The Determinants of Usage of Intermittent Preventive Therapy and Insecticide-treated Bed nets in Pregnancy in Juba, Southern Sudan

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

This thesis is dedicated to my wife, Mary Pita Justin, for the loneliness she felt while I was away, and to my parents, for all those years they had to bear to make me what I am today. To my siblings, for the many years of suffering they had to bear, but managed to come through it all. Finally this dedication goes to Late Beatrice Baye Abe, for her unforgettable surprise. To God be the glory.

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LIST OF ABBREVIATIONS AND ACRONYMS

ANC	Antenatal care
ASU-AQ	Artesunate-Amodiaquine
ASU-SP	Artesunate-Sulfadoxine Pyrimethamine
ATM	Arthemether
CDC	Centres for Disease Control and Prevention
CI	Confidence Interval
COR	Crude Odds Ratio
CPA	Comprehensive Peace Agreement
GOSS	Government of Southern Sudan
HIV	Human immunodeficiency virus
IPT	Intermittent preventive treatment
ITN	Insecticide-treated nets
IUGR	Intra-uterine growth retardation
JTH	Juba Teaching Hospital

LBW	Low birth weight
MOH	Ministry of Health
NMP	National Malaria Protocol
OR	Odds Ratio
Q	Quinine
SP	Sulfadoxine-Pyrimethamine
UN/OCHA	United Nations Office for Coordination of Humanitarian Affairs
UNICEF	United Nations Children's Fund
WHO	World Health Organization

ABSTRACT

Southern Sudan lies in areas of high malaria transmission where pregnant women are at a greater risk of malaria infection, especially from the most severe form caused by *Plasmodium falciparum,* which can cause maternal or foetal complications. The disease is a leading cause of maternal mortality. According to WHO recommendations, the Ministry of Health (MOH) of the Government of Southern Sudan has adopted the treatment of clinical malaria, use of insecticide treated nets (ITN's) and intermittent presumptive therapy (IPT) to reduce the burden of malaria in pregnancy. To date there is no dearth on ITN and IPT use in pregnancy in Southern Sudan. This study sought to determine the adherence of pregnant women using ITNs and IPT and factors that affect their use in Juba Teaching Hospital. A facility-based cross-sectional study was conducted in Juba Teaching Hospital in 2009. The study participants were recruited from women in their second or third trimesters who came for ANC services and those women in the post delivery period. Using a semi-structured questionnaire, 334 study participants were enrolled by systematic random sampling technique. The data was analyzed using *Epi info* version 3.5.1(2008). The overall IPT usage among the participants was 61%, and ITN usage was 87%. Participants who made three or more ANC visits were four times more likely to use IPT than those who made fewer visits (p=<0.05), while those who used indoor residual spraying were two times more likely to use IPT (p=0.01). The study participants who bought ITNs

were five hundred and four times more likely to use ITNs (p=<0.05), while those who use indoor residual spraying were sixteen times more likely to use ITN (p=<0.03). A household income of $90 or below hindered the use of IPT and ITN in pregnancy. Giving of free or subsidized ITNs, encouraging frequent ANC visits and use of indoor residual spraying can improve the coverage of IPT and ITN use in pregnancy. Finally, a community-based study needs to be done to provide further information on the use of IPT and ITN in pregnancy.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Malaria is a parasitic infection that affects millions of people worldwide with more than a million deaths annually (Greenwood, *et al.*, 2005). In most of the areas with a steady transmission of malaria such as sub-Saharan Africa, studies observed that most of the infections during pregnancy which are due to *Plasmodium falciparum* go unnoticed, undiagnosed and, therefore, untreated (Desowitz, *et al*, 1992; Shulman, 1999). Numerous efforts have been geared at eradicating the disease; however, malaria continues to haunt many of the tropical countries. Worst of all, the parasite is becoming resistant to most antimalarial drugs, and the vector has shown resistance to insecticides (White, 1996).

More than 247 million malaria cases were reported in 2006, resulting in the death of more than a million people, mainly children under five years. Of all the attacks of malaria in the world, Africa accounts for 90% of the malaria burden, with children and pregnant women more vulnerable to the infection and its complications, especially by *P. falciparum* (WHO, 2002).

It is estimated that it costs a typical African family about 25% of their income to prevent and control malaria, while the African countries lose $12 billion annually to malaria, thus affecting economic development (WHO, 2000).

1.1.1 Malaria Parasites

Humans are affected by four main species namely *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium ovale*, and *Plasmodium malariae*. The most common and the most virulent malaria parasite found in Africa is *P. falciparum* which causes the most severe form of the disease, and has the highest death rates (White, 1996).

1.1.2 Malaria in Sudan

Malaria is the leading cause of morbidity and mortality in Sudan. Symptomatic malaria accounts for 20–40% of outpatient clinic visits and approximately 30% of hospital admissions (WHO, 2007). Each year more than 1.2 million women become pregnant, of those 750,000 are in areas with high malaria transmission: intense perennial, high seasonal transmission or in areas of irrigation. Figure 1.1 shows the areas of Sudan affected by malaria (WHO, 2005).

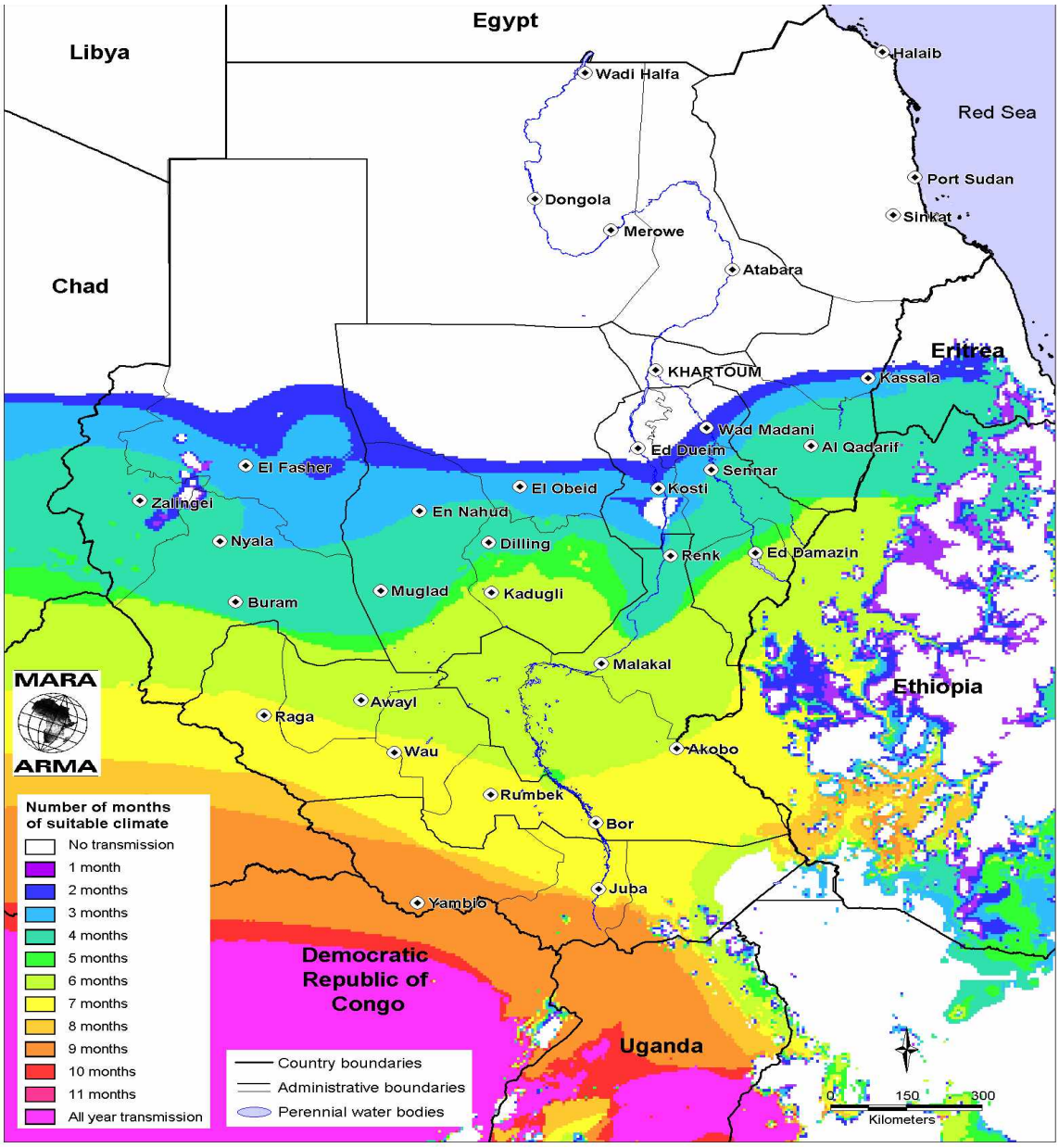

Figure 1.1: Duration of Malaria Transmission Season in Sudan (Source: WHO, 2005)

The recently ended war left the southern part of the country in administrative, economic, political and social decay. In this state of complex emergency, malaria, the leading health problem in Sudan is inadequately controlled (WHO, 2000). It is estimated that in the southern part of Sudan, 24–36% of the population are affected by malaria (United Nations Office for Coordination of Humanitarian Affairs, UN/OCHA, 2002).

1.1.3 Malaria in Pregnancy

In Africa, about 25 million women become pregnant each year in areas of high malaria transmission, with *P. falciparum* the predominant malaria species (WHO, 2005; Steketee, *et al.*, 2001). The pregnant women are more at risk of developing clinical malaria infections and complications than the non-pregnant women of the same age (Fievet, *et al.*, 2002).

In sub-Saharan Africa, malaria infection in pregnancy results in high morbidity and mortality in pregnant women and their unborn children. Severe attacks of malaria in pregnant women with low immunity, especially in areas with low transmission of *P. falciparum*, can cause anaemia, intra-uterine growth retardation (IUGR), and low birth weight (LBW) (Lines, *et al.*, 1987), stillbirths, abortion or maternal death (Luxemburger, *et al*., 1997).

In sub-Saharan Africa, *P. falciparum* infections are more common in pregnant women than in non-pregnant women. A number of factors influence the prevalence of malaria

in pregnant women, including maternal age, gravidity, use of prophylaxis, nutrition, host genetics, level of antiparasite immunity, as well as parasite genetics and transmission rates. Studies that have been done have also indicated that malaria in pregnancy affects women in their first or second pregnancies more than the women with multiple pregnancies (O'Neil-Dunnel, *et al.*, 2001).

Most epidemiologic studies conducted in malaria-endemic countries have found that primigravidae are more susceptible to malaria than multigravidae (Rogerson, *et al.*, 2000). Therefore, pregnant women must acquire a form of pregnancy-associated immunity during their first pregnancies that will protect them during subsequent pregnancies (McGregor, 1983; Brabin, 1983; Fried, *et al.*, 1998). Young women of child-bearing age may also be more susceptible than older women to malaria because they are still in the process of acquiring natural immunity to malaria. The relative importance of pregnancy associated and age- dependent immunity may differ among pregnant women living in different environments (Shi, *et al.*, 1996; Oeuvray, et *al.*, 2000; Johnson, *et al.*, 2004).

Women in their first pregnancies are at highest risk for developing malaria in pregnancy, and the morbidity patterns that follow it. The risks decrease with increasing number of pregnancies in the same woman. In areas of very high transmission, studies done in the eighties and nineties have shown that malaria hardly causes mortality in pregnant

women who live in these areas. However, they have higher parasitaemia levels compared with women of similar age group who are not pregnant. The level of parasitaemia decreases with increasing number of pregnancies but is highest in the second trimester for any one pregnancy (WHO, 2000).

1.1.4 Diagnosis of Malaria in Pregnancy

All the four malaria species have common presentations that usually manifest one to two weeks following exposure. Most adult patients present with headache, myalgia, arthralgia, abdominal pain, fatigue and fever, while children present with irritability, lethargy and anorexia (Krogstad, 1995).

Peripheral malaria parasitaemia detected by microscopy in pregnant women does not always provide an accurate estimation of the prevalence of placental malaria parasitaemia. In one study, detection of peripheral parasitaemia by microscopy failed to identify one-fifth of women with placental malaria infections. Thus, previous assessments of malaria in pregnancy have used blood films made from blood from the maternal side of the placenta to determine whether placental malaria infection is present (Brabin, 1991).

1.1.5 Treatment of Malaria in Pregnancy

Treatment of all clinical episodes is the most readily-available means to limit the impact of malaria on pregnancy and it has been recommended that pregnant women with clinical malarial illness should receive prompt treatment with effective and safe antimalarial drugs (Nosten, *et al.*, 1991; WHO, 1986).

The current antimalarial treatment policy for malaria in Sudan advocates the use of Artesunate-Sulphadoxine combination (ASU+SP) in the North, and Artesunate-Amodiaquine combination (ASU+AQ) in the South for *Falciparum* malaria. For treatment failure, Artemether-Lumefantrine (ATM-LUM) is used in the north while the south uses Quinine (Q) or Artemether injections (ATM). In pregnancy SP is used for IPT while treatment is with Q or ASU-SP from 13 weeks onwards (WHO, 2007).

1.1.6 Complications of Malaria in Pregnancy

Pregnant women with low or no pre-existing immunity are more susceptible to episodes of cerebral malaria, pulmonary oedema, hypoglycaemia, severe haemolytic anaemia and very high perinatal foetal loss of about 60-70% (Shulman, *et al*., 2003, McGregor, *et al.*, 1983, Brabin, 1983, Nosten, *et al*., 1991). Infections with malaria during pregnancy can cause maternal anaemia, low birth weight, and even preterm delivery (Greenwood, *et al*., 1989; Brabin, 1991a; D'Alessandro, *et al*., 1996; Menendez, *et al*., 2000). The complications of malaria are shown in Figure 1.2.

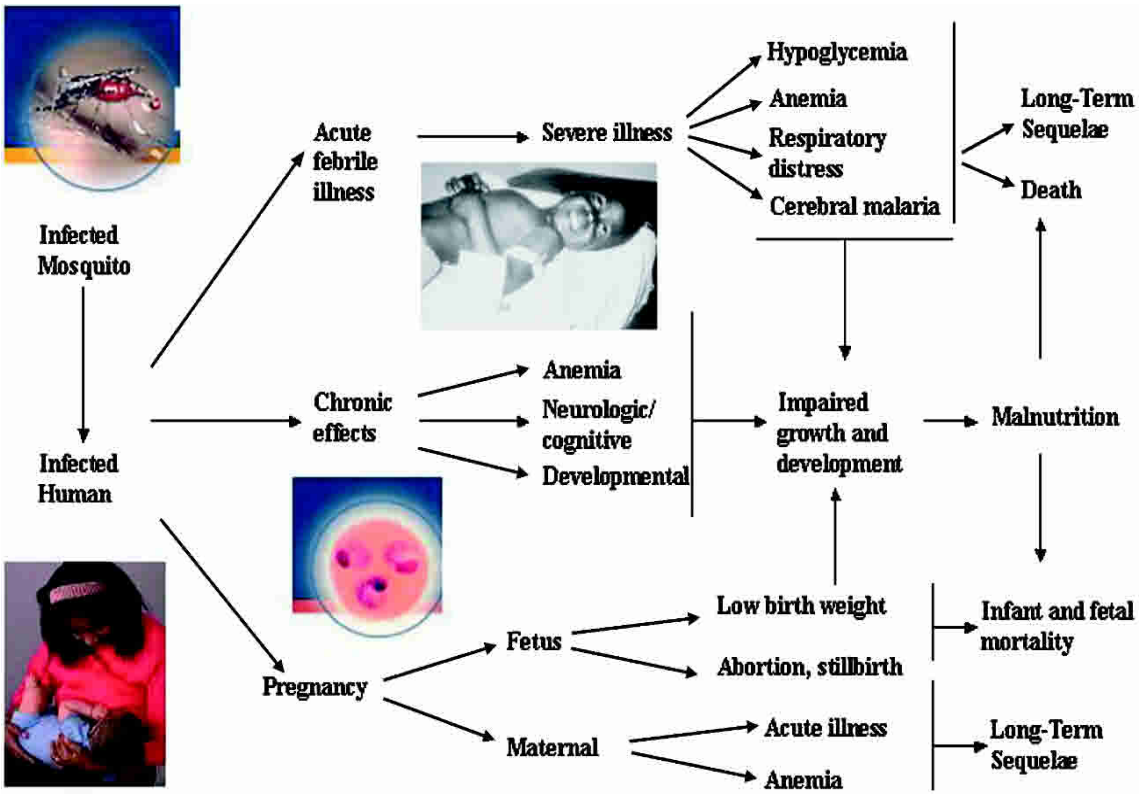

Figure 1.2: Acute, chronic, and pregnancy-related manifestations of malaria (Breman, 2001).

1.1.7 Roll Back Malaria

In April 2000, the Roll Back Malaria adopted the Abuja Declaration which stressed the commitment to improve access to effective prevention and treatment of malaria to 60% of pregnant women by 2005. The Abuja Declaration stipulates that the correct, affordable and appropriate treatment within 24 hours of the onset of symptoms; protective measures such

as insecticide-treated nets (ITNs) and; chemoprophylaxis or intermittent preventive treatment (IPT) for pregnant women (WHO, 2008).

1.1.8 The Position of the World Health Organization on Malaria

Malaria is a global public health problem which has resulted more than 500 cases of febrile illness and 1 million deaths each year (Bremen, 2001). The global distribution of malaria is indicated in Figure 1.3. Most of the cases are from sub-Saharan Africa which accounts for more than 90% of deaths related to malaria, especially in children under five years (Greenwood, *et al*).

In 2008, 45 out of the 109 malaria-endemic countries were from the African region (WHO, 2008). The treatment of the disease varies from place to place depending on the disease severity, the age, immunity, reaction to the antimalarials and the cost (WHO, 2004).

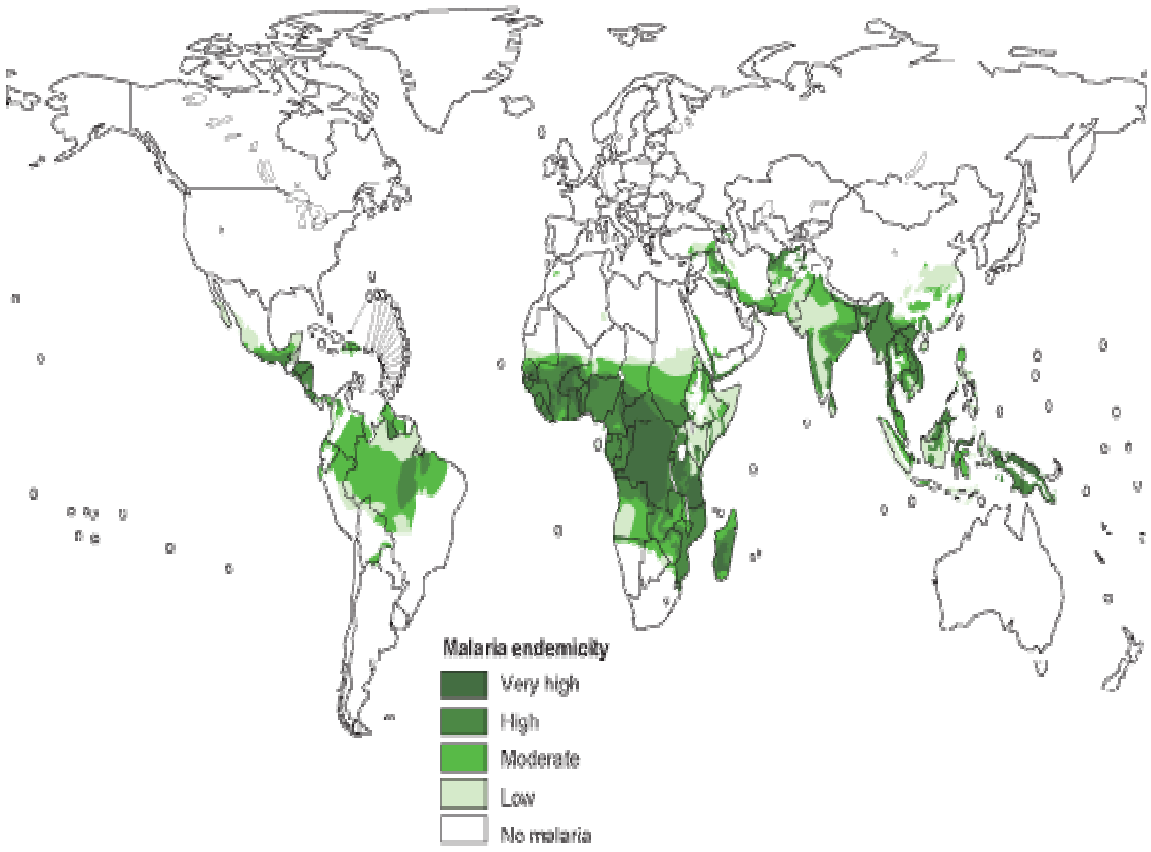

Figure 1.3: Global distribution of malaria in 2003. (World Health Organization)

The WHO recommends a three pronged approach to malaria control in pregnancy. The approach entails the use of ITN, IPT, and case management (Lengeler, 2004). The use of ITN's throughout pregnancy, especially in the first pregnancies has been found to improve the outcomes of pregnancy (Gamble, *et al.*, 2007). For IPT, the WHO recommends the giving of at least two doses of Sulfadoxine-pyrimethamine (SP) during pregnancy in all pregnant women at risk of P. *falciparum* infection in areas of stable

malaria transmission (in the first and second ANC visit) after the first noted movement of the fetus or “quickening"(WHO, 2007).

Though most of the African countries have adopted the policy of IPT, only a few sub-Saharan African countries have reached the Roll Back Malaria target that stipulates that by 2010, 80% of all pregnant women in high stable areas should receive IPT (Hill, *et al*., 2006, Crawley, *et al*., 2007).

Studies conducted in East Africa on IPT use in pregnancy have shown that IPT was able to reduce rates of placental malaria, low birth weight, and maternal anaemia (Praise, *et al.*, 1998; Verhoeff, *et al.*, 1998; Shulman, *et al.,* 1999).

1.2 Statement of the Problem

Studies indicate that about 75,000−200,000 infants die each year due to malaria infection during pregnancy (Steketee, *et al.*, 2001). About 50 million pregnant women are exposed to malaria episodes annually, putting both mother and foetus at risk of malaria complications (Lindsay *et al.*, 2000; Steketee, *et al.*, 2001). Malaria infections are very high in the first and second pregnancies, and lower in the subsequent pregnancies (Brabin 1991b and Steketee, 1996b). In sub-Saharan Africa which has high

parasitaemia rates in pregnancy, the WHO recommended intermittent presumptive treatment (IPT) and other prevention methods (WHO, 1986).

In areas of high malaria transmission such as Southern Sudan, pregnant women and young children are at high risk. The effects of malaria in pregnancy can be maternal anaemia or death, miscarriage, stillbirth, low birth weight or even neonatal death (WHO 2006). Malaria causes many maternal and infant deaths in malaria-endemic areas because pregnant women are not given the proper prevention and treatment (WHO, 2008).

Southern Sudan is suitable for malaria transmission almost throughout the year. Studies conducted in 2002 found that between 24–36% of the population of Southern Sudan was infected with malaria (United Nations Office for the Coordination of Humanitarian Affairs, 2002).

In line with the WHO recommendations for prevention of malaria in pregnancy, the Ministry of Health (MOH) of the Government of Southern Sudan (GOSS) has adopted the treatment of clinical malaria, use of ITN's and IPT to reduce the burden of malaria in pregnancy, with at least two doses of SP for pregnant women (Malaria Strategic Plan, 2006). There is no documented study on the coverage of IPT and ITN use in pregnancy in Southern Sudan. Since malaria and its complications/sequelae can be prevented in

pregnancy by ITN and IPT, it is therefore important to enhance malaria control measures among this vulnerable group.

1.3 Justification of the study

Malaria is the leading cause of morbidity and mortality in Sudan, causing between 7.5 to 10 million cases and 35,000 deaths every year in Sudan (The National Malaria Protocol, June 2004). The disease has also been implicated in the cause of maternal anaemia, low birth weight infants, and is a leading cause of maternal mortality (Adam, *et al.*, 2005, Dafallah, *et al.*, 2003 and Taha, *et al.*, 1993).

In Juba Teaching Hospital, more than 17,000 cases of malaria were reported from July to November 2008 with 364 cases (2.1%) reported in the Obstetrics and Gynaecology wards (unpublished hospital records). The situation of Southern Sudan is unique in that it has just emerged from war and no study has been done in Juba on the determinants of use of IPT and ITN in pregnancy. Since the ANC sees about 250 women a week, and a similar number of deliveries per week, the need to enhance the malaria control measures among the most vulnerable group becomes important. This study sought to determine the usage of ITN and IPT in pregnant women attending Antenatal Care (ANC) at the hospital.

The results of this study will also be used to guide or review policies that will target improved ITN usage among this vulnerable group. In addition, the findings of the study will try to assess the progress of meeting the Abuja Declaration targets and the extent of implementation of malaria control policy in Southern Sudan.

1.4 Null Hypothesis

There are no factors associated with use of IPT or ITN use in women during pregnancy or after delivery in Juba Teaching Hospital.

1.5 Objectives of the study

1.5.1 General Objectives

To assess the determinants of usage of IPT and ITN among pregnant women attending ANC and the maternity ward in Juba Teaching Hospital.

1.5.2 Specific Objectives

1. To assess adherence to IPT and ITN usage among pregnant women attending the antenatal clinic and the maternity ward at Juba Teaching Hospital.
2. To identify factors associated with IPT and ITN use in pregnancy among women attending the antenatal clinic and the maternity ward at Juba Teaching Hospital.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Global Distribution of Malaria

The WHO estimates that annually there are about 300 to 500 million people worldwide infected with malaria with mortality between 1.5 to 3.5 million. Most of the deaths were among women and young children, mainly in sub-Saharan Africa, which accounts for 80 – 90% of the cases of malaria in the world (Guyatt, *et al.*, 2002). Among these about 19–24 million women are at risk of being infected with malaria or suffer from the severe complications of malaria during pregnancy (2, *et al.*, 2001; Steketee, *et al.*, 1996a).

2.2 Prevention and Control of Malaria in Pregnancy

Policies for malaria prevention and control during pregnancy in areas of stable transmission should emphasize a package of IPT and use of ITN and ensure effective case management of illness and anaemia. ITN and prompt effective case management are recommended for all pregnant women living in malaria endemic areas (WHO, 2004).

2.3 Intermittent Preventive Treatment (IPT)

The World Health Organization has recommended the use of IPT in pregnancy after studies conducted in East and South-east Africa showed the beneficial effects of IPT on

prevalence of maternal anaemia and low birth weight (Praise, *et al*., 1998; Shulman, *et al.*, 1999; Newman, *et al*., 2006). The use of IPT with SP for malaria in pregnancy in high malaria transmission areas have indicated an increase in haemoglobin levels of the mother and her baby (Parise *et al*., 1998; Verhoeff *et al*., 1998; Shulman *et al*., 1999; Rogerson *et al.*, 2000b, van Eijk *et al.*, 2004).

IPT is administered during pregnancy, by giving at least two doses of SP tablets at predetermined intervals, beginning after quickening in the second trimester. The drug action was by clearing the malaria parasites from the placenta during the period of rapid foetal growth (WHO, 2004).

The WHO recommends that women in areas of high transmission in Africa receive IPT with an effective antimalarial drug at regularly scheduled antenatal clinic visits after ‘‘quickening’’, i.e., when the pregnant woman feels foetal movement for the first time (WHO, 2002). Several studies have reported on the safety and efficacy of IPT with SP for preventing malaria during pregnancy (Parise, *et al.*, 1998; Shulman, *et al*., 1999).

2.4 Insecticide-Treated Nets (ITN)

In 2006, almost all African countries had adopted the policy of providing pregnant women and children, mosquito nets for free (WHO, 2008). The risk of a malaria infection in pregnancy and the likelihood of developing maternal anaemia and low birth

weight can be reduced by sleeping under insecticide–treated bed nets (Hawley, *et al*., 2003). Studies in sub-Saharan Africa have shown that the use of ITNs have reduced child mortality by 20%, thus saving six children per 1000 under five per year (Lengeler, 2004). ITNs have also been found to reduce the episodes of malaria by about 50% (Lengeler, 2004). Out of the 34 malaria-endemic countries in Africa that had submitted recent national data, Eritrea was the only country that had achieved ITN coverage of more than 60% among children aged less than 5 years (WHO, UNICEF, 2007).

ITNs have been found to protect individuals from malaria by killing or repelling the mosquitoes. (Fanello *et al*., 2003; Lindsay *et al*., 1989, 1991, 1992; Miller *et al*., 1991; Pleass *et al*., 1993). ITNs prevent malaria as well as minimizing the risk of exposure to the vector in unprotected people by reducing the mosquito density (Carnevale *et al*., 1988; Curtis *et al*., 2006; Robert and Carnevale, 1991), their frequency of feeding (Charlwood *et al*., 2001), and their survival (Carnevale *et al*., 1988; Curtis *et al*., 2006; 1991; Robert and Carnevale, 1991).

ITNs have also been found to be protective against insects like lice, fleas, and bedbugs (WHO, 2002), as well as on preventing other diseases like leishmaniasis (Desjeux, 2004). ITN should be provided as early in pregnancy as possible to all pregnant women living in malaria-endemic areas, including epidemic and disaster situations, according to the perceived need in the locality. Their use should be encouraged for women

throughout pregnancy and postpartum. Nets can be provided in the antenatal clinic or through other sources in the private and public sectors (WHO, 2007).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Study Site

Juba, the largest town in Southern Sudan is the regional capital of Southern Sudan and the capital of Central Equatoria State (Figure 3.1). It has a population estimated at more than 750,000, and is located on the banks of the River Nile. Twenty-one year civil war has left most health and sanitation structures in disrepair.

With the signing of the Comprehensive Peace Agreement (CPA) in January 2005, the town has seen an increase in the population as well as improvement in the infrastructure. With the improvement in the road network connecting Juba to the other towns in the south and the neighbouring countries, there has been a steady influx of people into Juba. This has led to a population boom and overstretching of the few facilities.

The town has four hospitals: Juba Teaching Hospital, Military Hospital, El Sabbah Children's Hospital, Police Hospital, and the SPLA Hospital. Of these, Juba Teaching Hospital is the oldest and the busiest. More than seventy-five percent of the patients go to Juba Teaching Hospital for their health services.

Juba Teaching Hospital was a British Military Garrison headquarters until 1928 when it became Juba Civil Hospital. After the signing of the Addis Ababa Agreement in 1972, the University of Juba was established and opened in 1978. That was when the hospital earned its present name Juba Teaching Hospital (JTH).

The hospital has a bed capacity of 600. The hospital has all the four major departments of Medicine, Surgery, Obstetrics and Gynaecology and Paediatrics. There are also departments of Ophthalmology, in addition to Chest, Dermatology, and Psychiatric, and a Tropical Diseases Unit.

The Obstetrics and Gynaecology Unit has four consultants, five medical officers and several interns. There are several trained midwives, clinical officers, and nurses working in the unit. The unit has ANC services and attends to more than 50 patients per day.

Figure 3.1: Map of Africa showing Sudan and Juba (Source: *www.wikimedia.org*, *www.iteams.ca*. Cited on 8/7/2010)

3.2 Study Population

The study population was enrolled from the pregnant women attending antenatal care services in Juba Teaching Hospital in their second and third trimesters and women in the maternity ward in the immediate period after delivery.

3.2.1 Inclusion criteria

Any consenting pregnant women in the second or third trimester attending ANC at JTH or any consenting women in the immediate period following delivery were included in the study.

3.2.2 Exclusion criteria

Any woman not fitting the above criteria or not consenting to participate in the study will were not enrolled.

3.3 Study Design

The study was a hospital-based cross-sectional study. Data collection was conducted between September and December 2009.

3.4 Sample size and sampling procedure

The Cochran formula, $\mathbf{z^2 x\ p\ (1\text{-}p)/d^2}$ (Cochran, 1963) was used for sample size determination and the sample size was based on the following assumptions: the proportion of pregnant women using IPT **(p)** of **32%** (Brabin, *et al*., 2008), a confidence interval (**z)** of **95%,** degree of freedom **(d) of 5%,** the sample size (**n**) of **334** was calculated thus:

Sample size = 1.96^2 x 0.32 x 0.68/0.05^2 = 334

The participants were selected by systematic sampling technique. 167 pregnant women were recruited at the point of leaving the ANC clinic, and 167 women were recruited from the maternity ward (before being discharged from the hospital following delivery).

Every sixth study participant was selected and recruited into the study if she agreed to take part. In case of refusal the next one was enrolled.

3.5 Data Collection

Two people were trained to sample eligible participants in the hospital and to collect data using semi-structured questionnaires. Informed consent was obtained from the study participants before administration of the questionnaire and data was collected from the study participants on socio-demographics and socio-economic status of the study participants, reproductive history, services at the ANC clinic, and knowledge about malaria prevention.

3.6 Data Management and Analysis

Data quality was done by assessing the completeness and consistency of the filled questionnaires. The data was coded and entered into the computer and analysis was done using *Epi Info version 3.5.1*. Statistical software (CDC, Atlanta, USA, 2008). Double data entry was done during the study period to minimize errors by identifying inconsistently entered data file and cleaned prior to analysis. Access to the computer was restricted. A descriptive statistical analysis was done for the socio-demographic variables by calculating proportions based on the usage of IPT and ITN. The overall proportion of IPT and ITN usage was calculated for the enrolled study participants along selected socio-demographic characteristics at 95% confidence interval (CI).

Bivariate analysis for factors associated with IPT and ITN was performed, and the measure of association was Odds Ratio (OR). The cross multiplication method was used to calculate the OR using a "2 by 2" table for separate exposure groups. An odds ratio (OR) of < "1" was taken to be protective while an odds ratio of > "1" was taken as a risk factor. An odds ratio of "1" indicated that there was no difference between the study group with the outcome variable under study.

Chi square test was used for categorical variables (nominal data) at 95% CI and alpha level of significance set at 0.05. A P-value $\leq$ 0.05 was considered statistically significant association, while above 0.05 was considered not significant statistically association within the selected factors. Confidence interval (CI) was used to assess the variability of the odds ratio. A confidence interval which included 1 was interpreted to be not significant. Factors associated with IPT were analyzed separately from those associated with ITN.

Factors that were significant during bivariate analysis ($P \leq 0.05$) were taken to the unconditional logistic regression where a backward stepwise elimination method was used to obtain the final model. During the backward stepwise methods all the significant factors were entered in the model and the regression run. The factor with the highest P-value was removed before the model was run again. This was repeated until only factors that were significant at ($P \leq 0.05$) were retained in the model which was the final "best" model.

3.7 Ethical Considerations

The study was well explained to the participants. Informed consent was obtained from them, and they were informed of their voluntary participation and were free to withdraw from the study at any time. Ethical approval was sought from and granted by the Ethical Review Board of GoSS Ministry of Health (Appendix 3).

The confidentiality of the information collected in the questionnaires from the study participants was guaranteed by using identification codes and the completed questionnaires and the collected information was stored in the computer which was protected by a password and only accessible to the investigator and supervisors.

CHAPTER FOUR

4.0 RESULTS

4.1 Usage of Intermittent Preventive Therapy and Insecticide Treated Bed-nets in Pregnancy in Juba Teaching Hospital, Juba, Southern Sudan

This study enrolled a total of 334 study participants. These consisted of 167 from the ANC clinic and 167 from the maternity ward. The average age was 24 years (SD±5.4) and the median age was 23 years (range 14-42). The majority of the participants were within the 18-31 age group. The demographic characteristics assessed were age, occupation, educational level, household monthly income and religion. The overall proportion of IPT use was 61% while that of ITN use was 87%. The demographic characteristics on the use of IPT and ITN in pregnancy in Juba Teaching Hospital are outlined in Table 4.1 below.

Table 4.1: Usage of IPT and ITN in Pregnancy in Juba, Southern Sudan

Socio demographic Characteristics	Total study participants	IPT users (n)	IPT usage (%)	ITN Users (n)	ITN usage (%)
Age-group in years					
Unknown	4	2	50	4	100
<18	49	32	65	41	84
18-24	147	87	59	131	89
25-31	101	58	57	89	88
32-38	29	21	**72**	27	**93**
>39	4	4	100	4	100
Occupation					
Formal employment	37	28	**76**	34	**92**
Unemployed	248	152	61	219	88
Informal employment	24	09	38	21	88
Student	24	14	58	21	88
Others	1	1	100	1	100
Education level of participant					
Informal	90	47	52	74	82
Primary	106	60	57	95	**90**
Secondary	115	83	**72**	106	**92**
College/University	23	14	61	21	**91**
Education level of participant's spouse					
Informal	57	30	53	47	83
Primary	48	26	54	44	**92**
Secondary	169	106	63	151	**89**
College/University	60	42	**70**	54	**90**
Monthly household income					
≤$90	139	74	53	113	81
$370-$400	186	123	66	174	94
>400	9	7	**78**	9	**100**
Religion					
Christianity	264	163	62	228	86
Muslim	65	40	62	64	99
Traditional	5	1	20	4	80

4.2 Bivariate analysis of factors associated with usage of IPT in pregnancy in Juba Teaching Hospital, Juba, Southern Sudan

Bivariate analysis of factors associated with IPT use revealed six factors to be statistically significant at $p \leq 0.05$. These included buying ITN, attending three or more ANC clinics, monthly household income of ≤$90 and use of indoor spraying as a method of preventing mosquito bites. Lack of formal education of study participant and starting ANC above six months gestation were determinant factors (Table 4.2). The table below shows Crude Odds Ratios (COR), 95% confidence intervals (CI) of COR and significance of risk factors that may be responsible for the use or non use of IPT among pregnant women in the study. Those participants who bought ITN were more likely to use IPT. This finding was statistically significant (P=0.05). The study also found that those participants who attended three or more ANC were 2.5 times more likely to use IPT, and this was statistically significant (P<0.05). Similarly the study found that participants with a monthly household income below $90 were less likely to use IPT in pregnancy. This was statistically significant (P=0.017). The study revealed that the participants who use of IRS were 2.53 times more likely to use IPT, and this finding was also statistically significant (P<0.05). This study found out that those participants with no formal education were unlikely to use IPT. This was statistically significant (P=0.059). Participants who started attending ANC above six months were less likely to use IPT, and this was statistically significant (P=0.02).

Table 4.2: Bivariate Analysis of factors significantly associated with usage of IPT use in Pregnancy in Juba, Southern Sudan

	IPT Use					
	Yes(n=204)	**No(n=130)**	**TOTAL**			
Characteristics	**n (%)**	**n (%)**	**n (%)**	**COR ***	**95%CI**	**P-value**
Bought ITN						
Yes	184(90)	102 (79)	286 (86)	**2.5**	**1.35-4.70**	**0.005**
No	20 (10)	28 (22)	48 (14)			
ANC visit 3 or above						
Yes	141 (69)	45 (35)	186 (56)	**4.22**	**2.65-6.75**	**<0.005**
No	63 (31)	85 (65)	148 (44)			
House hold income ≤$90						
Yes	74 (36)	65 (50)	139 (42)	**0.6**	**0.36-0.89**	**0.017**
No	130 (64)	65 (50)	195 (58)			
Use of indoor spraying						
Yes	67 (33)	21 (16)	88 (26)	**2.53**	**1.45-4.40**	**<0.005**
No	137 (67)	109 (84)	246 (74)			
No formal education of participant						
Yes	47(23)	43 (33)	90 (27)	**0.6**	**0.37-0.99**	**0.059**
No	157 (77)	87 (67)	244 (73)			
ANC above 6 months						
Yes	38 (19)	37 (28)	75 (23)	**0.6**	**0.34-0.97**	**0.049**
No	166 (81)	93 (72)	259 (77)			

* COR Crude Odds Ratio

Some factors turned not to be significantly associated with the use of IPT in pregnancy (at alpha level of >0.05). These factors were, age above 24 years, primigravidity, grand multiparity, belief that mosquitoes cause malaria, no formal education of the husband, using nothing to prevent mosquito bites, Christianity, use of repellents, and unemployment. These are outlined in Table 4.3 below.

Table 4.3: Bivariate analysis of factors not-significantly associated with usage of IPT in Pregnancy in Juba, Southern Sudan

	IPT Use					
Characteristics	**Yes n (%)**	**No n (%)**	**TOTAL n (%)**	**COR**	**95%CI**	**P-value**
Age >24years						
Yes	85 (42)	53 (41)	138 (41)	**1.0**	**0.66-1.62**	**0.961**
No	119(58)	77 (59)	196 (59)			
Primigravida						
Yes	64 (31)	32 (25)	96 (29)	**1.4**	**0.85-2.30**	**0.227**
No	140(69)	98 (75)	238 (71)			
Grand multiparity						
Yes	59 (29)	43 (33)	102 (30)	**0.8**	**0.51-1.32**	**0.490**
No	145(71)	87 (67)	232 (70)			
Mosquito causes malaria						
Yes	202(99)	124(96)	326 (98)	**4.9**	**0.97-24.6**	**0.080**
No	2 (1)	6 (4)	8 (2)			
No informal education of participant's spouse						
Yes	30 (15)	27 (21)	57 (17)	**0.6**	**0.37-1.17**	**0.198**
No	174(85)	103(79)	277 (83)			
Using nothing to protect against mosquito bites						
Yes	35 (17)	23 (18)	58 (17)	**0.9**	**0.54-1.72**	**0.982**
No	169(83)	107(82)	276 (83)			
Christian religion						
Yes	163(80)	101(78)	264 (79)	**1.1**	**0.67-1.95**	**0.729**
No	41 (20)	29 (22)	70 (21)			
Repellent use						
Yes	99 (49)	77 (59)	176 (53)	**0.6**	**0.41-1.01**	**0.072**
No	105(51)	53 (41)	158 (47)			
Unemployed						
Yes	152(75)	96 (74)	248(74)	**1.0**	**0.63-1.71**	**0.994**
No	52 (25)	34 (26)	86 (26)			

4.3 Multivariate analysis of factors associated with usage of IPT in Pregnancy Juba Teaching Hospital, Juba, Southern Sudan

The six factors significant for IPT use in pregnancy were taken into the unconditional logistic regression model where a stepwise backward elimination method was used to obtain the final "best fit model". Three of the six factors remained significant: bought ITN, use of IRS and having attended three or more ANC (Table 4.4). Those participants who used ITN were 1.92 times more likely to use IPT. This remained statistically significant (P=0.0449), while those participants who used IRS were 2.1 times more likely to use IPT. This finding was also statistically significant (P=0.0091). Also participants who had attended three or more ANC were 4.1 times more likely to use IPT and this finding was statistically significant (P<0.05). Therefore, three factors were independently associated with IPT use in pregnancy in Juba Southern Sudan; buying ITN, use of indoor spraying, and having attended three or more ANC.

Table 4.4: Independent Factors Associated with usage of IPT in Pregnancy Juba, Southern Sudan

Exposure Characteristics	Odds Ratio	95%C.I.	P-value
Bought ITN	1.992	1.0157-3.9067	0.0449
Use of Indoor Spraying	2.1801	1.2141-3.9147	0.0091
≥ 3 ANC Visits	4.0166	2.4917-6.4748	<0.001

4.4 Bivariate analysis of factors associated with usage of ITN in Pregnancy in Juba, Southern Sudan

The bivariate analysis for factors associated with ITN use identified and ten factors to be statistically significant at P≤ 0.05. These factors include buying ITNs, attending the first ANC, monthly household income of ≤$90, use of IRS as a method of preventing mosquito bites, lack of education among study participants, not using anything to prevent mosquito bites, Christianity, and use of IPT (Table 4.5). The table illustrates Crude Odds Ratios (COR), 95% confidence intervals (CI) of OR and significance of risk factors that may influence the use or non use of ITN among pregnant women in the study.

Participants who bought ITN were 426 times more likely to use ITN. This finding was statistically significant (P<0.05). Those study participants who attended the first ANC were less likely to use ITN. This observation was statistically significant (P=0.026).

The study also found that those participants who had a monthly household income of $90 or less were less likely to use ITN. This finding was statistically significant (P=0.02). The participants who used IRS were 14 times more likely to use ITN, and this observation was statistically significant (P=0.01). This study also revealed that the participants who were aware that mosquitoes transmit malaria were 8.6 times to use ITN. This observation was statistically significant at P=0.0035. Another finding was that those participants who had not achieved any formal education were less likely to use ITN. This observation was statistically significant (P=0.041). The study also revealed that participants who used some protection against mosquito bites were less likely to use ITN. This finding was statistically significant (P=0.075). In this study, participants who belonged to the Christian Religion were less likely to use ITN and this was statistically significant (P=0.02). Finally, study revealed that those participants who use IPT were 3.1 more likely to use ITN. This was statistically significant (P=0.002).

Table 4.5: Bivariate analysis of factors significantly associated with usage of ITN in pregnancy Juba, Southern Sudan

Characteristics	ITN USE					
	Yes	No	TOTAL			
	n(%)	n (%)	n (%)	COR	95%CI	P-Value
Bought ITN						
Yes	284(96)	2(5)	286(86)	**426.0**	**91.6-1980.39**	**0.000**
No	12(4)	36(95)	48(14)			
First ANC visit						
Yes	38(13)	11(29)	49(15)	**0.4**	**0.17-0.79**	**0.016**
No	258(87)	27(71)	285(85)			
House hold income < $90						
Yes	113(88)	26(68)	139(42)	**0.3**	**0.14-0.59**	**0.001**
No	183(62)	12(32)	195(58)			
Indoor spraying						
Yes	87(29)	1(3)	88(26)	**14.4**	**2.08-114.0**	**0.001**
No	209(70)	37(97)	246(74)			
Awareness that mosquitoes transmit malaria						
Yes	292(99)	34(90)	324(98)	**8.6**	**2.05-35.91**	**0.0035**
No	4(1)	4(10)	8(2)			
No formal education						
Yes	74(25)	16(42)	90(27)	**0.5**	**0.23-0.92**	**0.041**
No	222(75)	22(58)	244(73)			
Use of protection against insect bite						
Yes	47(16)	11(29)	58(17)			
No	249(84)	27(71)	276(83)	**0.7**	**0.21-0.99**	**0.075**
Christian religion						
Yes	228(77)	36(95)	264(79)	**0.2**	**0.04-0.79**	**0.020**
No	68(23)	2(5)	70(21)			
Use IPT						
Yes	190(64)	14(37)	204(61)	**3.1**	**1.52-6.19**	**0.002**
No	106(36)	24(63)	130(39)			

These factors were taken to the unconditional logistic regression model where a stepwise backward elimination method was used to obtain the final “best fit model”.

Non significant factors associated (at alpha level of 5%) with IPT use in this study were age above 24 years, primigravidity, nil husband education, Christianity, use of repellents, starting ANC after six months gestation, attending four or more ANC visits during the current pregnancy, and unemployed (Table 4.6).

Table 4.6: Bivariate analysis of factors not-significantly associated with usage of ITN in pregnancy Juba, Southern Sudan

Characteristics	ITN USE					
	Yes	No	TOTAL			
	n (%)	n (%)	n (%)	COR	95%CI	P-Value
Age >24 years						
Yes	124(42)	14(37)	138(41)	**1.2**	**0.61-2.48**	**0.674**
No	172(58)	24(63)	196(59)			
ANC visits≥ 4months						
Yes	90(30)	10(26)	100(30)	**1.2**	**0.57-2.62**	**0.741**
No	206(70)	28(74)	234(70)			
Primigravida						
Yes	86(29	10(26)	96(29)	**1.1**	**0.53-2.46**	**0.872**
No	210(71)	28(74)	238(71)			
No formal education of spouse						
Yes	47(16)	10(26)	57(17)	**0.5**	**0.24-1.16**	**0.167**
No	249(84)	28(74)	277(83)			
Repellent use						
Yes	155(52)	21(55)	176(53)	**0.9**	**0.45-1.75**	**0.869**
No	141(48)	17(45)	158(47)			
Starting ANC visit above 6 months						
Yes	62(21)	13(34)	75(23)	**0.5**	**0.24-1.05**	**0.101**
No	234(79)	25(66)	259(77)			
Unemployed						
Yes	219(74)	29(76)	248(74)	**0.9**	**0.39-1.94**	**0.910**
No	77(26)	9(24)	86(26)			

4.5 Multivariate analysis of factors associated with usage of ITNs in pregnancy in Juba, Southern Sudan

Several factors were analyzed for possible risk factors for use of ITN for malaria prevention during pregnancy, but only three turned out to be significant at P-value of <0.05 as shown in Table 4.7. Those who had bought ITNs (P-value, <0.0001) and those who used residual indoor spraying (P-value=0.0290) were more likely to sleep under insecticide treated nets. The participants with low monthly household income were less likely to use nets (OR=0.16, p-value, 0.0148).

Multivariate analysis, therefore, found that only three factors were independently associated with ITN use in pregnancy in Juba Southern Sudan; buying ITN, use of indoor spraying and household monthly income of $90 or less (Table 4.7).

Table 4.7: Independent Factors associated with usage of ITN in Pregnancy Juba, Southern Sudan

Exposure Characteristics	Odds Ratio	95%C.I.	P-Value
Bought ITN	504.1437	91.50-2777.93	0.0000
Household income ≤250 SDG	0.1688	0.04-0.71	0.0148
Use of Indoor Spraying	16.58	1.33-206.22	0.0290

CHAPTER FIVE

5.0 DISCUSSION

The overall proportion of IPT use in this study was 61% (204/334). This finding was slightly lower than in Malawi in which the proportion of women using IPT was 75% (Mathanga and Bowie, 2007). However, a similar study in an area of high ITN use in Kenya reported a low IPT use of just 19.1% (Van Eijik, *et al.*, 2005). The overall reported proportion of ITN use was 87% (296/334). This finding was higher than a similar study done in Uganda that reported only 31.1% (Mpungu, *et al.*, 2008), but lower than the reported ITN usage of 82% in the same study in Kenya by Van Eijik *et al.*, (2005). Although the results in this study indicate that the Abuja targets for 60% ITN coverage has been achieved, this might be higher than the actual proportion because the answers were from study participants reports, but does not reflect whether the participants actually have and use the bed-nets or not.

The proportion of IPT usage was reported to be 61% (among the age range 32 to 38). In a similar study in Malawi only 29 % of the pregnant women were given the recommended dose of at least two doses during the pregnancy (Mathanga and Bowie, 2007), compared to only 5% of women interviewed who had had received two or more doses of SP as a presumptive treatment in Kenya (Guyatt *et al*, 2004).

This present study revealed that those participants that were formally employed had higher IPT use (76%) than their counterparts in the informal sector (61%). This might be because the formally employed study participants had access to regular incomes. This in turn could be because they were educated and were aware of the preventive measures of malaria in addition to being able to buy the medication (if not available) and use it.

The study revealed that attaining secondary education by the participant or university education by the husband was found to be associated with high IPT use (72% and 61% respectively). This might be explained that the more a woman is educated (or her husband is), the more knowledge she may have of preventive measures (IPT and ITN use) of malaria and, therefore more use of IPT. A similar study in Western Kenya confirmed that women with formal education were more likely to have received at least one dose of IPT (Ouma *et al*., 2007).

Those participants with a monthly household income above $400 also had high IPT use (78%). This had been highlighted in a study by Carme *et al.*, (1994) in Congo Brazzaville in which he showed that the poorest households are usually less likely to purchase and access health care services, like malaria preventive tools.

The proportion of ITN usage among the participants aged 32 to 38 years was almost twice that reported for ITN usage (53%) by pregnant women in a study by Marchant *et al.*, (2002) in Tanzania.

The present study revealed that the participants who are formally employed have a higher rate of ITN use (92%). This finding might be because those who are formally employed are more likely to be more educated, and have a regular income which allows them to buy ITN. This was also demonstrated in a study in Kenya (Ouma, *et al.*, 2007) which reported that pregnant women with a higher level of education were more likely to use an ITN. In this regard secondary education status of participant was associated with a high ITN use. This agrees with a similar study in Kenya (Ouma, *et al.*, 2007) that proved being educated was associated with malaria-specific knowledge and uptake of malaria preventive measures. This finding has also been corroborated in a study in the Democratic Republic of Congo (DRC) which indicated that women who had secondary school or higher education were 3.4 times more likely to own a net (95% CI 1.6–7.3) and 2.8 times more likely to have used a net (95% CI 1.3–6.0) compared to women with less education (Pettifor *et al.*, 2008).

Another important finding in this study was that ITN use was found to be low among participants with a monthly household income below $90 (OR=0.3, CI=0.14-0.59, p=0.001). This proves that those without a steady income are unable to buy ITNs. A study on ITN in pregnancy the Gambia that indicated that affluent individuals with

better incomes possessed more nets than the poorer ones (Wiseman *et al.*, 2006). A study in Tanzania also established that the poorest in the population were 2.74 times less likely to own a bed net than the least poor (Hanson and Worrall, 2002). From these results it has been shown that the poorest households are less likely to pay for and access health care services, like malaria preventive tools (Carme, *et al.*, 1994).

Factors independently associated with IPT and ITN use in pregnancy in Juba, Southern Sudan were buying ITN, use of indoor spraying, three or more ANC visits and monthly household income of $90 or less. These findings concur with Guyatt *et al.,* (2002) that the poorest households have inadequate access to the use of the tools for preventing malaria; as such they may have a huge burden of malaria. Similarly Guyatt *et al.,* (2002) showed that some underprivileged people were unable to pay for vector control tools, consequently subjecting them to increased contact with to the disease. A previous study by Carme *et al.,* (1994) documented the fact that the poorest households in most cases are less likely to acquire malaria preventive tools and access health services. This underlines the fact that due to poverty, the expectant mothers would not be able to afford mosquito nets hence exposing them to the disease and its complications.

In this study, attending three or more ANC visits was associated with the use of IPT. This indicated that the more the women go for ANC, the more knowledge they acquire. Also they are more likely to receive and use IPT in those visits. However, these findings are contradicted by a study from Malawi which showed a low proportion of women

receiving the recommended two doses of IPT (36%) despite having attended at least two ANC visits (Rogerson *et al*.,2000b).

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The study found that the overall proportion of IPT and ITN use in pregnancy was reported to be 61% and 87% respectively. The factors that were independently associated with the use of both IPT and ITN in pregnancy in Juba, Southern Sudan included buying of ITN, use of IRS, and having attended three or more ANC visits. ITN use in pregnancy was independently associated with ITN and their use in pregnancy was buying of ITN, use of IRS and a monthly household income of $90 or less.

6.2 Recommendations

The Ministry of Health in the Government of Southern Sudan should subsidize mosquito bed nets as well as give them for free to the pregnant women during the ANC visits. The Directorate of Reproductive Health in the Ministry of Health should conduct rigorous awareness campaigns to educate mothers on the importance early ANC attendance, and the use of IPT and ITN in pregnancy. The government should undertake a community study on the determinants of the use of IPT and ITN in pregnancy.

REFERENCES

Adam, I., Khamis, A. H. and Elbashir, M. I. (2005). Prevalence and risk factors for anaemia in pregnant women of Eastern Sudan. *Trans R Soc Trop Med Hyg.* **90**:739–43.

Brabin, B. (1991a). An assessment of low birth weight risk in primiparae as an indicator of malaria control in pregnancy. *Int J Epidemiol.* **20**: 276–283.

Brabin, B. J. (1983). An analysis of malaria in pregnancy in Africa. Bull World Health Organ **61**: 1005–1016.

Brabin, B. J. (1991b). The Risks and Severity of Malaria in Pregnant Women. Geneva, Switzerland: World Health Organization. Applied Field Research in Malaria Reports, No. 1.

Brabin, L., Stokes, E., Dumbaya, I. and Owens, S. (2008). Rural Gambian women's reliance on health workers to deliver sulphadoxine – pyrimethamine as recommended intermittent preventive treatment for malaria in pregnancy. *Malar J.* **8**:25

Breman, J. G. (2001). The ears of the hippopotamus: manifestations, determinants, and estimates of the malaria burden. *AmJ Trop. Med. Hyg.*, **64**(1, 2). 1–11

Carme, B., Plassart, H., Senga, P. and Nzingoula S. (1994). Cerebral malaria in African children: Socioeconomic risk factors in Brazzaville, Congo. *AmJ Trop Med Hyg.* **50**: 131–6.

Carnevale, P., Robert, V., Boudin, C., Halna, J. M., Pazart, L., Gazin P., Richard, A. and Mouchet, J. (1988). Control of malaria using mosquito nets impregnated with pyrethroids in Burkina Faso. Bull. Soc. Pathol. Exot. Filiales **81**:832–846.

Charlwood, J. D., Qassim, M., Elnsur, E. I., Donnelly, M., Petrarca V., Billingsley, P. F., Pinto, J., and Smith, T. (2001). The impact of indoor residual spraying with malathion on malaria in refugee camps in eastern Sudan. *Acta Trop.* **80**:1–8.

Cochran, W. G., (1963). Sampling Techniques, 2nd Ed., New York: John Wiley and Sons, Inc.

Crawley, J., Hill, J., Yartey J., Robalo M., Serufilira A., Ba-Nguz A., Roman E., Palmer, A., Asamoa, K. and Steketee, R. (2007). From evidence to action? Challenges to policy change and programme delivery for malaria in pregnancy. *Lancet Infect Dis.* **7**:145-155.

Curtis, C. F., Maxwell, C.A., Magesa, S. M., Rwegoshora, R. T. and Wilkes, T. J. (**2006).** Insecticide-treated bed-nets for malaria mosquito control. *J Am Mosq Control Assoc.* **22(**3):501-6.

D'Alessandro, U., Langerock, P., Bennett, S., Frances, N., Cham, K. and Greenwood, B. M. (1996). The impact of a national impregnated bed net programme on the outcome of pregnancy in primigravidae in The Gambia. *Trans R Soc Trop Med Hyg*. **90**:487-492.

Dafallah, S. E., EL-Agib F. H. and Bushra, G. O. **(2003)**. Maternal mortality in a teaching hospital in Sudan. *Saudi Med J,* **24:**369–73.

David L. Heyman, MD, (Ed), Control of Communicable Diseases Manual. 18th Ed. Washington, DC: American Public Health Association; 2000, 50: 325

Desjeux P. (2004). Disease Watch Focus – Leishmaniasis. *Nature Reviews – Microbiology*. **2**:693.

Desowitz, R. S. and Alpers, M. P. (**1992)**. Placental Plasmodium *falciparum* parasitaemia in East Sepik (Papua New Guinea) women of different parity: the apparent absence of acute effects on mother and foetus. *Ann Trop Med Parasitol.* **86***:* 95–102.

Fanello, C., Carneiro, I., Ilboudo-Sanogo, E., Cuzin-Ouattara, N., Badolo, A. and Curtis, C. F. (2003). Comparative evaluation of carbosulfan- and permethrin-impregnated curtains for preventing house-entry by the malaria vector Anopheles gambiae in Burkina Faso. *Med Vet Entomol*. **17**:333–338.

Fievet, N., Tami, G., Maubert, B., Moussa, M., Shaw, I. K., Cot, M., Holder, A. A., Chaoua, G. and Deloron, P. (2002). Cellular immune response to *Plasmodium falciparum* after pregnancy is related to previous placental infection and parity. *Malar J,* **1**:16

Fried, M., Nosten, F., Brockman, A., Brabin, B. J. and Duffy P. E. **(1998)**. Maternal antibodies block malaria. *Nature.* **395**: 851–852.

Gamble, C., Ekwaru, P. J., Garner, P. and ter Kuile, F. O. **(2007)**. Insecticide-treated nets for the prevention of malaria in pregnancy: a systematic review of randomised controlled trials. PLoS Med, **4**:e107.

Greenwood, B. M., Bojang, K., Whitty, C. J. and Targett, G. A. **(2005).** Malaria. *Lancet*. **365**:1487-98

Greenwood, B. M., Snow, R. W., Byass, P., Bennett, S., and Hatibnjie, A. B. (1989). The Effects of Malaria Chemoprophylaxis Given by Traditional Birth Attendants on the Course and Outcome of Pregnancy. *Trans R Soc Trop Med Hyg*. **83**:589-594.

Guyatt, H. L., Corlett, S. K., Robinson, T. P., Ochola, S. A. and Snow, R. W. (**2002)**. Malaria prevention in highland Kenya: indoor residual house-spraying vs. insecticide-treated bednets. *Trop Med Int Health* **7**: 298–303.

Guyatt, H. L., Noor, A. M., Ochola, S. A. and Snow, R. W. (2004). Use of intermittent presumptive treatment and insecticide treated bed nets by pregnant women in four Kenyan districts. *Trop Med Int Health*. **9**:255-261.

Hanson, K. and Worrall. E. (2002): Social marketing of insecticide treated nets – Phase 2 (SMITN2), Tanzania: End- of- project household survey analysis London, Malaria Consortium.

Hawley, W. A., ter Kuile, F. O., Steketee, R. S., Nahlen, B. L., Terlouw, D. J., Gimnig, J. E., Shi Y. P., Vulule J. M., Alaii J. A. and other authors. **(2003)**. Implications of the western Kenya permethrin- treated bed net study for policy, program implementation, and future research. *Am J Trop Med Hyg*. **68**(4 Suppl):168-173.

Hill, J., and Kazembe P. (2006). Reaching the Abuja target for intermittent preventive treatment of malaria in pregnancy in African women: a review of progress and operational challenges. *Trop Med Int Health*, **11**:409-418.

Johnson, A. H., Leke, R. G., Mendell, N. R., Shon, D, Suh, Y. J., Bomba- Nkolo, D, Tchinda, V, Kouontchou, S, Thuita, L. W. and other authors. (2004). HLA class II alleles influence levels of antibodies to the Plasmodium falciparum asexual-stage apical membrane antigen 1 but not to merozoite surface antigen 2 and merozoite surface protein 1. *Infect Immun* **72**: 2762–2771

Krogstad, D. (1995). Plasmodium species (malaria). In: Mandell, G. L., Bennett, J. E. and Dolin, R, (ed). Mandell, Douglas and Bennett's principles and practice of infectious diseases. 4th ed. Vol. 2). New York: Churchill Livingstone; p. 2415-27.

Lengeler C. (2004). Insecticide-treated bed nets and curtains for preventing malaria. Cochrane Database of Systematic Reviews. Oxford, UK.

Lindsay, S., Ansell, J., Selman, C., Cox V., Hamilton, K. and **Walraven, G. (2000)** Effect of pregnancy on exposure to malaria mosquitoes. *Lancet* **355**: 1972.

Lindsay, S. W., Adiamah, J. H. and Armstrong, J. R. M. **(1992).** The effect of permethrin-impregnated bed nets on house entry by mosquitoes in The Gambia. Bull. *Entomol*. Res. **82**:49–55.

Lindsa,y S. W., Adiamah, J. H., Miller, J. E., Armstrong, J. R. M. (**1991).** Pyrethroid-treated bednet effects on mosquitoes of the Anopheles gambiae complex. *Med. Vet. Entomol*. **5**:477–483.

Lindsay, S. W., Snow, R. W., Broomfield, G. L., Semega J. M,. Wirtz, R. A and Greenwood, B. M. (**1989).** Impact of permethrin-treated bednets on malaria transmission by the Anopheles gambiae complex in The Gambia. *Med. Vet. Entomol*. **3**:263–271.

Lines, J. D., Myamba, J. and Curtis, C. F. (1987). Experimental hut trials of permethrin impregnated mosquito nets and eave curtains against malaria vectors in Tanzania. *Med Vet Ent*. **1**:37-51.

Luxemburger, C., Ricci., F, Nosten, F., Raimond, D., Bathet, S. and White N. J. (1997). The epidemiology of severe malaria in an area of low transmission in Thailand. *Trans R Soc Trop Med Hyg*, **91**:256–262.

Malaria Control Strategic Plan, Draft Proposal, Ministry of Health Government of Southern Sudan, April 2006

Marchant, T., Schellenberg, J. A., Edgar T., Nathan, R., Abdulla S., Mukasa O., Mponda H. and Lengeler, C. (2002). Socially marketed insecticide-treated nets improve malaria and anaemia in pregnancy in southern Tanzania. *Trop Med Int Health***.** **7** no 2 pp 149-158

Marshal, K. (1998). Malaria disaster in Africa. *Lancet.* **352**, 924.

Mathanga, D. P. and **Bowie C. (2007).** Malaria control in Malawi: are the poor being served? *Int J Equity Health.* **6**: 22.

McGregor, I. A., Wilson, M. E. and Billewicz, W. Z. (1983). Malaria infection of the placenta in The Gambia, west Africa; its incidence and relationship to stillbirth, birth weight and placental weight. *Trans R Soc Trop Med Hyg.* **77**: 232–244.

Menendez, C. (2006). Malaria during pregnancy. *Curr Mol Med.* **6**:269-273.

Menendez, C., Ordi, J., Ismail, M. R., Ventura, P. J., Aponte, J. J., Kahigwa, E., Font, F. and Alonso P. L. (2000). The impact of placental malaria on gestational age and birth weight. *J Infect Dis.* **181**:1740-1745.

Miller, J. E., Lindsay, S. W. and Armstrong, J. R. M. (**1991).** Experimental hut trials of bednets impregnated with synthetic pyrethroid and organophosphate insecticides for mosquito control in The Gambia. *Med. Vet. Entomol*. **5**:465–476.

Mpungu, S. K. and Patrobas M. **(2008).** Use of antenatal care, maternity services, intermittent presumptive treatment and insecticide treated bed nets by pregnant women in Luwero district, Uganda. *Malar J*. **7**:44

Newman, R. D., Moran, A. C., Kayentao, K., Kayentao, K., Benga-De, E., Yameogo, M., Gaye, O., Faye, O., Lo, Y., Moreira, P. M., Doumbo, O., Parise, M. E., and Steketee RW (2006). Prevention of malaria during pregnancy in West Africa: policy change and the power of sub- regional action. *Trop Med Int Health*. **11**: 462–469.

Nosten, F., ter Kuile, F. O., Maelankirri, L., Decludt, B. and White, N.J. (1991). Malaria during pregnancy in an area of unstable endimicity. *Trans. R. Soc. Trop. Med. Hyg*. **85**, 424—429.

Oeuvray, C., Theisen, M., Rogier, C., Trape, J. F, Jepsen, S. and Druilhe, P. (2000). Cytophilic immunoglobulin responses to Plasmodium falciparum glutamate-rich protein are correlated with protection against clinical malaria in Dielmo, Senegal. *Infect Immun*. **68**: 2617–2620.

O'Neil-Dunne, I., Achur, R. N., Agbor-Enoh, S. T., Valiyaveettil, M., Naik, R. S., Ockenhouse, C. F., Zhou, A., Megnekou, R., Leke, R., and Taylor, D. W. (2001): Gravidity-dependent production of antibodies that inhibit binding of Plasmodium falciparum-infected erythrocytes to placental chondroitin sulfate proteoglycan during pregnancy. *Infection Immun*. **69**:7487-7492.

Ouma, P., van Eijk, A. M., Hamel1, M. J., Parise, M., Ayisi1, J. G., Otieno, Kager, P. A. and Slutsker L. (2007). *Trop Med Int Health* .**12** no 12 :1515–1523

Praise, M. E., Ayisi, J. G., Nahlen, B. L., Schultz, L. J., Roberts, J. M., Misore, A., Muga, R., Oloo, A. J., and Steketee, R. W. (1998). Efficacy of Sulfadoxinepyrimethamine for prevention of placental malaria in an area of Kenya with a high prevalence of malaria and human immunodeficiency virus infection. *Am J Trop Med Hyg.* **59**: 813–822.

Pettifor, A., Taylor, E., Nku, D., Duvall S., Tabala, M., Meshnick, S., and Behets, F. (2008). Bed net ownership, use and perceptions among women seeking antenatal care in Kinshasa, Democratic Republic of the Congo (DRC): Opportunities for improved maternal and child health. *BMC Public Health*, **8**:331

Pleass, R. J., Armstrong, J. R. M., Curtis, C. F., Jawara, M., and Lindsay, S.W. (**1993)**. Comparison of permethrin treatments for bednets in The Gambia. Bull. *Entomol*. Res. **83**:133–140

Robert, V. and Carnevale P. (1991). Influence of deltamethrin treatment of bed nets on malaria transmission in the Kou valley, Burkina Faso. *Bull.* WHO. **69**:735–740.

Rogerson, S. J., Van den Broek, N. R., Chaluluka, E., Qongwane, C., Mhango CG., and Molyneux, M. E. **(2000a)**. Malaria and anemia in antenatal women in Blantyre, Malawi: a twelve-month survey. *Am J Trop Med Hyg*. **62:**33**5**-40

Rogerson, S. J., Chaluluka E., Kanjala M., Mkundika P., Mhango, C., and Molyneux, M. E. (2000b). Intermittent sulfadoxine-pyrimethamine in pregnancy: effectiveness against malaria morbidity in Blantyre, Malawi, in 1997–1999. *Am J Trop Med Hyg*. **94**. 549–553.

Roll Back Malaria, WHO, UNICEF (2005) *World malaria report***.** Geneva, Switzerland

Shi, Y. P., Sayed, U., Qari, S. H., Roberts, J. M., Udhayakumar, V., Oloo, A. J., Hawley, W. A., Kaslow, D. C., Nahlen, B. L., and other authors. (1996). Natural immune response to the C-terminal 19-kilodalton domain of Plasmodium falciparum merozoite surface protein 1. *Infect Immun*. **64**: 2716–2723.

Shulman CE, Dorman, E. K., Cutts, F., Kawuondo, K., Bulmer, J. N., Peshu N. and Marsh, K. (1999). Intermittent sulphadoxine– pyrimethamine to prevent severe anaemia secondary to malaria in pregnancy: a randomised placebo-controlled trial. *Lance.t* **353**: 632–636.

Shulman, C. E, and Dorman, E. K. (2003). Reducing childhood mortality in poor countries—Importance and prevention of malaria in pregnancy. *Trans R Soc Trop Med Hyg*. **97**: 30–35.

Shulman, C. E. (1999). Malaria in pregnancy: its relevance to safe motherhood programmes. *Ann Trop Med Parasitol*.**93** (Suppl 1): S59–S66.)

Shulman, C. E., Dorman, E. K., Talisuna, A. O., Lowe, B. S., Nevill, C., Snow, R. W., Jilo, H., Peshu, N., Bulmer, J. N., and other authors (1998). A community randomized controlled trial of insecticide treated bed-nets for the prevention of malaria and anaemia among primigravid women on the Kenyan coast. *Trop Med Int Health.* **3**: 197–204.

Steketee, R. W., Nahlen, B. L., Parise, M. E. and Menendez. C. (2001). The burden of malaria in pregnancy in malaria-endemic areas. *Am J Trop Med Hyg.* **64**: 28–35.

Steketee, R. W., Wirima, J. J., Bloland, P. B., Chelima, B., Mermin, J. H., Chitsulo, L. and Breman, J. G., (1996a). Impairment of a pregnant woman's acquired ability to limit Plasmodium falciparum by infection with human immunodeficiency virus type-1. *Am J Trop Med Hyg.* **55**(suppl): 42–49.

Steketee, R. W., Wirima, J. J., Slutsker, L., Heymann, D. L. and Breman, J. G. (1996b). The problem of malaria and malaria control in pregnancy in sub- Saharan Africa. *Am J Trop Med Hyg.* **55:2**-7.

Taha, E. T., Ronald, G. and Abdalla, A. M. (1993). Malaria and low birth weight in central Sudan. *Am J Epidemiol*. **138**:315–25.

United Nations Office for the Coordination of Humanitarian Affairs, 2002.

Van Eijk, A. M., Blokland, I. E., Shuster, L., Odhiambo, F., Ayisi1, J. G., Bles, H. M, Rosen, D.H., Adazu, K. and Lindblade, K.A. (2005). *Trop Med Int Health.* **10**:11.1134–1140

Verhoeff, F. H., Brabin B. J., Chimsuku, L., Kazembe, P., Russell, W. B. and Broadhead, R. L. (1998). An evaluation of the effects of intermittent sulfadoxine-pyrimethamine treatment in pregnancy on parasite clearance and risk of low birth weight in rural Malawi. *Ann Trop Med and Parasitol* **92**. 141–150.

White, N. J. (1996). Malaria. In: Cook GC, editor. Manson's tropical diseases. (20th ed.). Saunders, United Kingdom.

WHO (1986). WHO expert committee on malaria 18th report. World Health Organ Tech Rep Ser 735**.**

WHO (2000). Action at Country Level. Country Updates. WHO, Geneva

WHO (2002): Instructions for treatment and use of insecticide-treated mosquito nets. Geneva.

WHO (2005). Roll Back Malaria Monitoring and Evaluation Sudan, Page 1

WHO (2006)*:* MALARIA IN PREGNANCY, Guidelines for measuring key monitoring and evaluation indicators

WHO. 2007). MALARIA IN PREGNANCY: Guidelines for measuring key monitoring and evaluation indicators. WHO, Geneva 2

WHO (2008). World Malaria Report

WHO/AFRO (2004): A strategic framework for malaria prevention and control during pregnancy in the African region. AFR/MAL/04/01

Wiseman, V., McElroy, B., Conteh, L. and Stevens, W. (2006): Malaria prevention in the Gambia: patterns of expenditure and determinants of demand at the household level. *Trop Med Int Health*. **11**:419-431.

APPENDICES

Appendix I: Questionnaire

The Determinants of the Usage of Intermittent Preventive Therapy (IPT) and Insecticide Treated Bed nets (ITN) in Pregnancy in Juba, South Sudan, 2009

Questionnaire Number ……..

A. Identifiers

1. Interview date _ _ / _ _ / _ _ _ _ (dd/mm/yr)
2. Interviewer's Name/Code ……..

B. Demographic Information

1. Participant's Age (in years)……....
2. What is your religion

I. Muslim ☐ II. Christian ☐ III. Traditional ☐

IV. Others (specify)…….....

1. What is your employment status?

I.Employed in formal sector ☐ II. Employed in informal sector ☐

II.Unemployed ☐ IV. Student ☐

III.Other specify ……..

2. What is your highest level of education?

I.Informal education ☐ II. Primary ☐

II.Secondary ☐ IV. Tertiary / university ☐

III.Other (specify) ……..

3. What is the highest level of education which your spouse attained?

I.Never went to school ☐ II. Primary ☐

II.Secondary ☐ 1V. Tertiary / university ☐

Others (specify)…….

4. How much is your monthly household income

I. Less than SDG. 250 ☐ II. SDG. 500 – 1000 ☐

II. More than SDG. 1000 ☐

C. Reproductive History

1. How many pregnancies did you have? ……...
2. How many children do you have now? ……
3. At how many months did you start coming for ANC? ……
4. What number is this ANC visit? ……

D. Services at ANC Clinic

1. Were you given Fansidar during this pregnancy?

Yes ☐ II. No ☐ III. Don't know ☐

2. If yes, where did you get it from?

I. Given in the hospital ☐ II. Bought it ☐

III. Others (specify).....

3. Did you take the Fansidar

I. Yes ☐ II. No ☐ III. I don't remember ☐

4. If you did not take it, what was the reason?

I. Caused bad reaction ☐ II. Did not like it ☐

III. Not available ☐ IV. Don't know ☐

5. In your opinion, does the medicine protect a pregnant woman from malaria?

I. Yes ☐ II. No ☐ III. Don't know ☐

6. Were you given a mosquito bed net?

I. Yes ☐ II. No ☐

E. Knowledge/ Attitudes about malaria prevention

1. What would you say is the cause of malaria?

I. Mosquito transmitted parasite ☐ II. Contaminated water ☐

III. Witchcraft ☐ IV. Others (specify)…..……

2. Do you think it is a good idea to prevent malaria while one is pregnant?

I. Yes ☐ II. No ☐ III. Do not know ☐

3. Do you support the use of insecticide treated nets as a way of preventing malaria?

I. Yes ☐ II. No ☐ III. Do not know ☐

4. Did you sleep under a mosquito net last night?

I. Yes ☐ II. No ☐

5. If yes, how did you acquire it?

I. Given free by MOH Staff ☐ II. Donated by NGO ☐

III. Bought it ☐ IV. Others (specify) ……

6. When was the last time you treated it?

I. In the past 6 months ☐ II. Between 6 months – 12 months ☐

II. 1yr – 3yrs ☐ IV. More than 3yrs ☐

7. If no, why?

I. Cannot afford to buy ☐ II. No need for it ☐

III. Chemicals used are dangerous ☐

IV. IV. My culture does not approve its use ☐

V. Have other ways of repelling mosquitoes ☐

8. What other ways do you employ to protect yourself from biting mosquitoes?

I. Burning cow dung ☐ II. Application of mosquito repellents ☐

II. Indoor residual spraying ☐ IV. I don't use anything ☐

III. Others

(specify).....

Appendix II: Consent Form

Hello, Madam. My name is ……I am a Student at Jomo Kenyatta University of Agriculture and Technology. I am requesting you to take part in a research study to assess the determinats and factors associated with usage of insecticide treated bed nets and intermittent preventive therapy in pregnant women attending antenatal care.

Malaria in pregnancy is serious condition that may cause a lot of medical problems to you or your baby like abortion, anaemia, and an underwieght baby at birth or even death. An understanding of conditions associated with malaria in pregnancy assist us to prevent it, or treat it early. This information may be used to improve the outcome of pregnancies associated with malaria.

The session with you will last only about 10 minutes. During this time, you will be asked some questions about the pregnancy (ies) and your antenatal care. The study will not interfere with any treatment you are taking.

Risks and benefits: This study will not cause any risks to you and may help to improve our understanding, prevention and treatment of malaria in pregnancy. You will not be asked to pay for participating in the study.

Confidentiality: Your name will not be required. Any information obtained about you for this study will be kept confidential and will be used only for the purposes of the study. The results of the study may be published or disseminated without revealing your identity.

Consent: Your participating in the study is optional. You are free to withdraw from the study at any time. You will not be penalized for withdrawing from the study.

Declaration of the participant

I have understood the intention of the study after reading (or being read to). I have asked questions which were answered to my satisfaction. I consent voluntarily to participate in this study.

Signature of participant _____

Signature of investigator_____

Date_____

Thank you.

Appendix III: Questionnaire: Juba Arabic Translation

Tasir ta istimal ta Namusia al amulu ma dawa (thibi) wa hibub ta malaria al gi wodi fi himil fi mustehfa Juba, Junub al Sudan, 2009

Nimra ta istimara ……..

A. **Sifat**

1. Tarik ta lika _ _ / _ _ / _ _ _ _ (yom/shahar/sena)
2. Isim/ishara ta zol al gi amulu lika de ……

B. **Maulumat an mushterik**

1. Umur (be sinin)……....
2. Din taki shunu?

   I. Muslim ☐ II. Mesihi ☐ III. Beledi ☐

   IV.Tanin (hadid)…….....

3. Shokol taki shunu?

   I. Muwazif ☐ II. Amal hurra ☐ III. Atil ☐

   IV. Thalib ☐ Ai haja tani (hadid) ……..

4. Ita wosulu yatu marhala ta talim?

IV. Ma agara ☐ II. Ibtidayi ☐ IV. senawi ☐

IV. Jama au fok jama ☐ V.Ai haja tani (hadid) ……..

5. Sidu bet taki wosulu yatu marhala ta talim?

I. Ma agara ☐ II. Ibtidayi ☐

III. senawi ☐ IV. Jama au fok jama ☐

VI. Ai haja tani (hadid) ……..

6. Fi shahar dakhli takum kam?

IV. Agala min SDG. 250 ☐ II. Beyin SDG. 500 – 1000 ☐

V. Akhtar min SDG. 1000 ☐

C. **Maulumat at wilada taki**

a. De himil nimra kam? ……...……

b. Indak kam jena? ……...

c. Ita bada dowru le mutaba ta himil fi shahar kam? ……..

d. De ziara ta mutaba ta himil nimra kam? …….

D. **Khadamat fi iyada ta mutaba**

a. Wodi le ita dawa ta malaria (Fansidar)?

I.Nam ☐ II. La ☐ III. Ma arif ☐

b. Kan nam, ita ligo wen?

I. Wodi fi musteshfa ☐ II. Ana biyu ☐

II. Teriga ukhra (Hadid).....

3. Ita abula dawa de?

III. Nam ☐ II. La ☐ III. Mabi zekir ☐

4. Kan ita ma abla, sabab shunu?

I. Amulu ana batal ☐ II. Ana ma rudu dawa de ☐

III. Mafi ☐ IV. Ana ma aruf ☐

5. Fi rai taki dawa de gi hami zol min malaria?

I. Nam ☐ II. La ☐ III. Ma arif ☐

6. Wodi le ita numusia thibi au ma dawa?

I. Nam ☐ II. La ☐

E. **Malumat an himaya min malaria**

a. Shunu yawu gi sabab malaria?

I. Bouda yau gi angulu ☐ II. Moyo waskan ☐

II. Kujur ☐ IV. Hajat tannin (hadid))…..……

b. Ita gi fikir uwo kwes kan wogifu malaria asna ita hamil?

I. Nam ☐ II. La ☐ III. Ma arif ☐

c. Ita gi dafi istimal ta dawa ta rusu bouda ashan bi hami nas min malaria?

I. Nam ☐ II. La ☐ III. Ma arif ☐

d. It num tehet namusia umbari bilel?

I. Nam ☐ II. La ☐

e. Kan nam, ita ligo kef?

I. Majani min wazara saha ☐ II. Majani min munazama ☐

III. Ana biyu ☐ IV. Teriga tani(hadid) ……

f. Akhir mara amulu ma dawa miten?

VI. Fi 6 shuhur al fat ☐ II. Beyin 6 – 12 shahar ☐

III.1 le 3 sena ☐ IV. Akhtar min 3 sena ☐

g. Kan ma amulu ma dawa, sabab shunu?

I. Ana ma akder biyu ☐ II. Mafi dayat ☐

III.Dawa khatar ☐ IV. Tagalid tanina ma der ☐

F. Indik teriga tani ta turuju bouda ☐

h. Ita gi stamil teriga yatu ta turuju bouda ashan mabi adi ita?

V. Aragu karat a bagar ☐ II. Masa dawa ta turuju bouda ☐

III. Rusu juwa ma dawa ta bouda ☐ IV. Ma gi stail ai haja ☐

VI. Teriga tani(Hadid).....

Appendix IV: Consent form in Juba Arabic : Istimara ta rudu au aba tai ka de

Salam, Madam. Isim tai…. ……ana talib fi jama ta Jomo Kenyatta University ta Zira wa Technologia. Ana gi asalu ita ashan bi sharik fi bahath tai de ashan der aruf tasir ta istimal ta Namusia al amulu ma dawa (thibi) wa hibub ta malaria al gi wodi fi himil fi mutaba ta himil fi mustehfa Juba.

Malaria fi himil de ayan khatar al gi sabab mashakil ketir ze tala jena, dom al besit, jena al gi woledu suker, hata bi katulu jena. Kan fahimu mashakil ta malaria fi himil bi saudu anina ahan be wogifu mashakil de aw aliju bedri Maulumat al ita bi wodi de bi hasinu fi netija ta himil.

Anina bi asalu ita le muda ashara dagayik bes. Fi zaman de bi asalu ita an himil wa mutaba wa mabi asir ma ilaj al ita gi shilu.

Istifada: Dirasa de mabi asir ma ita wa bi saidu anina ashan fahimu an malaria fi himil wa ilaj towo. Ita mabi dafa ai gurus ashan ta ishterik.

Siria: Mabi asalu isim taki. Malaumat al anina gi shilu de bi kun siri wa le dirasa de bes. Maulumat de mumkin bi stamilu fi dirasa, lakin isim taki mabi zekiru.

Rudu au aba: Ita hur ashan ishterik fir dirasa de. Ita mumkin bi kheli ai wokit wa mabi amulu le ita haja.

Bayan ta mushterik

Anan fahim sabab ta dirasa de bad wori le ana. Ana asalu as ila wa jowabu le ana kwes.

Ana gi itbara nefsa tai le dirasa de.

Imda ta mushterik: _____

Imda ta mushrif: _____

Tarikh: _____

Shukran.

Appendix V: Letter of Authorization

GOVERNMENT OF SOUTHERN SUDAN
(GOSS)
MINISTRY OF HEALTH

Our Ref:..... Date: 28 /08/2009

Your Ref:.....

APPROVAL LETTER FOR RESEARCH STUDIES OF FOUR FELTP PROSTGRADUATE RESIDENTS

I am writing in response to the request for authorization for Academic Research studies by four FELTP residents who are staff of the Ministry of Health, Government of Southern Sudan. The studies are as follows:

1. Determinants of Ownership and Use of Insecticide Treated Nets in Juba, Southern Sudan, 2009: By Dr. Edward Bepo.
2. Role of Malaria Preventive Measures in Pregnancy in Juba Teaching Hospital: Dr. Robert. P. Napoleon.
3. Prevalence and associated Risk Factors for Syphilis in Pregnant women, Juba Southern Sudan 2009: Sheila Konga Emmanuel.
4. Determination of Factors Associated with Brucellosis in Terekeka County, Central Equatoria State, Southern Sudan, 2009: Doris Daniel Lobojo.

After close review of the studies mentioned above, and further clarifications and amendments made, I am glad to inform the researchers and all those concerned that the ethical committee at the Ministry of Health for the Government of Southern Sudan (MOH-GOSS) has approved the research studies. The Ministry acknowledges the importance of the studies for planning purposes as well as improving services within the respective subject specific areas.

Head Office: P.O. Box 88, Juba, Southern Sudan
Tel: (+249-811820678/+249-811820134
*Emai: **infomohgoss@gmail.com***

The Ministry requests the researchers to keep the Directorate of Research informed on the progress of the research field activities.

I look forward to the report, especially the recommendations that will be generated as a result of the studies. Note that any information generated from the studies should not be published without the consent of the MOH-GOSS.

Good luck and don't hesitate to get in touch should there be any queries.

MINISTRY OF HEALTH
28 AUG 2009
GOVERNMENT OF SOUTHERN SUDAN

Dr. Olivia Adong Lomoro
Directorate of Research, Planning & Health Sys Dev
Ministry of Health
Government of Southern Sudan
Juba

CC: Under Secretary, MOH-GOSS

CC: Director General, Preventive Services

CC: Director General, HIV/AIDS/STIs

CC: Research FELTP Students