective is SP through IPT in clearing placental malaria parasites?

2.9 HYPOTHESIS

There is no association between doses of SP for IPT during pregnancy and clearance of placental malaria parasites.

There is an association between doses of SP for IPT during pregnancy and clearance of placental malaria parasites

2.10 OPERATIONAL DEFINITIONS

The operational definitions of the following terms and expressions used in this paper are set out in the following list:

Expression or term	**Operational definition**
Low birth weight (LBW):	A baby born with a weight of less than 2,500gm.
IPT course:	Three tablets of Fansidar taken 3 times with a difference of four weeks in between, starting from the second trimester (complete IPT course).
IPT dose:	Three tablets of Fansidar taken at once.
Availability of ITNs:	Having been sleeping under an ITN throughout pregnancy.
Knowledge:	Being able to understand the dangers of malaria in

	pregnancy.
Availability of staff:	Being able to supervise all antenatal women taking SP at every antenatal clinic visit.
Compliance:	Starting IPT by the 17th to 20th week of gestation and completing IPT by the 36th week of gestation.
Attitude:	Unwillingness to take IPT course of SP in pregnancy.
Malaria clearance:	Placental blood test with no malaria parasites.
Malaria non-clearance:	Placental blood test with malaria parasites i.e. (positive).
Effectiveness of IPT:	Placental blood tests negative for MPs after IPT course.
Frequency of ANC visits:	The number of times an antenatal woman attends ANC visits.

CHAPTER 3. OBJECTIVES

3.1 GENERAL OBJECTIVE

To compare rates of placental malaria parasites clearance between full course and incomplete course of SP for IPT.

3.2 SPECIFIC OBJECTIVES

1. To compare the proportional regimen who had full course between cases and control
2. To establish an association between compliance by pregnant women to take SP for IPT and the effectiveness of such IPT
3. To determine an association between a pregnant woman's HIV status and the effectiveness of SP for IPT.
4. To determine an association between staffing levels at antenatal clinics and effectiveness of SP for IPT.
5. To make recommendations.

CHAPTER 4. RESEARCH METHODOLOGY

4.1 CONCEPTUAL FRAMEWORK

The variables to be used for analysis of data are set out in Figure 2 below.

Figure 2. Interrelationship links of dependent and independent variables

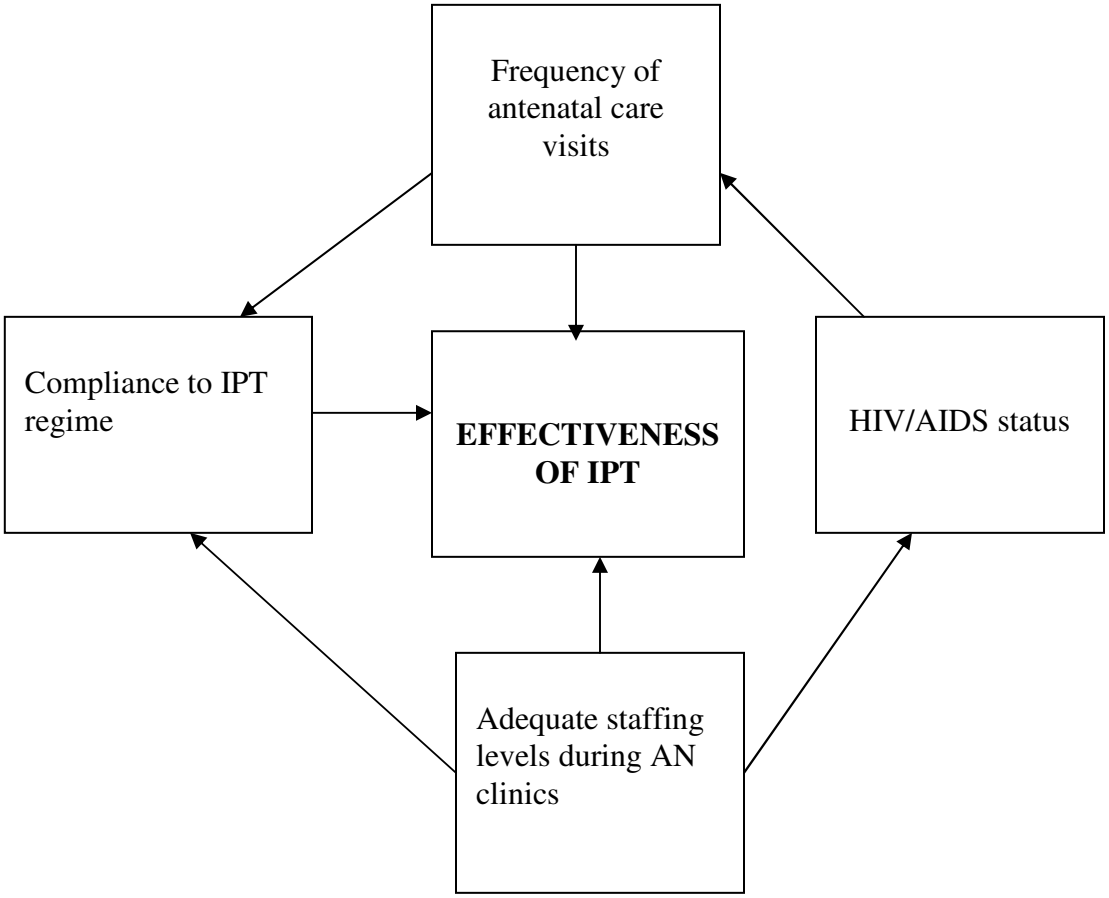


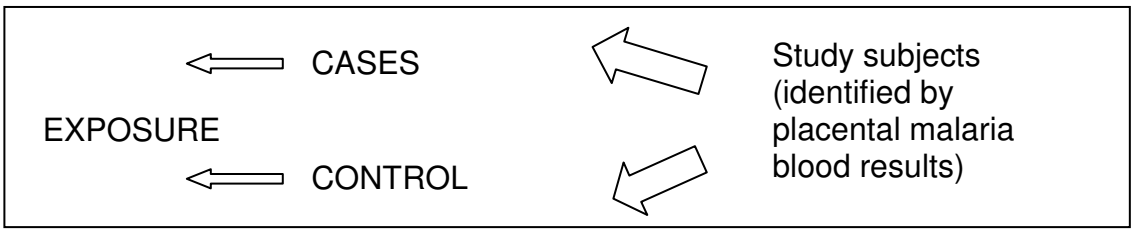
Table 3. Variables and scales of measurement

VARIABLES	INDICATORS	SCALE OF MEASUREMENT	QUESTIONS
Availability of staff	Available	Staff available to supervise SP taking at every antenatal clinic.	46
	Not available	Staff not available to supervise SP taking at every antenatal clinic.	48
Compliance	Compliance	Starting IPT by 16^{th}-20^{th} week and completing IPT by 36^{th} week of gestation.	44
	Non-compliance	Starting IPT by 29^{th} – 32^{nd} week and not completing IPT by 36^{th} week of gestation.	50
Frequency of ANC visits	More frequent	Four times or more	51
	Less frequent	Less than four times	
HIV status	Negative	Record review of HIV test results	52
	Positive	Record review of HIV test results	

4.2 RESEARCH DESIGN

The purpose of this study was to determine the effectiveness of IPT in the clearance of placental malaria parasites in pregnant women in Kafue District. To achieve this, a case-control research design was utilized (see Figure 3). A Case – control study (often called a retrospective study) is a common approach to test causal hypotheses (Park 2002). Some researchers prefer the name case-referent study (Maes et al. 1991). The case control study is an analytic epidemiological research design in which the study population consists of groups who either have or do not have the disease.

Figure 3. Definition of comparison groups in case-control studies



Source: Bererra et all. 1991

The cases were those postnatal women who were admitted in labour between the months of November and December 2005, who had dosages of IPT by delivery time and whose placental malaria slides were positive. The control group was the postnatal women who were admitted in labour during the same period and had dosages of IPT by delivery time whose placental malaria slides were negative.

For each woman who was admitted in labour records were checked to confirm how many dosages of IPT she had had during her pregnancy. Placental blood slides were then done after delivery. Then the women were assigned as either cases or controls on the basis of placental blood slide results.

Both groups were matched by the number of IPT dosages received during pregnancy; compliance to IPT, timing of booking for AN clinic, frequency of ANC visits, staffing levels during ANC, the HIV status in relation to compliance and clearance of placental malaria parasites after IPT compliance.

4.3 RESEARCH SETTING

The study was conducted in Kafue District (KD) in Zambia. Kafue District is in Lusaka Province, 45 kilometers south of the city of Lusaka. It shares borders with Mumbwa and Chongwe Districts in the north-west and north-east respectively. In the south, Kafue borders with Mazabuka, with the Kafue River as the natural boundary between the two Districts.

Kafue is largely rural with 51 per cent of its population living in the rural areas. The District has 14 Rural Health Centers, a health post and a district hospital. The climate of Kafue is sub-tropical and divided into three distinctive seasons with the warm and wet season between November and April. The warm and wet weather conditions determine the disease pattern

with an increase in malaria morbidity. The District is largely mountainous. The Kafue River drains into the Zambezi River at Chiawa. Both these rivers have swampy banks that promote the breeding of mosquitoes that significantly contribute to the mosquito population. There are many seasonal streams that also act as breeding areas for mosquitoes. During the warm and wet (rainy) season, the weather conditions precipitate an increase in malaria morbidity owing to the widespread stagnant water.

Around Kafue Urban critical breeding grounds for mosquitoes include the dambo between the industrial area and the shanty of Soloboni, as well as the stretch between the railway line and Zambia Compound. These areas are low-lying and tend to flood during the wet season. Effluents from Kafue Textiles (Z) Limited, Nitrogen Chemicals of Zambia, Bata, Lee Yeast and Zambia Concrete drain into this area as well.

Table 4. Demographic profile for research setting

Category	Growth rate*				
	%	2004	2005	2006	2007
Women in child bearing age:14-49years	22	58,217	54,982	56,742	58,557
Growth Rate %	3.2	320	320	320	320
Expected pregnancies	5.4	8,234	13,496	13,927	14,373
Expected deliveries	5.2	7,943	12,996	13,412	13,841
Total population	100	242,166	649,919	257,916	266,169

Source: Extrapolation from 1990 Census of Population and Housing

*The national growth rate is at 2.9%

4.3.1 Malaria profile of the research setting

Malaria is endemic and ranks first in the top five causes of morbidity in the district. It is the major cause of health center and hospital admissions in Kafue District. The incidence rate of malaria has been increasing despite control measures that have been put in place.

Some of the control measures include the sale of ITNs and information, as well as Information, Education and Communication preventive methods.

4.4 STUDY POPULATION

The study population included postnatal women who were admitted in labour, in 3rd trimester between ages of 15 and 49 years and had just delivered in the 2 selected health centres (out of 14 centres) during the period of July – October 2006, who had been on IPT. Each postnatal woman was taken as a study unit.

4.5 INCLUSION CRITERIA

Postnatal women who delivered in the third trimester of gestation, who had been on IPT, were admitted in labour and had just delivered a live baby.

4.6 EXCLUSION CRITERIA

Clients with premature deliveries and those living outside Kafue District. Stillbirths were also excluded in the analysis of placental malaria parasites.

4.7 SAMPLE SIZE DETERMINATION AND SAMPLING

4.7.1 Sample size determination

To evaluate the effectiveness of IPT in pregnancy on placental parasite clearance in order to increase the clearance from 35.6% among the women who have completed the course of IPT (Verhoeff et al., 1997) to 55.6% using the 2 independent groups as cases and controls. The sample size was determined by use of the formula:

$$n=\frac{(P_1Q_1+P_2Q_2)}{(P_1-P_2)^2}xf(a,\beta)$$

where: P_1 = The proportion in the control group

P_2 = The proportion in the control group, which the researcher wishes to have a good chance of detecting as difference from P1

$Q = (100 - P)$

And considering a two-tailed test at 5% significant level for the power of 90%.

Table 5. Values for f (a, β)

Significance level, a,				
	One – tailed test		Two – Tailed test	
Power, 1-P	0.05	0.01	0.05	0.01
0.5	2.71	5.41	3.84	6.63
0.8	6.18	10.04	7.85	11.68
0.9	8.56	13.02	10.51	14.88

Source: Dobson, 1984

$$n = \frac{[35.6\,(100 - 35.6) + 55.6\,(44.4)]}{(35.6 - 55.6)^2} \times 10.51$$

$$n = \frac{[35.6\,(64.4) + 2{,}468.64]}{(-20)^2} \times 10.51$$

$$n = \frac{[2292.64 + 2468.64]}{400} \times 10.51$$

$$n = \frac{24095.646 + 25944.986}{400}$$

$$n = \frac{50040.632}{400}$$

$$n = 125.10$$

$$n = 126$$

Expecting the response rate of 90%, the required number in each of the groups (cases and controls) was:

$$= \frac{126}{0.9}$$

$$= 140$$

Thus, we considered having two independent samples of 140 subjects each.

4.7.2 Sample selection

Kafue District has 14 health centers and one hospital, Kafue District Hospital which was opened early in 2005. This health institution provides maternity delivery services. The other maternity wing is at Nangongwe Clinic. Nangongwe Clinic used to be the only maternity facility in Kafue District before the hospital was belt.

The Nangongwe maternity facility serviced the entire district. Even today, most of the maternity cases in Kafue are referred to this facility before being taken to the hospital. It operates on a 24-hour basis.

Kafue District Health Management Board runs both of these delivery centers. Thus, they are government institutions where services are provided free of charge and drug provision during pregnancy follows the national policy. For this reason, the researcher will use a purposeful sampling method in the selection of the health centres to be included in the study.

A purposeful sampling is a non-probability sampling design where the sample units are selected subjectively by the researcher, who attempts to obtain a sample that appears to be representative of the population (Nachmias and Nachmias 1981). The chance that a particular sample unit will be selected for the sample depends upon the subjective judgment of the researcher. A sample is built up which enables the researcher to satisfy the needs of a project (Robson 1993). The health centres, which will be included in the study, are those, which offer maternity delivery services to the district. Thus, two health centres will be selected out of 14.

To get the required sample of 170 subjects, study units will be selected from the selected health centres using the systematic sampling method. The systematic sampling method is a probability design, which involves the selection of study units at fixed intervals from a list (Bererra et al. 1991). It consists of selecting every *K*th sampling unit of the population after the first unit is selected at random from the first K sampling units.

Using systematic sampling procedure, the postnatal women who were admitted in labour during the period of July – October 2006 would be chosen at regular intervals of 1 in 2 from the sampling frame. The cases and controls will be sampled separately. We will use 1 in 2 for cases. If the cases happen to be fewer than the controls then we will use 1 in 2 and 1 in 5

for controls. The women will be included in the study as either cases or controls on the basis of placental malaria parasite results. (see figure 3)

4.7.3 Selection of cases

The cases were postnatal women who were admitted in labour, and had delivered and placental malaria blood slide had been done and was positive.

4.7.3.1 Diagnostic criteria

The antenatal records were indicating that the woman has had dosages of IPT and was admitted in labour.

Laboratory investigations – A blood sample from placental villi was analyzed for malaria parasites.

4.7.3.2 Eligibility criteria

All women admitted in labour and had delivered a live baby and had had dosages of IPT and placental malaria parasite was positive between the period of July and October 2006 were eligible to be included as cases in the study.

4.7.3.3 Sources of cases

The cases were drawn from the 2 selected health facilities in Kafue District.

4.7.4 Selection of controls

The controls were the postnatal women who were admitted in labour and had dosages of IPT and their placental malaria parasite blood slide were negative and had live births.

4.7.5 Sources of controls

The controls were drawn from the 2 selected health facilities in Kafue District. These women were those admitted in labour during the same period as the cases and had delivered live births and placental malaria blood slides were negative, and had dosages of IPT by delivery time.

4.8 DATA COLLECTION

Data for independent variables that were hypothesized to be related to clearance of placental malaria parasites by IPT was collected by administering an interview schedule using a structured questionnaire. (Appendix A)

Data collection was done with the help of 2 research assistants. When permission to conduct the study was granted by the concerned institutions, that's when training of the research assistants was done. The training period was for a week and it was conducted a week before data for the main study was collected.

Non-participatory observations was also used to obtain data by observing the interaction of the health providers and their clients.

Blood slide samples for malaria parasites was collected from placental villi. A checklist was used to record the results of each respondent.

The records review for IPT dosages and HIV results were done.

IPT is given to all antenatal women in the 2^{nd} and 3^{rd} trimester, amounting to 3 dosages, making a full course by delivery time. HIV test was also done on antenatal women after VCT.

All questionnaires were checked for completeness and accuracy before collection as a quality control measure.

4.9 DATA ANALYSIS

The data was then entered and analyzed using SPSS for Windows Version 11.5. The analysis consisted of cross-tabulation tables and graphs. Discrete and continuous variables were compared using Chi-Squared (x^2) test. Odds Ratio was done to determine the strength of association between the dependent and independent variables. Statistical significance was achieved if $P< 0.05$. Then a multivariate logistic regression analysis was done to control for confounding factors.

4.10 ETHICAL CONSIDERATION

In order to conduct the study ethical approval was sought from the School of Medicine Ethical Committee of the University of Zambia. Permission was also obtained in writing from the Director of DHMB, with copies to the Health facilities-in-charge of the research sites. This was done in recognition of the respective authorities and to gain cooperation.

Written consent was also obtained from the respondents upon explaining to them the purpose of the study and how the results would be utilized. Information obtained from the respondents was treated with confidentiality. Participation was voluntary after being selected. Subjects were assured of confidentiality and anonymity of data.

4.11 PRETEST OF RESEARCH METHODOLOGY

Pretest of the research methodology refers to a small-scale trial of the research component. The pretest was conducted at Chipata clinic in the Maternity Ward in Lusaka District.

The researcher conducted a pretest to evaluate the following aspects of the research methodology:

1. Reaction of the respondents to the research procedures and determine:

    - Acceptability of the methods used to establish contact with the study population.
    - Acceptability of questions asked
    - Willingness of the respondents to answer the questions and collaborate with the study

2. The data collection tools to determine:

    - Whether the tools used would allow the researcher to collect the information which would achieve the main study objective and answer the research question.
    - How much time would be needed to administer the questionnaire.
    - Whether there was any need to revise the form of interview schedule as well as whether the sequence of the questions was logical; the wording of the

questions was clear; space for the answers was sufficient; there was need to re-categorize some answers or change closed questions into open-ended questions; there was need to adjust the coding system, and whether there was need for additional instructions for interviewers.

This would enable the researcher to identify potential problems in the tool, check its accuracy, clarity and completeness. It would also assist in testing the reliability and validity of the instrument.

3. Staffing and activities of the research team while participating in the pre-test to determine:

- How successful the training of the research team had been; the work output of each member of the research team; how well the research team would work together; whether the resources were adequate; and the reliability of the results when the instrument was administered by different research members of the research team.

4. Procedures for data analysis to determine:

- Appropriateness of the dummy tables; effectiveness of the system for quality control of data collection; appropriateness of statistical procedures; clarity and ease with which the collected data could be interpreted.

5. The proposed work plan and the budget for research activities, to determine:

- Whether the time allowed for different activities was appropriate and the amount budgeted for was adequate. The pretest would enable the researcher to make necessary corrections and modifications, inclusions or exclusion of some questions before the actual study was undertaken.

CHAPTER 5. PRESENTATION AND ANALYSIS

5.1 INTRODUCTION

This chapter presents the findings of the study. The chapter covers sections on social demographic characteristics in relation to the study groups, followed by knowledge, compliance, reasons for taking more than three doses, prevention of consequences of malaria with IPT, HIV status.

5.2 RESULTS

5.3 SOCIAL DEMOGRAPHIC CHARACTERISTICS

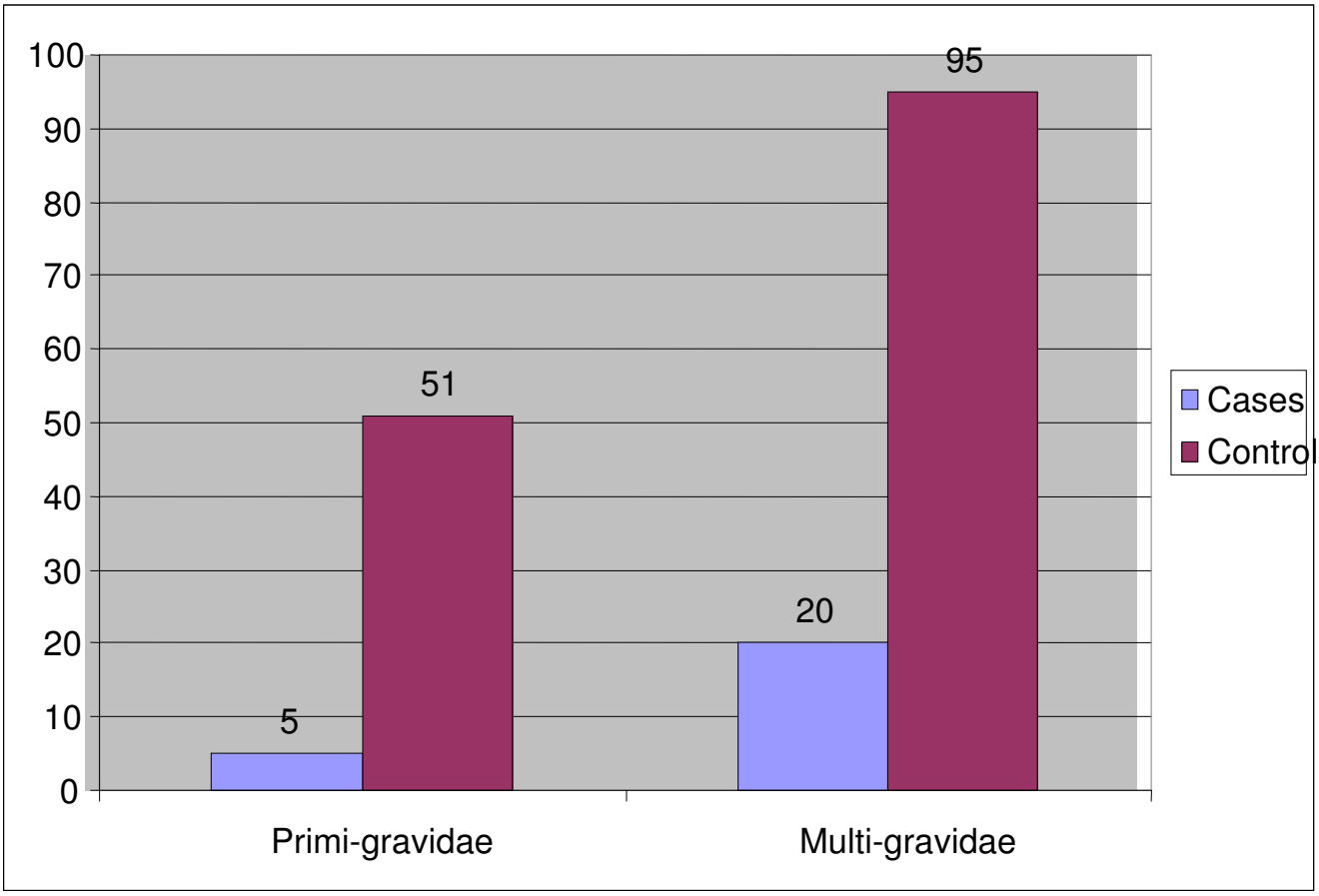
Totals of 25 cases and 146 controls were enrolled into the study. A comparison of the socio-demographic characteristics of the sample was done. Table 6 shows the analysis of the association between the distribution of demographic characteristics and the effectiveness of IPT/SP in clearance of placental malaria parasites. No significant associations were observed between demographic characteristics and effectiveness of IPT/SP.

Table 6 Associations of the socio-demographic characteristics of the post natal women who attended antenatal clinic and took IPT / SP and the effectiveness of IPT / SP

Demographic Characteristics	Did not clear [Cases] Total 25 [%]	Cleared [controls] Total 146 [%]	χ^2	P value
Age				
15 - 19 years	8 [32.0]	42 [28.8]	3.798	0.284
20 - 24 years	8 [32.0]	37 [25.3]		
25 - 29 years	7 [28.0]	30 [20.5]		
30 and above	2 [8.0]	37 [25.3]		
Marital Status				
Single	1 [4.0]	25 [17.1]	Fisher's	0.131
Married	24 [96.0]	121 [82.9]		
Educational Level			Fisher's	0.366
Primary	11 [44.0]	49 [36.6]		
Secondary	14 [56.0]	97 [66.4]		
Religion	4 [16.0]	28 [19.2]	Fisher's	1.000
Catholic	21 [84.0]	118 [80.8]		
Protestant				
Occupation	6 [24.0]	27 [18.5]	Fisher's	0.583
Gainful employment	19 [76.0]	119 [81.5]		
Unemployed				
Transport	2 [8.0]	6 [4.1]	Fisher's	0.331
Own transport	23 [92.0]	140 [95.9]		
Public transport				

There was no significant association between gravidae and the effectiveness of IPT/SP [p=0.142] as shown in Figure 4.

Figure 4 Relationship between gravidae and effectiveness of IPT/SP



5.4 KNOWLEDGE

The respondents were asked on what they knew about malaria, its treatment, the consequences of malaria in pregnancy and its prevention in pregnancy.

Table 7 shows the analysis of the association between the distribution of knowledge and the effectiveness of IPT/SP.

Table 7 Associations of knowledge and effectiveness of IPT/SP.

Knowledge	Did not clear [Cases] Total 25 [%]	Cleared [controls] Total 146 [%]	χ^2	P value
Knowledge of the causes of malaria				
Knowledgeable	41 [40.2]	16 [23.2]	5.35	0.021
Not Knowledgeable	61 [59.8]	53 [76.8]		
Knowledge of the signs of malaria				
Knowledgeable	49 [52.0]	18 [26.1]	8.32	0.004
Not Knowledgeable	53 [48.0]	51 [73.9]		

A significant association was observed between knowledge on the causes of malaria and the effectiveness of IPT/SP [χ^2=5.35; p=0.021] with more controls [76.8%] than cases [59.8%] among the respondents who where not knowledgeable. The table further shows a significant association [p=0.004] between knowledge of signs of malaria and effectiveness of IPT/SP. with more controls [73.9%] than cases [48.0%] among the respondents who where not knowledgeable about the signs of malaria.

5.5 COMPLIANCE

Table 8 shows the results on compliance with preventive interventions which are done to prevent malaria in pregnancy as part of focus antenatal care. These include number of IPT/SP doses taken during pregnancy, reasons for taking more than three dosages, age of pregnancy at which the last dose was taken and measures taken if they had malaria during pregnancy.

Table 8 Association between number of IPT/SP doses taken and effectiveness of IPT/SP.

Characteristics	Did not clear [Cases] Total 25 [%]	Cleared [controls] Total 146 [%]	χ^2	P value
Number of IPT dose taken				
<3 doses	25 [100.0]	77 [52.7]	19.81	<0.001
3 and above doses	0 [00.0]	69 [47.3]		
Reasons for not taking Fansidar				
Started late and no staff to supervise	7 [28.0]	43 [55.8]	5.85	0.016
No Fansidar during some visits	18 [72.0]	34 [44.2]		

Table 8 shows the analysis of association between number of IPT/SP doses taken and effectiveness of IPT. There was a significant association between IPT/SP doses and effectiveness of IPT/SP with more controls [100%] than cases [52.7%] among the respondents who had taken less than three doses of IPT/SP, [χ^2 =19.81; p<0.001].

Furthermore, a significant association was observed between reasons for not taking IPT/SP during pregnancy and the effectiveness of IPT/SP [χ^2 =5.85; p=0.016] with more cases [72%] than controls [44.2%] among the respondents who reported that there were no Fansidar tablets during some visits.

5.6 REASONS FOR TAKING MORE THAN THREE DOSAGES

Ten of the women, all of them controls, took more than three doses. Two of the women said they took more than three doses because they were told to do so by their health providers. The other eight said they had malaria and this prompted the health providers to give them another dose of Fansidar

Table 9 shows the analysis of association between the age of pregnancy at which the last dose of IPT/SP was taken and effectiveness of IPT/SP.

Table 9 *Association of age of pregnancy at which the last dose was taken and effectiveness of IPT/SP.*

Characteristics	Did not clear [Cases] Total 25 [%]	Cleared [controls] Total 146 [%]	χ^2	P value
Age of pregnancy when you took the last dose				
<36 weeks	17 [68.0]	47 [32.2]	11.68	0.001
>36 weeks	8 [32.0]	99 [67.8]		

A significant association was observed between the age of pregnancy at which the last dose of IPT/SP was taken and effectiveness of IPT/SP [χ^2 =11.69; p<0.001] with more cases [68.0%] than controls [32.2%] among the respondents who took the last dose before 36 weeks of gestation.

Figure 5 shows analysis of association between the results of blood slides among the respondents who had malaria during pregnancy and effectiveness of IPT/SP. There was no association between these factors [Fishers p=1.000].

Figure 5. *Relationship between malaria during pregnancy and effectiveness of IPT/SP.*

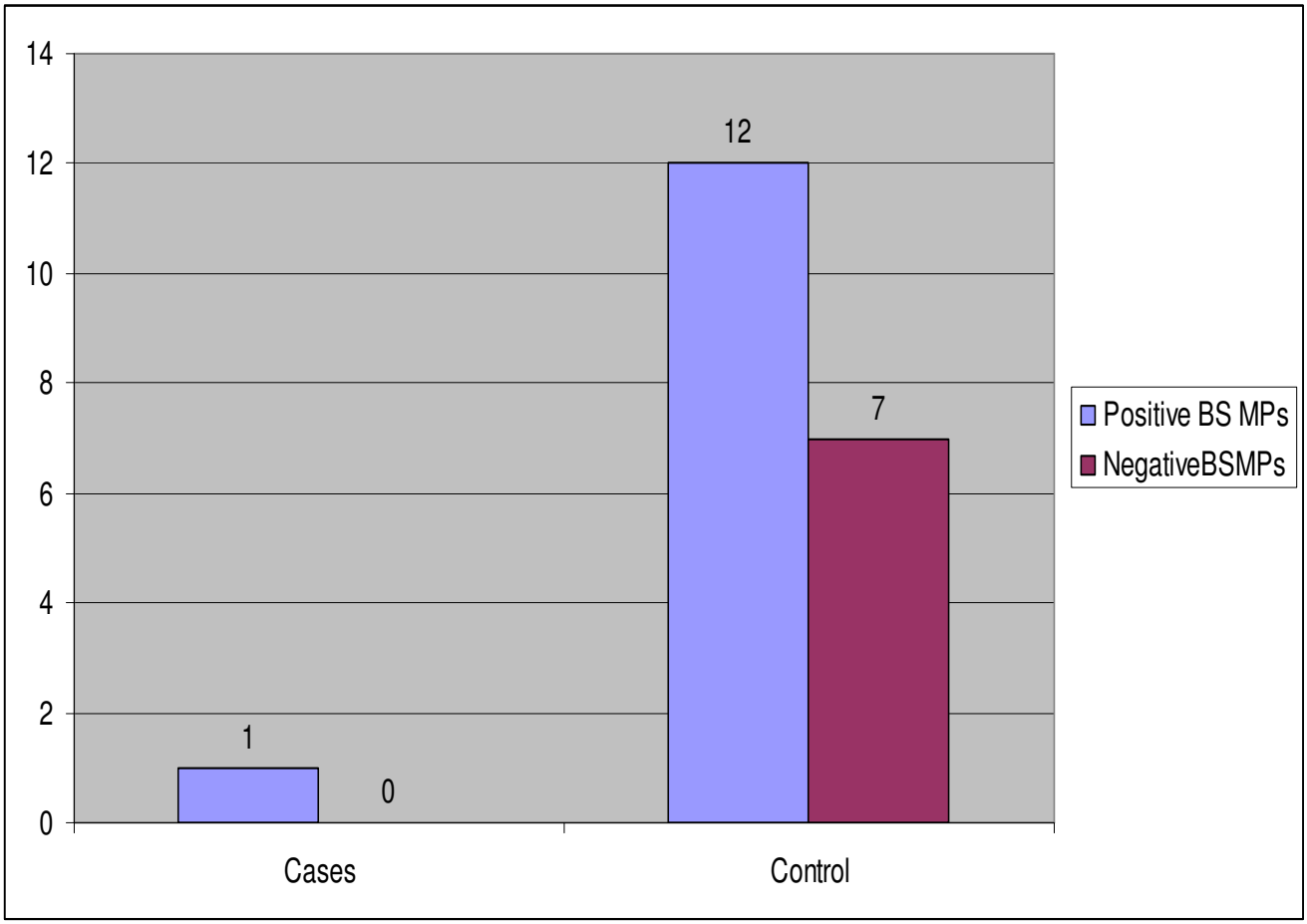


Figure 6 shows the analysis of the association between measures taken when they had malaria during pregnancy and effectiveness of IPT/SP. The statistics show that there was no association between these factors [Fishers p=1.000].

Figure 6. *Relationship between measures taken when they had malaria and effectiveness of IPT/SP.*

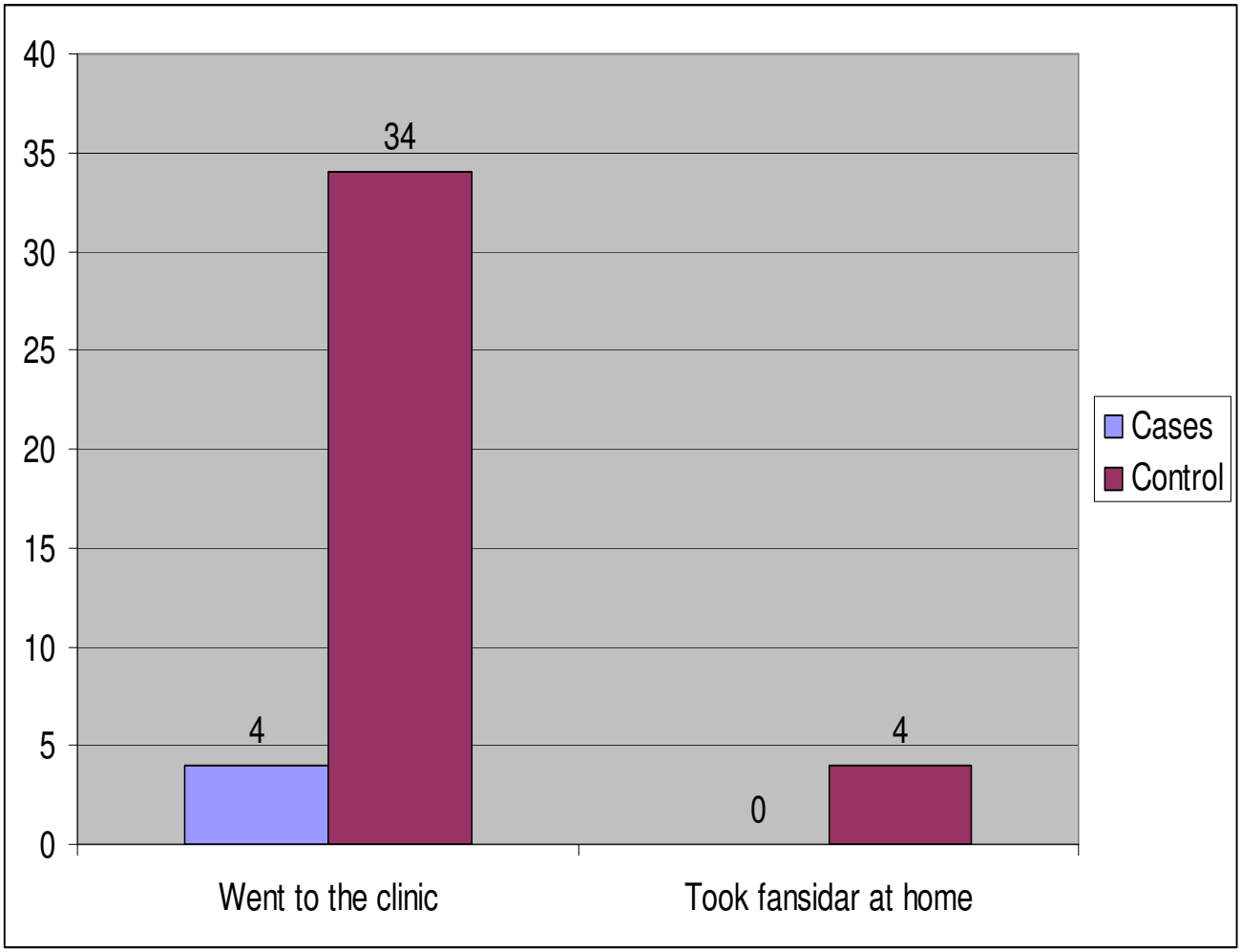


Figure 7 shows reasons for non-compliance with taking dosages by the study groups. Whilst most cases [56.0%] indicated that there was no fansidar during the visits, most controls [49.4%] reported that they started late and missed visits.

Figure 7. Relationship between reasons for non-compliance with taking doses and effectiveness of IPT/SP.

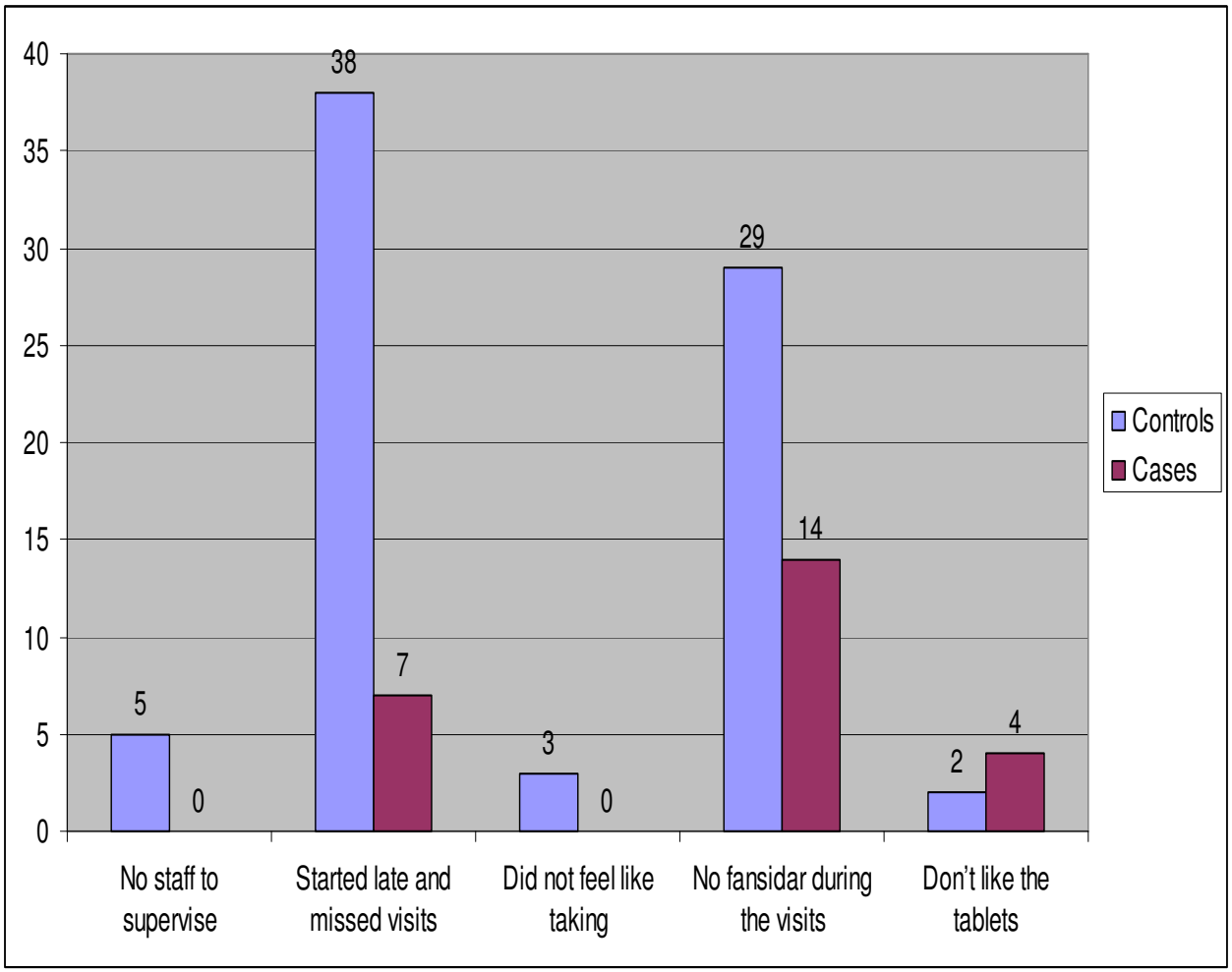


Table 10 shows the analysis of association between timing for Antenatal care and effectiveness of IPT/SP. A significant association was observed between timing for antenatal care and effectiveness of IPT/SP, with more cases [64%] than controls [39.7%] among the respondents who started their Antenatal clinic care at 21 weeks and above, [χ^2= 5.12; p=0.024].

Table 10. Association between timing for antenatal care and effectiveness of IPT/SP

Characteristics	Did not clear [Cases] Total 25 [%]	Cleared [controls] Total 146 [%]	χ^2	P value
Age of pregnancy when started attending ANC				
12 – 20 weeks	9 [36.0]	88 [60.3]	5.12	0.024
21 and above weeks	16 [64.0]	58 [39.7]		
Age of pregnancy when started taking IPT/SP				
12 – 20 weeks	9 [36.0]	85 [58.2]	4.30	0.039
21 and above weeks	16 [64.0]	61 [41.8]		
Number of times visited the antenatal clinic				
1 to 2 times	14 [56.0]	46 [31.5]	5.62	0.018
3 and above times	11 [44.0]	100 [68.5]		

Table 10 further shows a significant association between the timing the respondent started taking the IPT/SP and effectiveness of IPT/SP, with more cases [64%] than controls [41.8%], among respondents who started taking IPT/SP at 21 and above weeks, [χ^2=4.3; p=0.039].

Additionally, in relation to the number of times the respondent visited the antenatal clinic care and effectiveness of IPT/SP, a significant association was observed between frequency of visits and effectiveness of PT/SP with more controls [68.5%] than cases [44%] among respondents who attended antenatal care clinic three and above times [χ^2=5.6; p=0.018].

Table 11 shows the analysis of association between use of ITNs and effectiveness of IPT/SP.

Table 11 Association between use of ITNs by pregnant women and effectiveness of IPT/SP

Characteristics	Did not clear [Cases] Total 25 [%]	Cleared [controls] Total 146 [%]	χ^2	P value
Prevention of malaria in pregnancy by sleeping under ITNs every night				
Yes	21 [84.0]	96 [65.8]	Fisher's	0.102
No	4 [16.0]	50 [34.2]		
IPT/SP prevents consequences of malaria in pregnancy				
Yes	9 [36.0]	67 [45.9]	Fisher's	0.392
No	16 [64.0]	79 [54.1]		
Prevention of consequences of malaria with IPT				
Agree	22 [88.0]	144 [98.6]	8.497	0.004
Disagree	3 [12.0]	2 [1.4]		

Respondents were asked whether consequences of malaria could be prevented by the use of IPT/SP and ITN of which there was a significant association between their responses and the effectiveness of IPT/SP with more controls [98.6%] than cases [88%] among the respondents who agreed [χ^2=8.50; p=0.004].

5.7 PREVENTION OF CONSEQUENCES OF MALARIA WITH IPT

Table 11 further shows no significant association between the respondents' perception about effectiveness of IPT/SP and its effectiveness [p=0.392].

Figure 8 shows the analysis of association between sleeping under ITN every night and effectiveness of IPT/SP. There was no significant association between sleeping under

ITN every night and effectiveness of IPT/SP with more cases [48%] than controls [35.6%] among respondents who reported not sleeping under ITNs every night. There was no significant association [χ^2=1.40; p=0.237].

Figure 8. *Relationship between sleeping under ITN every night and effectiveness of IPT/SP.*

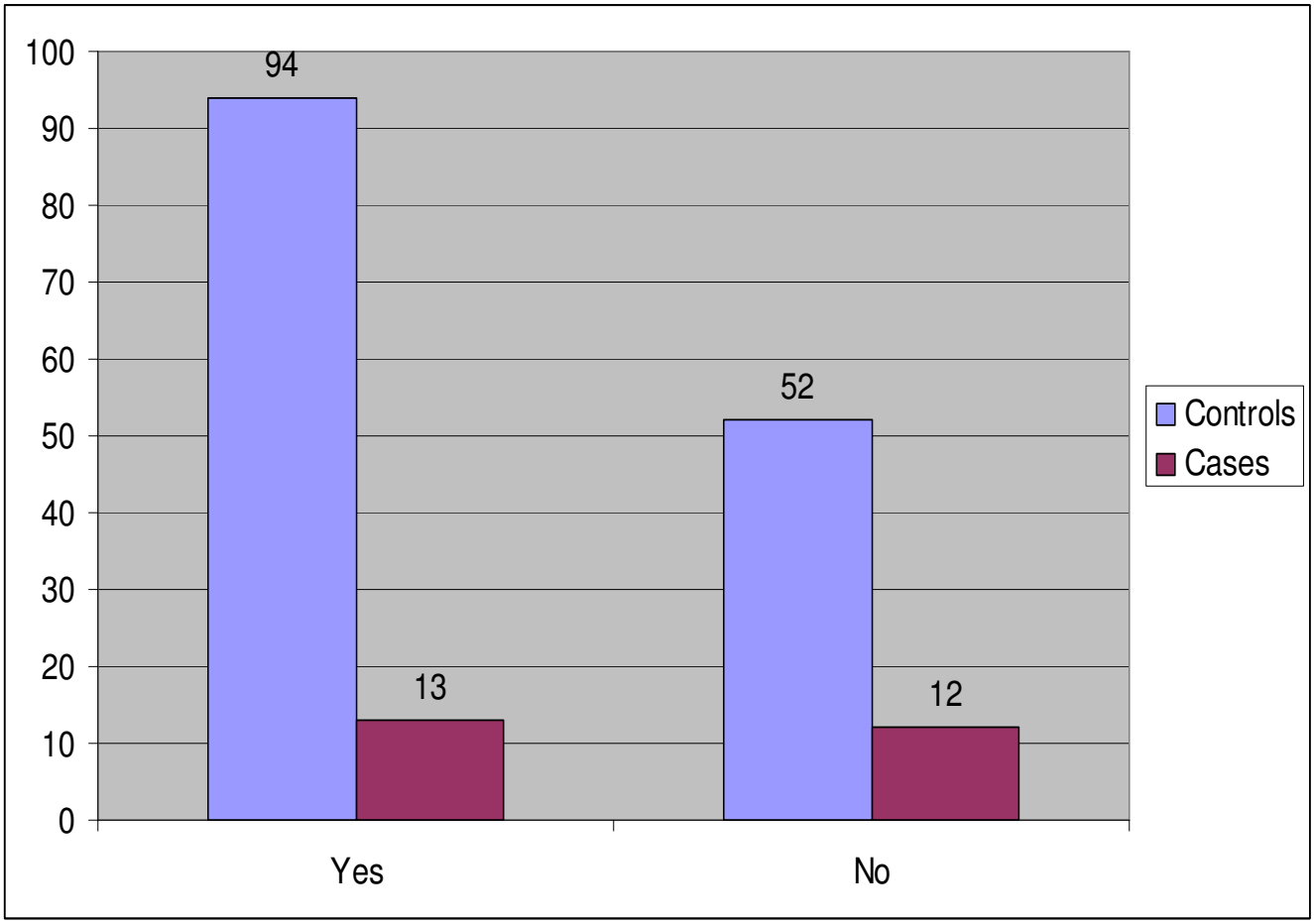


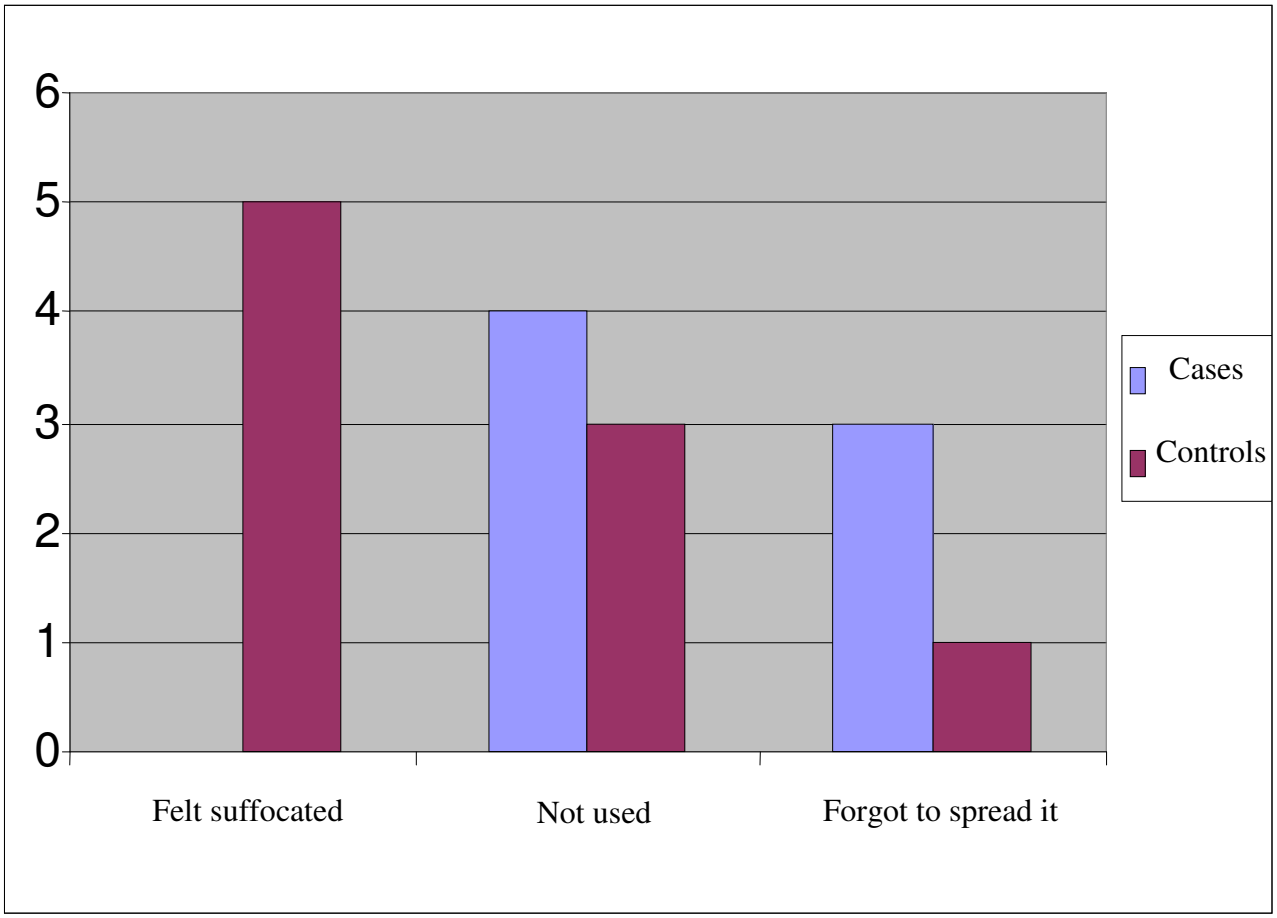
Table 12 shows the analysis of association between sources of ITNs the respondents used and the effectiveness of IPT/SP. There was a significant association observed between sources of ITNs and effectiveness of IPT/SP with more cases [100%] than controls [78.1%] among respondents who bought from the shop [χ^2=4.00; p= 0.046]. The respondents who did not own ITNs were excluded.

Table 12 Association of sources of ITNs and effectiveness of IPT/SP.

Characteristics	Did not clear [Cases] Total 15 [%]	Cleared [controls] Total 64 [%]	χ^2	P value
Source of ITNs				
Bought from shop	15 [100.0]	50 [78.1]	4.00	0.046
Given at the Clinic	0 [0.0]	14 [21.9]		

Figure 9 shows the analysis of association between the reasons for not using ITNs throughout the pregnancy and the effectiveness of IPT/SP. While most controls [5] reported gave the reason of feeling suffocated, most cases [4] did not use the ITNs.

Figure 9. Relationship between reasons for not using ITNs and effectiveness of IPT/SP.



5.8 HIV STATUS AND EFFECTIVENESS OF IPT/SP

Figure 10 shows the analysis of association between VCT and effectiveness of IPT/SP. There was no significant association observed between respondents who went for VCT and effectiveness of IPT/SP [Fishers p=0.148].

Figure 10. Relationship between attendances at VCT and effectiveness of IPT/SP.

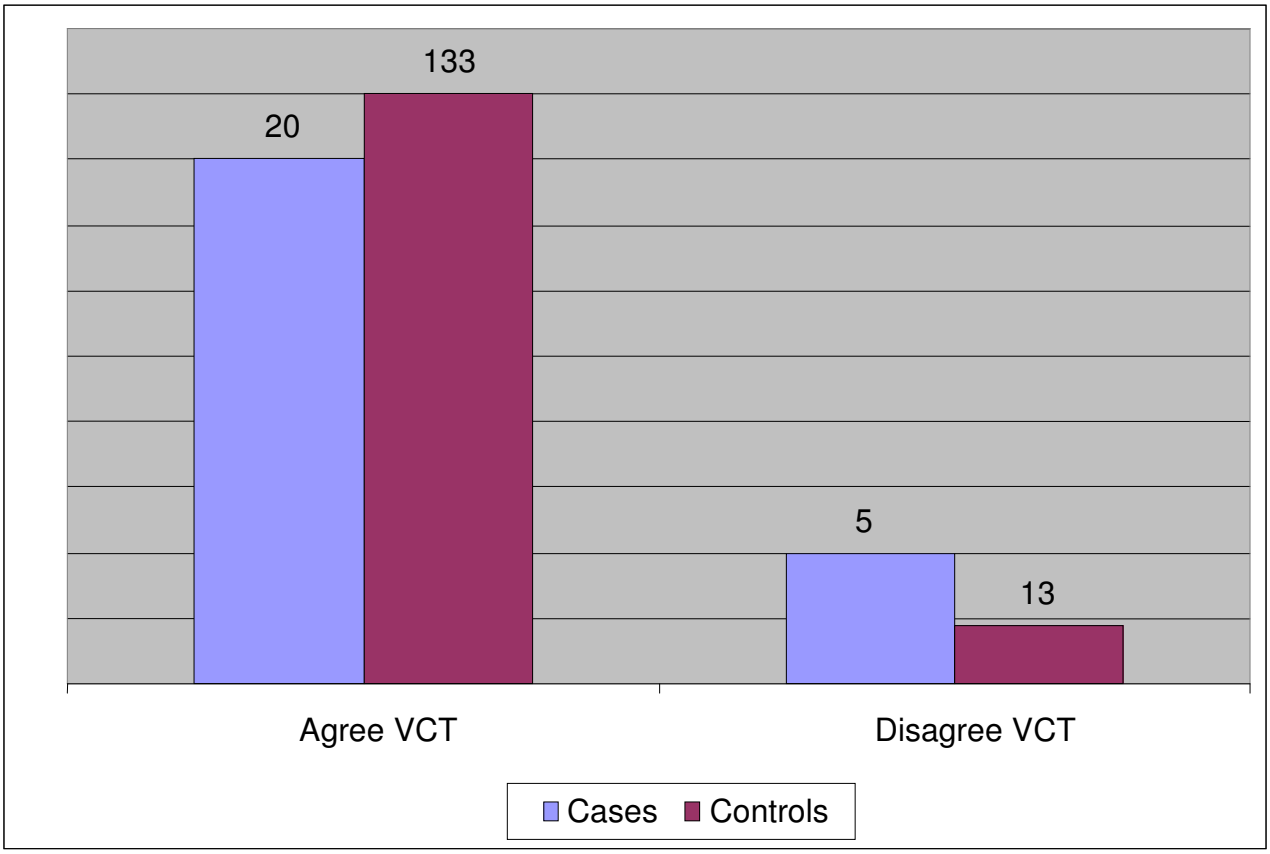


Figure 11 shows analysis of association between HIV status and effectiveness IPT/SP. No significant association was observed between these factors [χ^2=2.92; p=0.087].

Figure 11. Relationship between HIV status and effectiveness of IPT/SP.

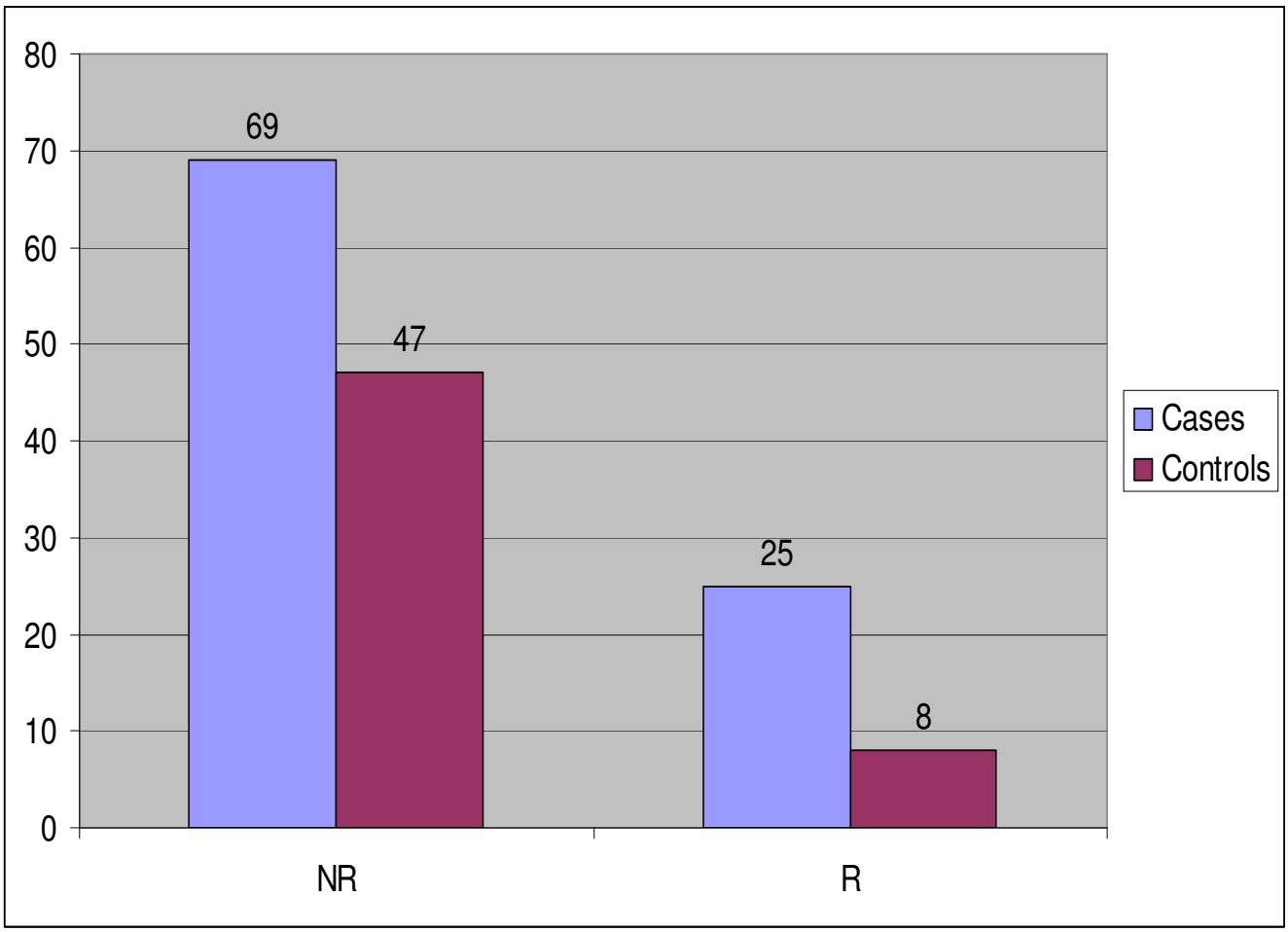


Table 13 shows the association between staffing levels and the effectiveness of IPT/SP. There was some evidence to suggest that a significant association existed between staffing levels and the effectiveness of IPT/SP [p=0.055].

Table 13 Association of staffing levels and effectiveness of IPT/SP

Characteristics	Did not clear [Cases] Total 25 [%]	Cleared [controls] Total 146 [%]	Fisher's
The health provider always gave you IPT by supervision [DOTS]			
Yes	14 [56.0]	109 [74.7]	0.055
No	11 [44.0]	37 [25.3]	

5.10 MULTIVARIATE ANALYSIS

Table 14 shows the multivariate analysis using logistic regression to control for confounding factors that were significant during the bivariate analyses.

Table 14. Results of the multivariate analysis

FACTOR	**OR**	**(95%CI)**
Age of pregnancy when you started ANC		
12 – 20 Weeks	0.51	(0.33,078)
21 and above	1	
HIV Status		
Yes	1.73	(1.02,2.95)
No	1	
The age of pregnancy when you took last dose of IPT/SP		
<36 weeks	4.46	(2.58, 7.71)
>36 weeks	1	

Compared to the age at which the woman started attending ANC (booking) of above 20 weeks, those who started at gestational age of 12-20 weeks were 49% (p=0.002) less likely to be cases.

Compared to the gestational age when the woman had her last dose of IPT of more than 36 weeks, those who had the last dose at less than 36 weeks of gestational period/age were 4.46 (p=0.001) times more likely to be cases.

Compared to HIV negative women, those who were positive were 1.73 (p=0.014) times more likely to be cases.

CHAPTER 6. DISCUSSION OF FINDINGS

6.1 INTRODUCTION

A case control study was conducted on the effectiveness of IPT/SP in clearance of placental malaria parasites in pregnancy in Kafue District. The results were based on the analysis of the responses from 171 postnatal women drawn from 2 Health Centres in the district and these included: Nangongwe and Kafue District Hospital. These health centres were selected using purposive sampling method. These health centres were selected because they offer maternity delivery services

The study population comprised of postnatal women in the third trimester of gestation, between the ages of 15-49 years who had just delivered and had been on IPT/SP during pregnancy. The women were selected using systematic sampling method. Each woman was included in the study after giving an informed written consent as either a case or control on the basis of her placental malaria blood slide result.

Malaria in pregnancy has serious consequences both to the mother and her baby. It leads to abortion, prematurity, low birth weight, foetal death, neonatal death, severe anaemia and maternal death. The current study revealed varied factors which could affect the effectiveness of IPT/SP in clearance of placental malaria parasites in pregnancy, in Kafue District. These include compliance, knowledge that mothers have on the consequences of malaria in pregnancy and timing for antenatal booking.

6.2 STUDY LIMITATIONS

This study could have been done on a large scale, but it was not possible due to limited time and resources. We could not even obtain the required sample sizes.

The estimates in the multivariate logistic regression analysis on the timing and the age of pregnancy at which the last dose was taken were less precise because of the wide confidence interval.

6.3 ASSOCIATION BETWEEN DEMOGRAPHIC CHARACTERISTICS AND EFFECTIVENESS OF IPT/SP IN PREGNANCY

6.3.1 Age and effectiveness of IPT/SP in pregnancy

There was no statistical association between age and effectiveness of IPT/SP in pregnancy [see table 5.1]. The results of the current study contradict the findings in the study by Nnaji *et al*, [2006] which revealed that pregnant women less than 20 years had the highest prevalence rate. It further demonstrated the higher prevalence of malaria parasitaemia in pregnant women of lower parity [primigravidae and secondigravidae]. This could indicate that teenage pregnancy and first pregnancy may influence the effectiveness of IPT/SP in pregnancy .

6.3.2 Marital status and effectiveness of IPT/SP in pregnancy

There was no association between marital status and the effectiveness of IPT/SP in pregnancy. This implies that marital status is not a risk factor for the effectiveness of IPT/SP in pregnancy. This finding contradicts that of Mbonye *et al* [2006] who reported that a high percentage of cases could imply husband's lack of interest in malaria prevention.

6.4 ASSOCIATION BETWEEN KNOWLEDGE LEVEL ABOUT MALARIA AND EFFECTIVENESS OF IPT/SP IN PREGNANCY

Knowledge is power, antenatal women who are educated on malaria and its deleterious effects in pregnancy would enhance preventive measures of malaria in pregnancy. The present study reveals a statistically significant association between knowledge level and effectiveness of IPT/SP in pregnancy, with more controls [78.6%] than cases [59.0%) being knowledgeable about the cause of malaria. This could mean that women who were knowledgeable were more likely to practice preventive measures than those without. The study further shows that more controls [73.9%] than cases [48.0%] were knowledgeable about the signs of malaria. These findings on knowledge could imply that little or no knowledge is a risk factor to the effectiveness of IPT/SP in pregnancy. These findings are in conformity with the studies by Valerie and others [2007] which

show knowledge levels about malaria to be associated with effectiveness of IPT/SP in pregnancy.

6.5 ASSOCIATION BETWEEN OBSTETRIC CHARACTERISTICS AND EFFECTIVENESS OF IPT/SP IN PREGNANCY

6.5.1 Gravidae and effectiveness of IPT/SP in pregnancy

The current study reveals no significant association between gravidae and effectiveness of IPT/SP in pregnancy. This finding contradicts the results in the study done by Nnaji *et al*, [2006] which show parity to be associated with malarial parasitaemia in pregnancy. This means that exposure to child bearing processes would put the women at risk of malarial parasitaemia in pregnancy.

6.5.2 Timing for antenatal/booking and effectiveness of IPT/SP in pregnancy

The current study also revealed a significant association between late booking for antenatal services and effectiveness of IPT/SP. Timely antenatal clinic attendance is a key to delivering the prevention package to pregnant women. The majority (56.7%) booked for antenatal services during the second trimester (21 and above weeks), with more cases (64.0%) than controls (39.7%). The bivariate analysis in this study revealed a statistically significant association between timing and effectiveness of IPT/SP in pregnancy, with more cases (64.0%) than controls (39.7%) who booked at 21 and above weeks of pregnancy. Furthermore, the multivariate logistic regression analysis showed that timing for antenatal of a woman was an independent determinant of the effectiveness of IPT/SP in pregnancy. The respondents who booked late were more likely to have un-cleared placental malaria parasites in pregnancy than those who booked early. This implies that the late timing for antenatal of a woman puts her at high risk of sequestration of malaria parasites in the placenta and long-standing placental malaria in pregnancy.

6.5.3 Number of times a woman visited antenatal care clinic and effectiveness of IPT/SP in pregnancy

The visits schedule of Antenatal care promotes the IPT/SP intervention Programme since a woman with no problems during pregnancy is expected to make four visits. The

first visit at less than 16 weeks, second, at 20-24weeks, third, at 28-32 weeks and the fourth being at 36 weeks of pregnancy, respectively. A significant association was observed between the times the woman visited ANC and Effectiveness of IPT/SP in pregnancy with more controls [68%] than cases [44.0% among respondents who visited the clinic three times or more. This means that antenatal timing is related to the effectiveness of IPT/SP in pregnancy.

6.6 ASSOCIATION BETWEEN COMPLIANCE WITH PREVENTIVE INTERVENTIONS AND EFFECTIVENESS OF IPT/SP IN PREGNANCY

Ministry of Health, through the Focused Antenatal Care and Roll Back Malaria recommends that all pregnant women without exception must be given three treatment doses of SP at least four months after the LMP [during her second and third trimester] with at least a period of four weeks in between [IPT], This is in conjunction with other various incorporated antenatal services interventions put forward to prevent malaria in pregnancy. These include: Information Education and Communication (IEC) on prevention of malaria in pregnancy; and use of ITNs, CBoH [2002].

6.6.1 Age of pregnancy when a woman started taking IPT/SP and effectiveness of IPT/SP in pregnancy

A statistically significant association was observed in bivariate analysis between the age of pregnancy when a woman started taking IPT/SP and effectiveness of IPT/SP in Pregnancy, with more controls (58.2%) than cases (36.0%) among the respondents who started taking IPT/SP at the gestational age of 12-20 weeks. Those who started at 21 and above had more cases [64.0%] compared to the controls [41.8%]. This could imply that, the earlier the woman starts taking IPT/SP in her second trimester the more chances she had to complete the three scheduled doses and be more likely to have placental malaria parasites cleared at delivery time.

6.6.2 Age of pregnancy when last dose was taken and effectiveness of IPT/SP in pregnancy

In this study the results revealed that the majority [62.6%] of the participants took the last dose after 36 weeks compared to those who took the last dose before 36 weeks of

gestation [37.4%], bivariate analysis shows a statistically significant association between gestational age and effectiveness of IPT/SP with more cases [68.0%] than controls [32.0%] among those who took the last dose before 36 weeks. This suggests that there could be re-infection by the time of delivery for those who completed before 36 weeks of gestation. This emphasizes the need for the fourth visit at 36 weeks to receive the last, third dose of IPT/SP.

6.6.3 Number of doses of IPT/SP taken by the respondent by the end of pregnancy and effectiveness of IPT/SP

The results showed a statistically significant association between the numbers of doses taken by the respondents, with more cases [100%] than controls [52.7%] among the respondents who took less than 3 doses. The findings were in conformity with those in the study by Schultz and others, [1994] which revealed that two doses of SP may have little effect on maternal parasitaemia at delivery. Furthermore, the findings by Kayentao *et al* [2005] revealed that in seasonal transmission settings more than 2 doses may be required to prevent placental re-infection. Nonetheless, this was not significant on the multivariate logistic regression analysis.

6.6.4 Reasons for non-compliance with IPT/SP and effectiveness of IPT/SP

The majority of the controls [49.4%] reported that starting late and missing ANC visits were the reasons for non compliance to taking SP. Meanwhile, most cases [56.0%] indicated that non availability of fansidar during visits was the reason for non compliance. The results of the current study are inline with the study by Donath [2007], whose findings revealed that about a third of the mothers did not receive SP for IPT because of unavailability and that among those who received; about a third did not swallow the tablet at the clinic because of empty stomach and sharing of water cups. Furthermore, a study by Helitzer-Allen et al, [1993] revealed that a woman's attitude towards a drug will affect compliance, and that, before advocating for an increase in the frequency of SP dosing during pregnancy, the acceptability and side effects of such a regimen need to be evaluated.

6.7 ASSOCIATION OF USE OF ITNS AND EFFECTIVENESS OF IPT/SP IN PREGNANCY

There was no significant association observed in bivariate analysis between the respondents who reported using ITNs through out pregnancy and effectiveness of IPT/SP in pregnancy. Those who did not use ITNs gave various reasons for doing so. The findings are inconsistent with those in the studies done by Carol and others, [2007] where ITNs were associated with the effectiveness of IPT/SP in pregnancy.

6.8 ASSOCIATION OF STAFFING LEVELS AND EFFECTIVENESS OF IPT/SP IN PREGNANCY

There was some evidence in the current study to suggest that there was a significant association between staffing levels and effectiveness of IPT/SP in pregnancy. This implies that staffing levels may improve supervision and ensure administration of IPT/SP by DOTS.

6.9 ASSOCIATION BETWEEN HIV INFECTION AND EFFECTIVENESS OF IPT/SP IN PREGNANCY

The negative interactions between malaria and HIV infections are most apparent in pregnant women. HIV infection is therefore an added challenge to the control of malaria in pregnancy [Van den Broek, et al. 1998]. There were more cases [26.6%] than controls [14.5%] among the respondents who were reactive. This conforms to the Study by Slutsker [2007] which revealed that HIV-infected pregnant women are more likely than non-infected pregnant women to acquire malaria. Additionally, the study by Brabin [1997] revealed that the effectiveness of two doses of SP in reducing parasitaemia at delivery was limited, especially in HIV infected women who showed increased risk of placental and peripheral parasitaemia.

6.10 CONCLUSION

The current study revealed varied factors that are associated with the effectiveness of IPT/SP in pregnancy in Kafue District. These include booking/timing for ANC, HIV status and age of pregnancy when last dose of fansidar was taken. These factors should

be considered in designing interventions to improve the effectiveness of IPT/SP in clearing placental malaria.

6.11 RECOMMENDATIONS

We make recommendations based on the results of the multivariate analysis.

1. Late booking for late for ANC was associated with effectiveness of IPT/SP, with IPT/SP being less effective in clearing placental malaria among women who book late for ANC. Reproductive health care providers should sensitize and motivate mothers on the benefits of early ANC attendance. The policy makers in conjunction with reproductive health care providers should make a deliberate policy to involve male partners also in the ANC teaching sessions [childbirth preparations] so that they can know about IPT/SP and encourage their spouses to go for ANC to get this benefit.

2. All pregnant women must be tested for HIV so that those who are positive are put on treatment. Not only will this improve the effectiveness of IPT/SP in clearing placental malaria but also it would lower the rate of HIV transmission from mother to child.

3. IPT/SP was less effective in clearing placental malaria when participants took the last dose of IPT/SP when their age of pregnancy was less than 36 weeks. Pregnant women should be encouraged to take IPT/SP even in late pregnancy without them fearing that it will affect their unborn child.

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APPENDICES

APPENDIX A: QUESTIONAIRE

UNIVERSITY OF ZAMBIA
SCHOOL OF MEDICINE
DEPARTMENT OF COMMUNITY MEDICINE

STRUCTURED QUESTIONNAIRE FOR POST NATAL MOTHERS
ON THE EFFECTIVENESS OF IPT IN PREGNANCY ON
PLACENTAL MALARIA PARASITE CLEARANCE

STRUCTURED INTERVIEW SCHEDULE

DATE: _____

HEALTH CENTRE: _____

QUESTIONNAIRE ID NO: _____

INSTRUCTIONS TO THE INTERVIEWER:

1. Do not write the name of the respondent on the questionnaire.
2. Information given will be considered confidential.
3. Indicate the answer to the question by circling (1) the responses provided and write the responses to open-ended questions in the space provided.
4. Please ask all questions as indicated.
5. * Indicates: Take Note
6. LANGUAGE/TRIBE CODES

ENGLISH	0	1
BEMBA	0	2
NYANJA	0	3
KAONDE	0	4
LUNDA	0	5
LUVALE	0	6
TONGA	0	7
LOZI	0	8
OTHER	0	9
DK: DON'T KNOW	9	8

The information you give is highly confidential

SECTION A: DEMOGRAPHIC DATA				
NO	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP TO**	**FOR OFFICIAL USE ONLY**
1.	Record Time	Hours ….. [ ][ ] Minutes .. [ ][ ]		
2.	Where do you live?	Kafue Town/Estates [1] Village ……. [2] Farm …… [3] Other …… [4] Specify		
3.	How long have you been living continuously in (name of current place of residence) If less than a month record '00'	Months [1] Always [2] Visitor [3]	→ 05	
4.	Just before you moved here, did you live in a city, in town, village or at a farm?	City …….. [1] Town …… [2] Village ……. [3] Farm ……. [4]		
5.	In what month and year where you born?	Month [ ][ ] Dk Month 9 8 Year [ ][ ] Dk Year 9 8		
6.	How old were you at your last birthday? *Compare and correct 05 and/or 06 if inconsistent	Age Completed in Years [ ][ ]		
7.	What is your marital status?	Single …… [1] Married …… [2]		
8.	Have you ever attended School?	Yes……. [1] No …….. [2]	→ 14	

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO	FOR OFFICIAL USE ONLY
9.	What is the highest level of School you attended: Primary, Secondary, or higher?	Primary …… 1 Secondary ……. 2 Higher …….. 3		
10.	How many years did you complete at that level? Comments_____	Years ……		
11.	Check 09 ☐ Primary ☐ Secondary Or Higher →		13	
12.	Can you read and understand A letter or newspaper, easily, With difficult, or not at all?	Easily …… 1 With Difficulty ……. 2 Not At All ……. 3		
13.	Do you usually read a newspaper or magazine at least once a week?	Yes ……. 1 No …….. 2		
14.	Do you usually watch television at least once a week?	Yes …… 1 No ……. 2		
15.	Do you usually listen to the radio at least once a week?	Yes …….. 1 No …… 2		
16.	What religion are you?	Catholic …… 1 Protestant ……. 2 Moslem ……. 3 Other ……. 4 (Specify)		
17.	What tribe do you belong to?	……..		
18.	What is your occupation?	Eemployed ……. 1 Self-Employed ……. 2 House-Wife/ 3 Unemplyed …….. 3 Student ……. 4		

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP TO	FOR OFFICIAL USE ONLY
19.	What number of pregnancy was this one?	One ……. 1 Two …… 2 Three …… 3 four and above…..….. 4		
20.	At what age of the pregnancy did you start attending Antenatal clinic?	WEEKS 12 - 16 …… 1 17 - 20 …… 2 21 and above …… 3		
21.	Now I would like to ask about the household in which you usually live. What is the source of water your household uses for hand washing and dishwashing?	Piped water into home or plot 1 Well water in yard or plot …. 2 River / stream …….. 3 Other …… 4 (Specify)		
22.	Does your household get water from this same source?	Yes ……. 1 No …… 2	→ 24	
23.	What is the source of drinking water for members of your household?	Piped water into home or plot 1 Well water in plot or yard …….. 2 River or stream …… 3 Other ……. 4 specify		
NO	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP TO**	**FOR OFFICIAL USE ONLY**
24.	What kind of toilet facility does your household have?	flush toilet …… 1 Traditional pit latrine ... 2 Ventilated pit latrine … 3 None - use bush or field 4 Other …….. 5 Specify		
25.	Does your household have: electricity? A radio? A television? A fridge? Circle all answers	Yes No Electricity ….. 1 2 Radio ……. 1 2 Television …. 1 2 Fridge …… 1 2		
26.	How many rooms in your household are used for sleeping?	Rooms		
27.	Does any member of your	Yes No		

	household own: a bicycle? A motorcycle? A car?	Bicycle 1 2 Motorcycle 1 2 Car 1 2		
SECTION B: EXISTING KNOWLEDGE ON THE CONSEQUENCES OF MALARIA IN PREGNANCY				
28.	What causes malaria? *Circle all answers mentioned or answered.	Female anopheles mosquito…….. 1 Mosquito…….. 2 Being soaked by rain… 3 Eating immature sugar cane…….. 4 Other: ……... 5 specify		
29.	How would you tell that a person is suffering from malaria in pregnancy? *Circle all answers mentioned/ answered.	Generalised body aches 1 Headache ……. 2 Fever …… 3 Vomitting …… 4 No signs ……... 5 Other …… 6 Specify		
30.	Did you have malaria during pregnancy?	Yes …….. 1 No …… 2 → 35		
NO	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP TO**	**FOR OFFICIAL USE ONLY**
31.	What measures did you take? Went to the clinic? Did nothing? Took home remedy? Other measures taken?	Went to the clinic …… 1 Did nothing ……. 2 → 35 Took Fansidar home … 3 Other measures …… 4 → 35 Specify		
32.	Did they take your blood slide?	Yes …….. 1 No …… 2 → 34		
33.	What was the result?	Positive malaria parasites……. 1 Negative malaria parasites……. 2		

34.	What treatment were you given at the clinic?	Fansidar SP ……... 1 Chloroquine ……... 2 Coartem …… 3 Panadol ……. 4 Nothing ……. 5 Don't know the drug 6		
35.	What would malaria in pregnancy cause?	Abortion …….. 1 Premature birth ……. 2 Retarded foetal growth …….. 3 Maternal anaemia …. 4 Stillbirth …… 5 Maternal death ……. 6 DK …… 7 Other ……. 8 Specify		
36.	How do you prevent malaria in pregnancy? *Circle all answers mentioned/ answered.	Taking IPT/Fansidar 1 Sleeping under ITN every night …… 2 Protective clothing during biting hours… 3 Keeping the surroundings clean ... 4 Other: …… 5 Specify		
37.	During antenatal visit were you given information about ITN during pregnancy?	Yes …… 1 No ……. 2 →	39	
NO	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP TO**	**FOR OFFICIAL USE ONLY**
38.	What information were you given about ITNs? To sleep under every Night To sleep under throughout pregnancy To have them retreated * Circle all answers mentioned/ answered.	To be used together with IPT…… 1 That they will kill the vector mosquito…… 2 To sleep under every night……. 3 To sleep under throughout pregnancy 4 To have them retreated…… 5 That they will kill vermin…….. 6 Other: specify		

39.	Do you own an ITN?	Yes …… 1 No ……. 2 → 43		
40.	How did you purchase it?	Bought it from a shop 1 Given at antenatal clinic .. 2 Other ……. 3 Specify		
41.	Did you use it throughout this pregnancy?	Yes 1 → 43 No 2		
42.	Why did you not use it throughout pregnancy? * Circle all answers mentioned/answered	Feel suffocated 1 Cannot afford 2 Not used to nets 3 Forget to spread it 4 Other: …….. 5 (Specify)		
SECTION C: COMPLIANCE TO IPT				
NO	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP TO**	**FOR OFFICIAL USE ONLY**
43.	What were you counseled about IPT at antenatal clinic? * Circle all answers mentioned/answered.	It prevents consequences of malaria in pregnancy 1 One should take 3 doses of Fansidar ….. 2 The first dose should be taken in second trimester ….. 3 There should 4 weeks between each dose. 4 It should not be taken in the first trimester. 5		
44.	At what age of pregnancy did you start getting the IPT dosages? * Confirm with the antenatal record.	Weeks 12 – 16…… 1 17 – 20…… 2 21 and above… 3		

45.	How many IPT dosages did you take?	Took one dosage….. 1 Took two dosages… 2 Took three dosages… 3 → 48 Took more than three 4 → 47		
46.	Why were you not able to complete the 3 IPT dosages?	No staff to supervise… 1 Started late and missed visits……. 2 Did feel like taking any more Fansidar ……. 3 No Fansidar during some visits ……... 4 Don't like the tablets 5 Other: ……... 6 Specify		
NO	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP TO**	**FOR OFFICIAL USE ONLY**
47.	Why did you take more than three dosages?	Was told so …….. 1 Did not know…… 2 Had malaria…….. 3 Other: ……... 4 Specify		
48.	Where the health providers always there to give you by supervision (DOTS)?	Yes……. 1 No…….. 2 Sometimes……. 3		
49.	Do you believe IPT can prevent consequences of malaria in pregnancy?	Strongly agree ……. 1 Agree …… 2 Strongly disagree…... 3 Disagree …… 4 DK: ……... 5		
50.	At what age of pregnancy did you take the last dose of IPT?	<36 weeks ……. 1 >36 weeks ……. 2		
51.	How many times did you attend ANC visits?	Times 1…….. 1 Times 2……. 2 Times 3……. 3 Times 4 and more…. 4		

52.	Did you attend VCT at any one of these visits? *Check ANC Card and enter results below.	Yes……. No……..	1 2		
53.	What was the birth weight of your live baby? *Confirm with Birth Record.	<2500gm ……. >2500gm …….	1 2		

D. LAB RESULTS.
*Circle appropriate results

1. HIV

Refer to Question 52 on the Questionnaire.	NR	1
	R	2

2. PLACENTAL MALARIA BLOOD SLIDE RESULTS

	NEGATIVE	1
	POSITIVE	2

ANY COMMENTS ABOUT THE INTERVIEW?

……

……

……

……

……

……

THANK YOU FOR YOUR CO-OPERATION AND PARTICIPATION!

APPENDIX B. CHECKLIST: RECORDS REVIEW AND LABORATORY RESULTS

A. RECORDS REVIEW

1. Review of antenatal records for the number of IPT dosages
2. Review of antenatal records for HIV test results
3. Review of antenatal records for frequency of visits

B. LABORATORY RESULTS

1. Placental blood slides for malaria parasites

APPENDIX C. INFORMATION SHEET: PARTICIPANT

INTRODUCTION

This form gives you information on the study in which you are being requested to participate. To make sure that you have all the facts about this study you must read or have someone read it for you. If you agree to participate in this study, you must sign the Consent Form or put your thumbprint into the space provided, if you cannot write. You will be allowed to keep a copy of this form and to discuss anything that is not clear to you concerning this study. You are free not to participate in it and your refusal will in no way jeopardize the care you will receive from the health centres.

PURPOSE OF THE RESEARCH AND PROCEDURES

Mrs. Namunji G. Kambole-Kakonkanya of the Department of Community Medicine, School of Medicine, University of Zambia, is carrying out this study. This is done in partial fulfillment of the requirements of the Masters of Public Health degree, which will be submitted to the School of Medicine, Department of Community Medicine, University of Zambia. If you have any queries, please direct them to Mrs. Namunji G. Kambole-Kakonkanya Woodlands Post Office, Private Bag 107 Woodlands, Lusaka Cell 097 476098 / 097809722 or to the Head of the Department of Community Medicine, P. O. Box 50110, Lusaka, Tel: 252641 or to the Chairman, Research Ethics Committee of the University of Zambia.

You are being requested to take part in a study that seeks to determine the effectiveness of IPT in clearing of placental malaria parasites in pregnancy. Malaria is a parasitic infection, which is preventable and curable. IPT is intended to clear placental malaria parasites by delivery time. Malaria is a major public health problem in the tropical and sub-tropical regions, which affects women in the reproductive age and requires regular reviews of the preventive and treatment measures in order to ensure the effectiveness of these measures. Malaria in pregnancy has numerous consequences, which include maternal death, low birth weight, abortion and low productivity of women. Control is related to many factors such as compliance to IPT regime, staffing levels, adequate resources, early booking for antenatal visits and willingness of women to participate in the preventive measures against malaria.

The Ministry of Health and Central Board of Health have put in place IPT, but malaria is still a problem among pregnant women in our communities. Recognizing that malaria is a serious problem and has adverse effects on the mother and her baby, the researcher desires to establish the effectiveness of IPT and identify any factors that may hinder the effectiveness of IPT among pregnant women. The study is intended to provide information that can be used to develop and or cause appropriate intervention measures.

This study will involve face-to-face interviews with the staff that will ask you a set of questions using a structured questionnaire about factors that may lead to failure of IPT and consequently have malaria. You will be asked questions about IPT you have taken, whether the staffing level was adequate to supervise you while taking it, how to protect yourself from malaria, what you know about the consequences of malaria in pregnancy. After signing the consent form, the staff will proceed to ask you relevant questions and the interview will be completed in one day. We will also be checking in your antenatal records for the dosage of IPT received and the HIV results after the VCT and your placenta will be analyzed for placental MPs .

RISKS, DISCOMFORTS AND BENEFITS OF THE STUDY

There is no risk associated with being a participant in this study. However, you will be requested to give us a placental blood slide for malaria parasites, so as to check if the IPT cleared the placental malaria parasites. This will be done after you have delivered. As a participant, you will benefit by gaining more knowledge on the benefits of preventing malaria in pregnancy. By complying to IPT pregnancy, you will abate the effects caused by malaria. If you are found with malaria parasites, the research staff will ensure that you are referred to appropriate people for treatment.

CONFIDENTIALITY

The information you will give in this study will remain confidential and will not be made available to anyone who is not connected with the study. Furthermore, your name will not be written on the questionnaire for confidentiality purposes.

Note: The above section should be given to the participant.

APPENDIX D. CONSENT FORM

By signing below I confirm that I understand participation in this study and that it is entirely voluntary. The materials in this consent have been answered to my satisfaction; I freely and voluntarily choose to participate. I understand that participation or not will not affect my health care or that of my family members.

I understand that my rights and privacy will be maintained.

I hereby give my consent to participate in study evaluation of the effectiveness of IPT in the clearance of placental malaria parasites in pregnant women ion Kafue District.

_____	_____
Signature (Thumbprint) of Participant	Date
_____	_____
Name of participant (Block Letters)	Date
_____	_____
Witness (Name and Signature	Date

THE UNIVERSITY OF ZAMBIA SCHOOL OF MEDICINE DEPARTMENT OF COMMUNITY MEDICINE

Telephone: 252641,
Fax: + 260-1-250753,

P.O. BOX 50110,
Lusaka, Zambia.

11th June 2006

The District Director
Kafue District Management Team
KAFUE

Dear Sir/Madam

RE: REQUEST FOR PERMISSION FOR MPH STUDENT TO COLLECT INFORMATION FOR DISSERTATION.

We are writing to kindly request for permission for Ms. Gertrude N K Kakonkanya who is currently studying for her Masters in Public Health (MPH) to collect information (including data) in your institution. The collected information (and data) would serve the purpose of dissertation on:

.:. Topic:
"Effectiveness of intermittent preventive Treatment of full course of sulfadoxine pyrimelthamine in clearance of placental malaria prasites in pregnancy in Kafue District".

We appreciate your support to our MPH programme and the student.

Yours Faithfully,

DEPT OF COMMUNITY MEDICINE
SCHOOL OF MEDICINE
UNIVERSITY OF ZAMBIA
P.O. BOX 50110, LUSAKA

Thomas Glover-Akpey
MPH COORDINATOR