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BY

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EFFECTIVENESS OF INTERMITENT PREVENTIVE TREATMENT WITH SULPHADOXINE-PYRIMETHAMINE AND INSECTICIDE TREATED NETS ON THE PREVENTION OF MALARIA IN PREGNANCY IN NON-MALARIAL ENDEMIC AREA.

LIST OF CONTENTS

DEDICATION

This book is dedicated to my wife ,Josephine , our three precious children ,Vincent,Gershom and Michelle; my mother, Selly and my late father, Bittok.

ACKNOWLEDGEMENT

I humbly thank the Almighty God, for his abundant blessings which enabled me to complete the book . I am indeed grateful to my sponsor , the Government of Kenya for providing me with the opportunity, time and tuition fees that enabled me pursue the postgraduate course.

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I thank my wife and our three children for understandably tolerating the long duration i was away while undergoing the training.

DECLARATION

In part fulfillment for the degree of Masters of Medicine (M.MED) in Obstetrics and Gynaecology, University of Nairobi.

I declare that, apart from where citations are made, this study is my original work and has not been presented in any academic institution of higher learning.

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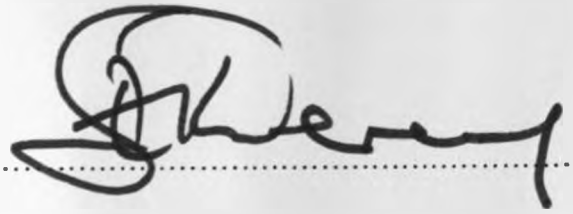
Signature: 

Date: 6th Jan 2010

CERTIFICATION BY SUPERVISORS

This is to certify that **Dr. Edward k. Serem** researched upon the long commentary presented in this book under our guidance and supervision and that this book is submitted with our approval.

Signed:---------- Date: January 7th 2010

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DR. OMONDI OGUTU

CERTIFICATE OF AUTHENTICITY

This is to certify that this dissertation is the original work of Dr. Serem K.Edward Mmed student registration number H58/7645/06 in Obstetrics and Gynaecology department ,University of Nairobi (2006-2010).The research was carried out in the department of Obstetrics and Gynaecology, school of Medicine, College of Health Sciences. It has not been presented in any other university for award of a degree.

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LIST OF ABBREVIATIONS

ANC: Antenatal clinic

C I Confidence interval

D: level of significance

GOK: Government of Kenya

Hb: Haemoglobin

LBWT; Low Birth weight

n; Sample size

ITNs: Insecticide treated nets

IPT-SP Intermittent preventive treatment with sulphadoxine-pyrimethamine

IRS Indoor Residual Spray

IUGR; Intra-uterine growth restriction

P; Prevalence

PCR; Polymeraze Chain Reaction

RBM; Roll Back Malaria

SP; Sulphadoxine Pyrimethamine

SPSS; Software programme for social science research

WHO; World Health Organisation

Z: Normal Standard Deviation

ABSTRACT

Background

Malaria prevention strategies significantly reduced the prevalence of malaria in pregnant women in several studies done in malaria endemic regions. We assessed the effectiveness of Intermittent preventive treatment with sulphadoxine-pyrimethamine and Insecticide treated nets on the prevention of malaria in pregnancy in a non-malaria endemic area.

Objective.

To determine the effectiveness of Intermittent preventive treatment with sulphadoxine-pyrimethamine and Insecticide treated nets on the prevention of malaria in pregnancy in a non-malaria endemic area.

Study Desgin.

Comparison pre and post Interventions.

Study Area .

Kapsabet district hospital –Cental Nandi.

Methodology.

This was pre and post IPT/ITN Intervention comparison study, where 143 non-randomised pregnant women were followed through the Antenatal clinic before 28 weeks gestation until delivery and compared with records of 600 pregnant women who attended ANC and delivered at the hospital in year 2001 before the interventions were implemented.

Results

The incidence of malaria infection in pregnancy was 21% in the non-intervention group compared with 8% in the intervention group, (p-value 0.000). The incidence of low birth weight was 12.5% in the non-intervention group compared with 5.6% in the intervention group (p-value 0.018), this showed a reduction of low birth weight by 50%.

The incidence of Still births was 6% in the non-intervention group and 1.4% in the intervention group (p-value 0.025). There were 2 (0.3%) cases of maternal mortality in the non-intervention group and no mortality in the intervention group which was statistically not significant but clinically significant.

Conclusion

The use of Intermittent preventive treatment with sulphadoxine-pyrimethamine and Insecticide Treated Nets is effective in prevention of malaria in pregnancy in non-malaria endemic region and is associated with reduction of adverse pregnancy outcomes.

Recommendations

Ministry of health and partners to:-

- Maintain and upscale the use of sulphadoxine-pyrimethamine during pregnancy,
- Avail subsidised long lasting insecticide treated bed nets to pregnant women.
- Carry out periodic health promotion and vector control activity education at the community level. .

INTRODUCTION AND LITERATURE REVIEW

Malaria is a febrile illness caused by the plasmodium *falciparum,vivax,ovale* and *malariae*. The most common plasmodium in africa is P.*falciparum* which contributes 98% of malaria cases. Pregnant women are more susceptible to malaria infection than non-pregnant, the susceptibility being greatest in the 2nd trimester **(8, 9, 10, 11)**. In moderate to high transmissions areas the point prevalence of maternal malaria infection (peripheral or placental) in all gravidae was 27.8% **(7)**. Pregnancy associated malaria results in several adverse outcomes which are; maternal anaemia, low birth weight (Lbwt), maternal and perinatal death, preterm deliveries and congenital malaria.

In Africa the proportion of severe anaemia among pregnant women of all gravidities attributable to malaria is estimated to be 26% **(12-15)**

Maternal death attributable to malaria from direct and indirect causes in low/high transmission areas is between 93-320/100,000 live births, according to studies done in Mozambique and Gambia **(30, 36)**.

In sub Saharan Africa 20% of Low birth weight (<2500g) is attributable to malaria in pregnancy, which is as a result of Intra-uterine growth restriction (IUGR) and preterm delivery **(7, 19)**. In malaria endemic regions, malaria contributes 70% of IUGR and 36% of preterm deliveries **(7)**. In high transmission areas of Africa, malaria induced Lbwt is estimated to be responsible for between 62,000-363,000 infant deaths every year which translates to 3-17 deaths per 1,000 live births **(18)**. Another study in Africa suggests that 11.4% (100,000) of all infant deaths in endemic areas is caused by malaria associated Lbwt **(20)**, the effect of Lbwt is greatest in infants born to primigravida causing 17.6% of neonatal deaths and 9.8% of infant deaths **(17)**. Nine hospital based studies showed that placental malaria was associated with twice the risk for stillbirth **(31)**

More recent reports from both malaria endemic and non-endemic areas show higher prevalence of congenital malaria ranging from 8% to 33%, these were detected by use of PCR (**21, 22**)

Malaria endemic region is where malaria transmissions is common throughout the year (perennial) there are two regions in Kenya around lake Victoria and along the coast.(**37**) While in non-malaria endemic regions there is limited transmission throughout the year but potential for epidemic outbreaks eg highland districts of Kenya(**37**).

Malaria in pregnancy was first described in early 20th century. Since then several studies have been done in sub Saharan Africa where 25M pregnant women are at risk.(**2, 3, 4, 5, 6**)

World health organisation (WHO) recommends a three-pronged approach to the prevention and management of malaria in pregnancy, which are:
Two doses of sulphadoxine –pyrimethamine (SP) during pregnancy , Use of insecticide treated nets (ITNs) and Case management (**23**).

Meta-analysis of intervention trials suggest that successful prevention of malaria infections decrease the risk of maternal anaemia by 38%, Lbwt by 43%, and perinatal mortality by 27% (**1**).

Intermittent preventive treatment with SP(IPT-SP) was found to reduce the prevalence of maternal parasitaemia to 10.4% in a study done in Nigeria (**34**). In a study done in Africa it was found out that use of ITNs in pregnancy was beneficial to maternal and foetal outcome but is not significant on the prevalence of malaria (**35**).

The Abuja declaration of April 2000 at the Africa head of states summit on 'Roll Back Malaria'(RBM) recognised the disease and its economic burden that malaria places on hundreds of people and the barriers it contributes to development and alleviation of poverty (**32**)

The Government of Kenya (GOK) policy on prevention and management of malaria in pregnancy is: To ensure that all pregnant women living in malaria areas will have access to two SP doses at 16-27 wks and 28-36 weeks, to increase access to ITNs amongst people at risk especially young children and pregnant women, and Effective community based communication to encourage prompt treatment of fever (**23**).

The GOK targets by 2006 were: To have 60% of pregnant women to receive two SP in 2nd and 3rd trimester (**23**). There are variations among African countries (Kenya included), as follows, 33%-93% for one dose and 24%-68% for the two or more doses (**1**).Another target was to have 80% of fever or anaemia cases to be appropriately managed at ANC services and to achieve over 60% of pregnant women to sleep under treated nets during their confinement. By December 2006, 50% of pregnant women were using ITNs (**23, 29**)

Studies at malaria-endemic regions of Kisumu and Kilifi have demonstrated significant reduction in incidence of anaemia among pregnant women following administration of IPT-SP. There is also strong evidence to suggest decreased incidence of LBwt following IPT-SP (**24**). Another study in Bondo demonstrated that IPT-SP is effective in controlling maternal anaemia in areas of high transmissions especially among primigravidae, however the use of ITNs alone showed a substantial protective effect against anaemia in primigravidae (**33**).

Some other evidence from studies in Siaya, Kenya, confirms findings from Gambia that ITNs may confer some protection against malaria infection among pregnant women (**25**). Evidence from other areas in africa is less conclusive, but areas of epidemic risk in SE Asia have shown significant protection against anaemia and LBwt through the use of ITNs by pregnant women (**26**).

GOK implemented the IPT-SP policy in the year 1998 and currently the coverage is 33-93% in malaria prone areas(**28**) .ITNs access was equally improved in the year2004/05 by

provision of subsidised treated nets to children and pregnant women through ANC and in the year 2006 there was distribution of 10 million free ITNs to vulnerable groups in malaria prone districts (27) .Therefore a larger proportion of pregnant women are on IPT-SP and more than half of them sleep under treated nets in most of malaria prone districts. The study was conducted in Central Nandi district where IPT-SP coverage was 88.5% for both 1st and 2nd doses.

MAGNITUDE OF THE PROBEM

Fifty (50) million pregnant women are at constant risk of malaria every year in the world, 25 million are in Africa (1) and about 1.7 million in Kenya (23). In Africa, Lbwt associated with Malaria in pregnancy is estimated to result in 100,000 infant deaths each year (1). In the whole world between 75000-200,000 infants die due to Lbwt associated with malaria (1).

In Kenya malaria causes severe anaemia in about 6000 primigravida women in the moderate and high transmission areas. About 4000 infants are born with LBwt who may die (23).

RATIONALE

The current national malaria guidelines on prevention of malaria during pregnancy recommends IPT-SP & ITN for all pregnant women in malaria endemic and non-malarial endemic regions, However the effect of this in non- malaria endemic regions has not been objectively evaluated. This study aims to determine the effectiveness of the interventions. Understanding the effectiveness and dynamics of the interventions on malaria during pregnancy in this region will help to revise malaria preventive approaches during pregnancy.

OBJECTIVES

Broad objective

To determine the effectiveness of Intermittent preventive treatment with sulphadoxine-pyrimethamine and Insecticide treated nets on the prevention of malaria in pregnancy in a non-malaria endemic area.

Specific objectives

1. To compare pre and post Intermittent preventive treatment with SP and Insecticide treated nets intervention in pregnancy.
2. To determine the incidence of malaria during pregnancy.
3. To determine the incidence of Low birth weight.
4. To determine the incidence of maternal and perinatal mortality.

Null Hypothesis

Intermittent preventive treatment with sulphadoxine-pyrimethamine and use of insecticide treated nets is not effective in the prevention of malaria in pregnancy in a non-malaria endemic area.

Main Question

What is the effectiveness of Intermittent preventive treatment with sulphadoxine-pyrimethamine and use of insecticide treated nets on the prevention of malaria in pregnancy in a non-malaria endemic area.

METHODOLOGY

STUDY DESIGN

This was pre and post IPT/ITN/IRS Intervention comparison study, where a group of pregnant women who received IPT and used ITNs were followed through the antenatal clinic until they delivered and compared with records of other group of women who attended ANC and delivered at the hospital before the implementation of intervention strategies.

STUDY AREA

The study was conducted at Kapsabet district hospital, Central Nandi district. The district has a population of 363,742 and has high transmissions season from February through to August each year. The hospital has a bed capacity of 200 and conducts about 12 deliveries per day.

STUDY POPULATION

The study population consisted of pregnant women attending antenatal care (ANC) at Kapsabet District Hospital. The population of pregnant women in the district is approximately. 18,187 per year and the average monthly ANC attendance at the district hospital is approximately 300. 40% of those who attend ANC deliver at the hospital.

ELIGIBILITY CRITERIA

Inclusion criteria

1. Consenting pregnant women who present to ANC in the first and second trimester before 28 weeks of pregnancy.

Exclusion criteria

1. Refusal of informed consent. Those who decline to take part in the study after adequate explanation were excluded.

2. Those commencing ANC after 28 weeks of pregnancy.

3. Those known to be allergic to SP.

SAMPLING PROCEDURE

Mothers attending ANC, who consent to the study and meets the inclusion criteria were recruited consecutively until the desired sample size was reached, then they were followed until delivery.

SAMPLE SIZE

The minimum sample size was calculated using the formula for comparative studies as follows:-

$$n1 = \left[\frac{z_{\alpha}\sqrt{2\bar{p}\bar{q}} + z_{\beta}\sqrt{p_1 q_1 + p_2 q_2}}{p_1 - q_1}\right]^2$$

n2 = kn1

Where:

n1 = Minimum sample size for Intervention group

n2 = Minimum sample size for Non - Intervention group

k = Factor of disease in non-intervention group when compared with the Intervention group (3 for this case)

z_α = Standard normal deviation for desired precision (1.96 in this case for α=0.05)

z_β = Standard normal deviation for desired power (1.28 in this case for power of 90%)

p_1 = Prevalence of malaria in the treated group -10.4% (34)

p_2 = Prevalence of malaria in the untreated group- average 25% (21, 22)

q_1 = $1-p_1$

q_2 = $1-p_2$

p = Average of p_1 and p_2

q = Average of q_1 and q_2

$$n1 = \left| \frac{1.96\sqrt{2x0.177x0.823} + 1.28\sqrt{0.104x0.896 + 0.25x0.75}}{0.104 - 0.25} \right|^2$$

n_1 = 141

n_2 = 3xn1 = 423

However, 143 subjects were sampled for the intervention group and 600 for the non-intervention group to improve on the precision.

STUDY TOOLS AND PROCEDURE

Three study assistants who were qualified nurses were trained on the study and how to administer the questionnaire. Questionnaire was then pretested to find out ease of administration and understanding. Recruitment of study participants was carried out after meeting the eligibility criteria. The questionnaire was administered to the study

participants by the study assistants and the principal investigator. **Part A** of the questionnaire was administered at recruitment and during administration of the second dose of SP.SP doses were administered at ANC, directly observed (DOTS)

Recruited woman were advised to seek treatment at the District hospital or nearby health facility should they fall sick. Documentation of malaria infection were based on those who were diagnosed with clinical malaria and put on anti-malarial drugs and those who tested positive for malarial parasites .Women were advised to deliver at the District hospital, and if not to report to the ANC within one week of delivery .

Study participants attended ANC routinely and at delivery **Part B:** of the questionnaire was administered and data collection form filled.

Records and files of 600 pregnant women who attended and delivered at the hospital were reviewed and data on those diagnosed with malaria, birth weights, still births, and maternal mortality from malaria were documented on non-intervention data collection form.

DATA ANALYSIS

Data was checked and cleaned before entering into software programme for social science research (SPSS). Analysis was done using SPSS and excel. Chi square and student t-test were used to test the relationships.

ETHICAL CONSIDERATIONS

The use of ITNs and IPT-SP is already a GOK policy and is acceptable. The study participants were explained to the nature of the study before being requested to participate. An informed consent was obtained from the participants recruited into the study and questionnaire administered then the outcomes were documented at delivery. Permission was obtained from the hospital medical superintendent to collect data at the ANC and to access hospital records. The study was approved by the Kenyatta National Hospital

Research and Ethical Committee. The study was also approved by the department of obstetrics and gynaecology University of Nairobi.

LIMITATIONS OF THE STUDY

Review of records and files was not randomised and therefore could have introduced bias. The use of ITNs was assessed through self reporting and it was yes or no answer,but the consistency of ITN use could not be verified. Use of ITNs is affected by the type of house which were not the same.

RESULTS

Table 1: Socio-demographic characteristics of the study participants.

		STUDY GROUPS			
Characteristics		Non-Intervention	Intervention	Total	P-Value
Age (yrs)	<15	4 (0.76)	0 (0%)	4 (0.5%)	0.13
	15-24	357 (59.5%)	73 (51%)	430 (57.9%)	
	25-34	192 (32%)	61 (42.7)	253 (34.1%)	
	35-44	44 (6.3%)	9 (7.3%)	53 (7.1%)	
	45+	3 (0.5%)	0 (0%)	3 (0.4%)	
	Total	**600 (100%)**	**143 (100%)**	**743 (100%)**	
Parity	0	357 (59.5%)	83 (58%)	440 (59%)	0.11
	1	141 (23.5%)	30 (21%)	171 (23%)	
	2	72 (12%)	21 (14.7%)	93 (12.5%)	
	3+	30 (5%)	9 (6.5%)	39 (5.5%)	
	Total	**600 (100%)**	**143 (100%)**	**743 (100%)**	
ANC Visits	1	274 (45.2%)	0 (0%)	274 (37.2%)	0.001
	2	278 (46.3%)	65 (45.6%)	343 (45.8%)	
	3+	48 (8.0%)	78 (54.4%)	126 (17%)	
	Total	**600 (100%)**	**143 (100%)**	**743 (100%)**	

Table 1, above, shows the mean age for the Non-Intervention group to be 24 years, while the mean age for the Intervention group was 25 years. In both groups most of the study participants were of parity 0 (59.5% in the non- intervention and 58% in the intervention group). Participants in the non- intervention group had less ANC visits, 45.2% had one visit, 46.3% had two visits and only 8% had more than two visits, compared with the intervention group where most of the participants had more than two visits (54.4%) and (45.6) had two visits.

Figure 1: Gestation at administration of 1st dose of SP (Intervention group)

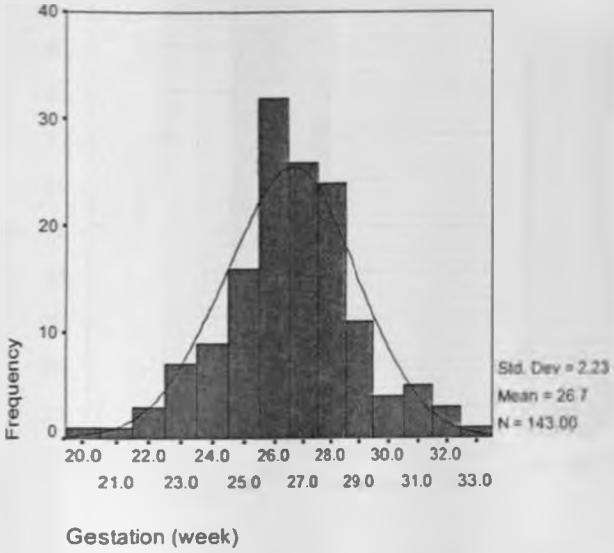


Figure 1 above., Shows that the mean gestational age at administration of 1st SP dose was at 26 weeks which was within the WHO recommended period (16-27wks) .

Figure 2: Gestation at administration of 2nd dose of SP. (Intervention group)

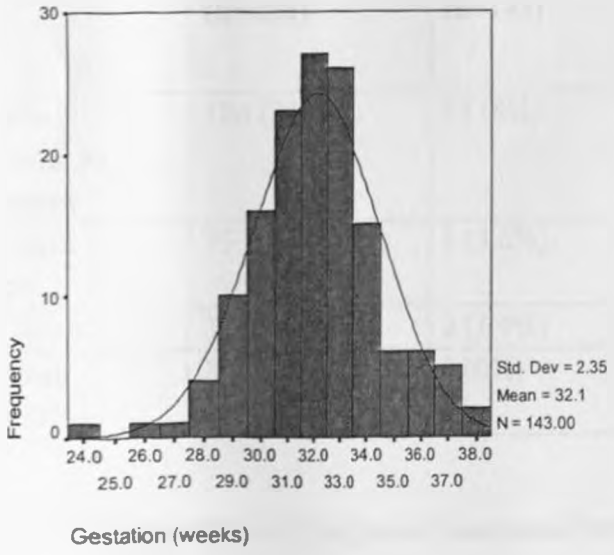


Figure 2, above shows that the mean gestational age at administration of 2nd SP dose was at 32 weeks, which was within the WHO recommended period (28-36wks).

Figure 3: **Methods of malaria prevention. (Intervention group).**

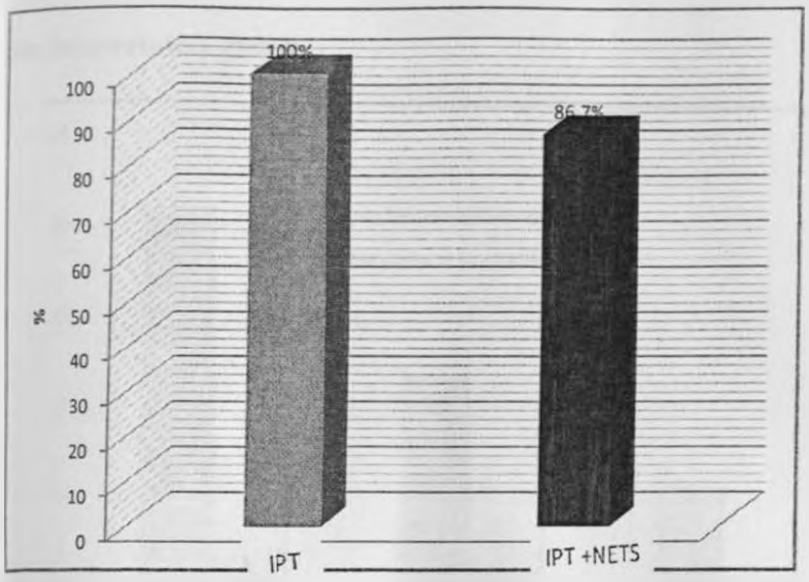


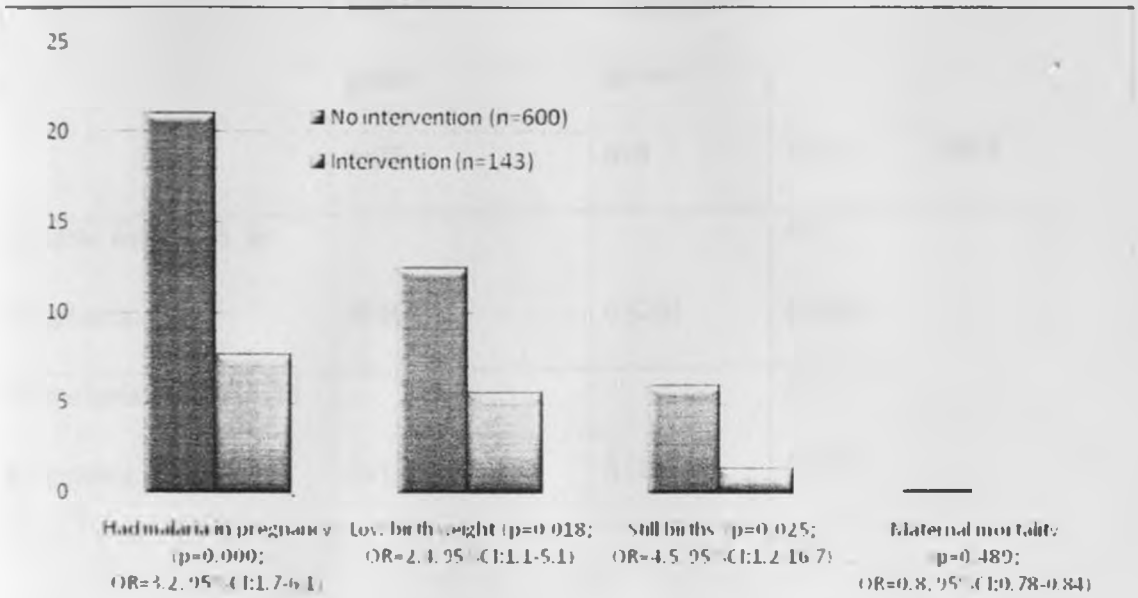
Figure 3, above , shows malaria protection methods used by the prospective study group (n=143). All the study subjects used IPT (100%) and 87 % used IPT &ITNs.

Table 2: **Comparisons of pregnancy outcomes between the Non- intervention and the intervention group**

Pregnancy out come	Non-Intervention (n=600)	Intervention IPT/ITNS (n=143)	P value	Odds Ratio	95% Confidence Interval
Malaria infection in pregnancy	126 (21%)	11 (8%)	0.000	0.024	1.7-6.1
Low birth weight	75 (12.5%)	8 (5.6%)	0.018	0.027	1.1-5.1
Still births	36 (6%)	2 (1.4%)	0.025	0.014	1.2-16.7
Maternal mortality	2 (0.3%)	0 (0%)	0.489	----	0.78- .84

Figure 4: **Comparisons of pregnancy outcomes between the Non- Intervention and the Intervention group**

Figure 4. **Comparisons of pregnancy outcomes between the Non- Intervention and the Intervention group**



OR = Odds Ratio, CI = Confidence Interval

Table 2 and figure 4 above shows that, the prevalence of malaria was 21% in the non-intervention group compared with 8% in the intervention group. 12.5% had low birth weight in the non-intervention group compared with 5.6% in the intervention group. Still births was more prevalent in the non-intervention group (6%) compared with intervention group(1.4%). There were 2 (0.3%) cases of maternal mortality in non-intervention group, and no maternal death in the intervention group.

Table 3: **Correlation of malaria in pregnancy and low Birth weight**

	Low Birth Weight(n=83)			
	Non- Intervention group n=75	Intervention group n=8	Total	P-value
Malaria infection in pregnancy.	46 (61%)	0 (0%)	46 (100%)	
No malaria infection in pregnancy.	29 (39%)	8 (100 %)	37 (100%)	
Total	**75 (100%)**	**8 (100%)**	**83 (100%)**	0.001

Table 3 above, shows that 61% of the women in the Non-intervention group who had malaria infection during pregnancy also delivered low birth weight babies compared with 0% in the intervention group.39% of the women in the Non-intervention group who had no malaria infection in pregnancy also had low birth weight babies compared with 8% in the intervention group.

DISCUSSION

This study found that the incidence of malaria infection in pregnancy was 21% in the non-intervention group compared with 8% in the intervention group, (p=0.000), this is comparable to the study done by Stekette et al where the point prevalence of malaria infection without interventions was 25% **(7)** and another by Falade et al where they found the incidence of malaria infection with IPT-SP intervention was 10% **(34)**. Malaria infection was reduced by 65% in the intervention group.

The incidence of low birth weight was 12.5% in the non-intervention group compared with 5.6% in the intervention group (p-value 0.018), this represented reduction of low birth weight by 50%, which is comparable to a study done by Duffy et al, where they found that preventive interventions reduced low birth weight by 43% **(1)**. 61% of the women in the Non-intervention group who had malaria infection during pregnancy also delivered low birth weight babies compared with 0% in the intervention group.39% of the women in the Non-intervention group who had no malaria infection in pregnancy also had low birth weight babies compared with 8% in the intervention group (p=0.001 **Table 3)**. There is a significant difference in low birth weight between the two groups among those who had no malaria infection during pregnancy which could be attributed to better antenatal care in the intervention group for other causes of low birth weight.

The incidence of Still births was 6% in the non-intervention group and 1.4% in the intervention group (p=0.025 **Table 2**). This represented a reduction in perinatal mortality by 66% which is different compared with results obtained from meta-analysis of intervention trials where perinatal mortality was reduced by 27% **(1)**. There were 2 (0.3%) cases of maternal mortality in the non-intervention group and no mortality in the intervention group. The maternal mortality in the non-intervention group translated to 2/1200 live births which is comparable to the study done by Ganja et al in Mozambique

where they found that maternal mortality attributable to malaria was in the range of 93-320,000/100,000 live births (**30, 36**).

There was no difference in age and parity distributions between the two study groups. Most of the study participants had a mean age of between 24-25 years (60%) in the non-intervention group and (51%) in the intervention group. Larger proportion of participants (59%) in both groups were primigravida which is also the group more susceptible to malaria in pregnancy (**Table 1**). Participants in the intervention group had more ANC visits, more than two visits (78%) compared with (8%) in the non- intervention group ($p=0.001$ **Table 1**). The difference in ANC visits is attributed to counselling and follow up during antenatal care in the intervention group.

In this study the use of intermittent preventive treatment –SP and insecticide treated nets was associated with favourable pregnancy outcome ($p<0.05$ **figure 4**). Other factors which could have contributed to the favourable change is health promotion education on the vector control activities, improved awareness on the signs and symptoms and early treatment of malaria which accompanied social mobilization during the implementation of the interventions in the year 2002. IPT/ITN policy is indeed good, but cost implications especially on sustainability of ITN provision and development of resistance to SP might be challenging in the near future. The on going trials of malaria vaccine in other countries might indeed be a promising intervention.

CONCLUSION

The use of Intermittent preventive treatment with sulphadoxine-pyrimethamine and Insecticide treated nets is effective in prevention of malaria in pregnancy in non-malaria endemic region and is associated with reduction of adverse pregnancy outcomes.

RECOMMENDATION

Ministry of health and partners to:-

- Maintain and upscale the use of sulphadoxine-pyrimethamine during pregnancy,
- Avail subsidised long lasting insecticide treated bed nets to pregnant women.
- Carry out periodic health promotion and vector control activity education at the community level. .

REFERENCES

1.Duffy E, Fried M, Malaria in pregnancy deadly parasite susceptible host .J lancet infectious diseases vol .7 Feb 2007.

2.Duffy E, Desowitz RS, Malaria in pregnancy throughout history ,dangerous labour , New York ,Taylor & Francis,2005:1-25

3.Blacklock DB, Gordon RM. Malaria infections as it occurs in late pregnancy ,its relationships to labour and early infancy .Ann Trops.med parasitol.1925,19:327-65.

4.Wickramasuriya GW, Some observations on malaria occurring in association with pregnanacy.J.Obs/Gyn.1935:42;816-34.

5.Archibald HM, The influence of malaria infections of the placenta on the incidence of prematurity ,Bull,WHO 1956 15:842-45.

6.Cannon DS, Malaria and prematurity on the western region of Nigeria .Br med J 1958,2:877-78.

7.Stekette RW , Nahlen Bl, Parise ME, Menendez C.The burden of malaria in pregnancy in malaria endemic areas ,AM J Trop,med Hyg 2001,64 (suppl) 28.

8.Diagne N, Rogier C, Sokhna CS ,*et al* .Increased susceptibility to malaria during the early postpartum period .N Eng,J med 2000. 343:598-603.

9.Nalhen BL, Rolling back malaria in pregnancy .N.Eng J med 2000.343:651-52.

10.Ramharler M, Grobusch MP, Kiessling G, *et a*l. Clinical and parasitological characteristics of puerperal malaria .J of Infectious diseases 2005 .195:1005-09.

11.Brabin BJ, Brabin LR, Sapau J, Alpers MP. A longitudinal study of splenomegally in pregnancy in malaria endemic areas in papua New Guinea .Trans.R.society tropical med .Hyg 1988.82:677-81.

12.Menedez C, Flaming AF, Alonso PL. Malaria-related anaemia. parasitology today 2000.6:469-76.

13.Shulman CE, Dorman EK, Bulmer JN. Malaria as a cause of anaemia in pregnancy .Lancet 2002 .360,494.

14.Verhoeff FH, Brabin BJ, Chinisuku L, Kazembe P, Broadhead RL. An analysis of the determinants of anaemia in pregnanat women in rural Malawi –a basis for action.Ann.Trop.med .parasitology 1999 .93:119-33.

15.Garner P, Gulmezoglu AM. Drugs for preventing malaria in pregnant women .Cochane Database system Rev.2006,4 CD000169.

16.Luxemberg C, MCGready R, Kham A, *et al.* Effects of malaria during pregnancy on infant maturity in areas of low malaria transmissions .AM J epidemiology 2001,154:459-65.

17.Guyatt HL, Snow RW. Malaria in pregnancy as indirect cause of infant mortality in sub-saharan Africa.Trans R,society of tropical med Hyg 2001,95;569-76.

18.Murphy SC, Breman JG. Gaps in the childhood malaria burden in Africa,cerebral malaria, neurological sequelae, anaemia, respiratory diseases,hypoglycaemia,& complications of pregnancy.AM J trop.med.Hyg2001,64(suppl) 57-67.

19.Brabin B, Rogerson SJ. The epidemiology and outcomes of maternal malaria.New York:Taylor & Francis ,2001.27-52.

20.Guyatt HL, Snow RW. Impact of malaria during pregnancy on low birth weight in sub-saharan Africa .Clinical microbiology rev.2004 17:760-69.

21.Akinde JA, Sowunmi A, Abohweyere AE. Congenital malaria in hyperendemic area,a preliminary study.An trop.paediatric 1993,13:273-76.

22.Egwunyenga OA, Atayi JA, Popova-Duhlinja DD, Nmorsi OP. Malaria infection of the umbilical cord and birth weight.in Nigerians.Cent. Africa J med 1996 ,42:265-68.

23.Division of malaria control.Intermittent preventive treatment of malaria in pregnancy MOH-National malaria strategy 2001-2010 pg 27-28.

24.Praise M *et al.* Efficacy of SP for the prevention of placental malaria in endemic and high prevelance of Hiv .1998.

25.D Alessandro V *et al.* The impact of national ITNs programme on the outcome of pregnancy in primigravida in Gambia .1996.

26.Dolan G, *et al.* Bed nets for prevention of malaria and anaemia in pregnancy .Trans.of Royal soc.of trop.medicine and Hyg 1993 ,87:620-626.

27.Hospital informations Systems (HIS-MOH) .Kapsabet District hospital. 2007.

28.Kenya Demographic and Health Survey 2003. Intermittent preventive treatment of malaria in pregnancy pg 175-178.

29.PSI /ITNs coverage of vulnerable groups reaches 50% in Kenya .Country briefs in Nairobi 12 Dec. 2006.

30.Ganja AC,Machungo F,Gomes A, Bergstrom S, Brabin B.Malaria related in urban mozambique.Tropical med.parasitol.1998 Apr.92(3)257-63.

31.Van Geetruydah JP, Thomas F, Erhart A, D Alessandro V. The contribution of malaria in pregnancy to perinatal mortality.Am J trop.med.Hyg.2004 :71(suppl) 35-40.

32.World Heatlh Organisation,Department of Malaria. The Abuja Declaration on Roll Back Malaria in Africa by the African heads of states and the Government of Kenya, 25th April 2000.Abuja Nigeria. Statement prepared by RBM,WHO,Geneva.April 2000.

33.Njagi K, Pascal M, Estambale B, Ouma J. Prevention of anaemia in pregnancy using ITNs and SP in highly malarious area of Kenya.A randomised contolled trial..Tran.Royal.soc.of tropical med. 2003.

34.Falade CO, Yusuf BO, Federo FF, Mokwolu OA, Hamer DH, Salaku LA. Intermitent preventive treatment with SP is effective in preventing maternal and placental malaria in Ibadan south-western Nigeria.2003.Pub. Medical Journal.

35.Gamble C, Ekwaru JP, Ter Kuche FO. Insecticide Treated Nets for preventing malaria in pregnancy.2001,Pub. Medical Journal.

36.Seasonal variation in the risk and causes of maternal death in Gambia.Am J Trop. Med.hyg. 2004 may.70(5):510-3.

37.Kenya. Ministry of Health. National Guidelines for Diagnosis, Treatment and prevention of malaria for heath workers in Kenya.Division of malaria control, Ministry of Health 2008edition.

APPENDIX 1: CERTIFICATE OF INFORMED CONSENT

University of Nairobi –Department of obstetric and gynaecology.

Name of the Research study : Effectiveness of intermittent preventive treatment with sulphadoxine-pyrimethamine (SP) and insecticide treated nets on the prevention of malaria in pregnancy in non-endemic region.

Principal Investigator : Dr Serem k. Edward

Resident ,Dep. of Obs/Gyn

University of nairobi

General information

We are requesting you to participate in the above mentioned research study. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not . Please read this form, (or have read to you). You will also be asked to sign it (or make a mark infront of a witness.)

Kenyatta National Hospital Ethics and Research committee and university of Nairobi have approved the study.we will give you a copy of this consent .The consent form may contain unfamiliar words,please ask us to explain.

Purpose of the Research .

This study will help us to know whether the use of fansidar/SP and mosquito bed nets by pregnant women in this region is beneficial in reducing malaria infection ,preterm delivery, low birth weight .maternal and foetal death and maternal anaemia.The information collected during this study will help in improving the future care of pregnant mothers in this region, Kenya and the world at large.

How the Research will be done and the role you will play.

The study will invite 143 pregnant women who come for antenatal care and who resides around this area to participate in the study. If you accept to participate in this study, you

will sign this consent form. You will then be given a brief education on malaria then asked questions by the study nurse and or doctor on your social, demographic, reproductive history and on use of mosquito nets. You will undergo the routine antenatal care carried out in this hospital, which involves periodical check on your general health .weight, blood pressure, baby's growth, haemoglobin levels .urinalysis, taking two doses of Fansidar/SP and blood building drugs(haematinics).if you develop a febrile illness during the study a finger prick blood (about 0.15ml) slide smear to check for malaria parasite .

Immediately after delivery the study nurse and or doctor will ask you other questions if at all you fell sick or had a febrile illness during the study period and where you were treated and if at all you were admitted. Your baby will then be weighed and that will mark the end of your participation in the study.

Possible risks .

There are no risks associated with this study .The use of Fansidar/sp and mosquito nets in pregnancy is already a government policy and it is approved and widely used.

Confidentiality

We will protect information about you and your taking part in this research to the best of our ability .We will not write your names on the research form nor on the consent form .If the results of this research are published, your name either will not be stated. However, Kenyatta National Hospital Ethics and Research committee and University of Nairobi may look at the records of those who participated in the study .

Compensation

You will not be paid for taking part in this research. You will however get all the care necessary for you and your baby.

Staying in or leaving the research study

You may choose to stay in or leave the study at any time. If you decide to leave , please inform the research doctor or nurse why you wish to leave. If you leave the study you will not be denied the care necessary for you and your baby.

Contacts for Questions

Please contact Dr Serem k. Edward ,Department of Obstetric and gynaecology ,Faculty of Medicine, University of Nairobi, P.O.Box 19676,Nairobi.mobile phone number +254722674108,

e-mail seremkim@yahoo.com if you have any problems or questions about this research

If you have any questions concerning your rights while you are on the research, you may contact the chairperson, Kenyatta National Hospital Ethics and Research committee, P.O.Box 20723,Nairobi.Tel.020-2726300-9.

This study has been explained to me. I have had a chance to ask questions.

I volunteer to take part in this research.

_____ _____

Sign or mark of volunteer Date

_____ _____

Sign of Research assistant /Investigator Date

APPENDIX 11: QUESTIONNAIRE

INTERVENTION- GROUP

PART : A: ADMINISTERED AT RECRUITMENT.

Demographic data

1. Clinic No _____ 2. Study No._____

3.Age _____Yr Parity _____

4.LMP _____EDD_____

5.Gestation at first clinic_____ 6.Hb at First clinic_____

7.1st SP dose date _____ 8.2nd SP dose Date _____

9.Residence s/loc _____ 10.District _____

11..Level of Education

(a) Nil [ ] (b) Primary [ ](c) Secondary [ ](d) Post Sec.[ ]

12.Marital status .

(a) Married [ ] (c) Single [ ] (c) separated/ divorced[ ]

(d) widowed [ ]

Occupation (Q13-14)

13. Self

(a) Employed [ ] (b) self employed [ ] (c) H/ wife [ ]

14. Husband

(a) Employed [ ] (b)Self employed [ ](c) farmer [ ] (d)others[ ]

15. Type of housing.

(a) Permanent(stone) [ ](b)Semi-permanent (mad) [ ](c)Others [ ]

ITNs

16. Do you have a mosquito bed net?

(a)Yes [ ] (b)No [ ]

17. If yes to Q 16, how many mosquito nets do you have in the house

(a) 1-2 [___] (b) 3-4[__] (c)5-10 [__] (d) > 10 [___]

18. Where did you get the bed nets?

(a) Issued free [ ] (b) Bought [ ]

19. Do you treat your bed nets ?

(a) Yes [ ] (b) No [ ]

20. If Yes to Q 19, how frequently?

(a) 3-5 months [ ] (b) 6-9 months [ ] (c) 10-18 months [ ]

21. If No to Q 19, why don't you treat your bed nets ?

(a) Cant afford [ ] (b) Don't know how to treat [ ]

(c) LLITNs [ ] (d) others_____

PART : B :. ADMINISTER AT DELIVERY

22.If No to Q 16 ,Did you acquire and use a bed net in the last 6 months ?

(a) Yes [ ] (b) No [ ]

23. Was your house sprayed with insecticides (IRS) within the last six months

(a) yes [ ] (b) No [ ]

24. Did you fall sick during this pregnancy?

(a) Yes [ ] (b) No [ ]

25. If yes to Q 24, did you seek treatment at the health facility?

(a) Yes[ ] (b) No[ ] (c) self medication[ ]

26. If yes to Q 25, was a blood slide taken for mps

(a) Yes [ ] (b) No [ ]

27. If yes to Q 26 above, what were the results?

(a) positive [ ] (b) Negative [ ] (c) Don't know [ ]

27. What kind of drugs were you given ?

(a)Anti-malarial [ ] (b)Antibiotics [ ] (c)Both a and b [ ]

(d) Don't know [ ]

ACUTE MALARIA –(ADMISSIONS)

28.Were you admitted to a health facility due to a febrile illness in this pregnancy

(a) yes [ ] (b) No [ ]

29.If yes to Q 28, which Health facility ?

(a) Disp. [ ] (b) H/ Centre [ ] (c) D/Hosp.[ ]

(d) Prov/National hosp. [ ]

30.Was the blood slide for mps taken ?

(a) Yes [ ] (b) No [ ] (c) Don't know [ ]

31. If yes to Q 30 what were the results ?

(a) positive [ ] (b) Negative [ ] (c) Don't know [ ]

32.What kind of drugs did you receive at the facility ?

(a) Quinine [ ] (b) Artemesinin [ ] (c) Don't know [ ]

33.Were you transfused with blood?

(a) Yes [ ] (b) No [ ]

34.How many days were you admitted at the H/ facility

(a) 1-2 [ ] (b) 3-5 [ ] (c) 6-10 [ ] (d) > 11 [ ]

APPENDIX 111: DATA COLLECTION FORM.

INTERVENTION GROUP

Date _____

1.Date of Delivery _____

2.No of ANC visits [ ]

3.Place of delivery

(a) Home [ ] (b) H/Facility [ ]

4.Gestation at Delivery [_____wks]

5.Mode of delivery (a) Vaginal [ ](b) C/S [ ]

6.Birth weight [_____gm]

(a) Live Birth [ ] (b) FSB [ ] (c) MSB [ ]

7.Maternal outcome

(a) Alive [ ] (b) Died [ ]

8.If Maternal dead, what was the cause ?

(a) Severe malaria [ ] (b)Anaemia [ ] (c) others [ ]

APPENDIX 1V :

DATA COLLECTION FORM

NON-INTERVENTION GROUP

1.Study No._____

3.Age _____Yr

4.Parity _____

5.Residence s/loc _____

6.District _____

7.Date of Delivery _____

8.No. of ANC visits [ ]

9.Mode of delivery

(a) Vaginal [ ](b) C/S [ ]

10.Birth weight [_____gm]

(a) Live Birth [ ] (b) FSB [ ] (c) MSB [ ]

11.Maternal outcome

(a) Alive [ ] (b) Died [ ]

12.If Maternal dead, what was the cause ?

(a) Severe malaria [ ] (b)Anaemia [ ] (c) others [ ]

APPENDIX V:

RESEARCH APPROVAL BY ETHICAL COMMITTEE

KENYATTA NATIONAL HOSPITAL
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Ref. KNH-ERC/ 01/ 412

21st May, 2008

Dr. Serem K. Edward
Dept. of Obs. & Gynae
UNIVERSITY OF NAIROBI

Dear Dr. Serem

RESEARCH PROPOSAL: "EFFECTIVENESS OF INTERMITENT PREVENTIVE TREATMENT AND INSECTICIDE TREATED NETS ON THE PREVENTION OF MALARIA IN PREGNANCY" (P34/3/2008)

This is to inform you that the Kenyatta National Hospital Ethics and Research Committee has reviewed and approved your above revised research proposal for the period 21st May, 2008 – 20th May, 2009.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given. Clearance for export of biological specimen must also be obtained from KNH-ERC for each batch

On behalf of the Committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study

This information will form part of database that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

PROF A N GUANTAI
SECRETARY, KNH-ERC

c.c. Prof. K.M. Bhatt, Chairperson, KNH-ERC
The Deputy Director CS, KNH
The Dean, School of Medicine, UoN
The Chairman, Dept. of Obs. & Gynae. UoN
Supervisors Dr Lubano Kizito, Dept. of Obs. & Gynae. UoN
Dr. Omondi Ogutu, Dept. of Obs. & Gynae. UoN