ASSESSMENT OF BURDEN OF MALARIA PARASITAEMIA AT BOOKING

DISSERTATION SUBMITTED TO THE NATIONAL POSTGRADUATE MEDICAL COLLEGE OF NIGERIA AS PART OF FULFULMENT FOR THE PART 11 FELLOWSHIP EXAMINATION IN THE FACULTY OF OBSTETRICS AND GYNAECOLOGY

BY

DR. EMMANUEL TUNDE OSINUGA
(MBBS LAGOS)

NOVEMBER 2011
DECLARATION

I hereby declared that this work is the original project conducted by me. The work has not been presented to any other college before now for the conferment of any degree or award nor has it been submitted elsewhere for publication.

………………………..

DR. E.T. OSINUGA
SUPERVISOR’S ENDORSEMENT

I certify that this research work titled ‘BURDEN OF MALARIA PARASITAEMIA WITH ADVANCING GESTATIONAL AGE’ was carried out under our supervision.

----------------------------------------------------------------------------------
Supervisor:

DR. O.A ROBERTS (MBBS, FRCOG, FICS)
Consultant Obstetrician and Gynaecologist
Department of Obstetrics and Gynaecology
University College Hospital Ibadan

----------------------------------------------------------------------------------
Supervisor:

DR. O.A ADESINA (MBBS, FWACS, MSC)
Consultant Obstetrician and Gynaecologist
Department of Obstetrics and Gynaecology
University College Hospital Ibadan

----------------------------------------------------------------------------------
Supervisor:

DR. F.A FEHINTOLA (MBBS, MSC, FMCP)
Consultant Clinical Pharmacologist
Department of Clinical Pharmacology
University College Hospital Ibadan
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title page</td>
<td>i</td>
</tr>
<tr>
<td>Declaration</td>
<td>ii</td>
</tr>
<tr>
<td>Certification</td>
<td>iii</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>iv</td>
</tr>
<tr>
<td>Dedication</td>
<td>vi</td>
</tr>
<tr>
<td>Acknowledgment</td>
<td>vii</td>
</tr>
<tr>
<td>Summary</td>
<td>viii</td>
</tr>
<tr>
<td><strong>CHAPTER ONE</strong></td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td><strong>CHAPTER TWO</strong></td>
<td></td>
</tr>
<tr>
<td>2.1 Literature Review</td>
<td></td>
</tr>
<tr>
<td>2.1.1 Life Cycle of Plasmodium</td>
<td>4</td>
</tr>
<tr>
<td>2.1.2 Pathophysiology</td>
<td>5</td>
</tr>
<tr>
<td>2.1.3 Clinical Manifestation</td>
<td>6</td>
</tr>
<tr>
<td>2.1.4 Diagnosis</td>
<td>7</td>
</tr>
<tr>
<td>2.1.5 Prevention &amp; Management</td>
<td>8</td>
</tr>
<tr>
<td>2.2 Rationale</td>
<td>11</td>
</tr>
<tr>
<td><strong>CHAPTER THREE</strong></td>
<td></td>
</tr>
<tr>
<td>Aim and Objectives</td>
<td>12</td>
</tr>
</tbody>
</table>
CHAPTER FOUR

Methodology
4.1 Study Area 13
4.2 Study Population 13
4.3 Sampling 13
4.4 Inclusion Criteria 14
4.5 Exclusion Criteria 14
4.6 Sample Size 15
4.7 Data Collection Method 16
4.8 Data Analysis 18
Ethical Consideration 19

CHAPTER FIVE

Results 20

CHAPTER SIX

Discussion 31

CHAPTER SEVEN

7.1 Conclusion 35
7.2 Recommendation 35
7.3 Limitation of the Study 36
Dissemination of Results 36
References 37
Appendices 44
Questionnaire 50
DEDICATION

This book is dedicated to:

The Almighty God for his guidance and grace.

My wife, Olajumoke, and my children Mofopefoluwa and Moyosoreoluwa

My parents, siblings and in-laws.
ACKNOWLEDGEMENT

I give God all the glory for the privilege to be in this profession and for making this dissertation a reality.

My profound gratitude goes to my Head of Department, Professor Arowojolu and to the entire consultant staff of the Department of Obstetrics and Gynaecology of the University College Hospital, Ibadan, for the great knowledge they have imparted on me.

I am very grateful to my supervising consultants Dr. A. Roberts, Dr. Adesina and Dr. Fehintola, for their guidance, encouragement and support towards the completion of this dissertation.

I appreciate my senior colleagues and contemporaries alike, those that have left the department and those that are still around.

I say a big thank you to my parents for being with me through the thick and thin. I appreciate my siblings Ayo, Titi, Femi and Lanre and my Uncle, Dr. Kalejaiye.

My wife Olajumoke has been a pillar of support and encouragement to me, without her I would not have been able to finish this work. I will not forget my children Mofopefoluwa and Moyosoreoluwa for taking care of daddy too.

I also appreciate Dr. & Mrs Ladapo my in-laws for always asking after my well being and the support they offered.

Finally to all that participated in the study, thank you all.
SUMMARY

A pregnant woman is more prone to adverse consequences of malaria infection than her non pregnant counterpart. The World Health Organisation (WHO) developed a strategic framework for malaria prevention and control during pregnancy with a goal to reducing the morbidity and mortality associated with malaria infection. The strategy involves effective case management of malaria infection, use of insecticide treated nets (ITN) and intermittent preventive treatment (IPTp).\(^1\)

SETTING

This study was carried out at the antenatal clinic of the University College Hospital Ibadan.

OBJECTIVES

This study was to determine the prevalence of malaria parasitaemia among pregnant women at booking and to evaluate malaria preventive measures undertaken by them.

METHODOLOGY

This was a descriptive cross-sectional study conducted between August 2010 and November 2011. One hundred and eighty pregnant women were randomly recruited at booking clinic after obtaining an informed consent.

In addition to routine antenatal care, a structured questionnaire containing bio-data and malaria preventive measures was administered to each participant at each visit. Two thick blood film samples were taken to screen for the presence of malaria parasite and determine parasite density. Two capillary blood samples were also taken and read on Hawksley microhematocrits reader to determine the packed cell volume the average was calculated.
RESULTS

The prevalence of peripheral malaria parasitaemia at booking in this study was 7.2%, primigravidae have a higher prevalence 11.8% compared to multigravidae 3.9% ($p = 0.041$).

Malaria parasitaemia was less common among respondents with tertiary education (3.9%) compared with those with secondary school education and below (16%) ($p = 0.005$).

HIV prevalence among the respondents was 14.4%, 19.2% of this group had malaria parasitaemia this was statistically significant ($p = 0.011$).

Prevalence of anaemia at booking was 11.1%, 40% of respondents with anaemia had malaria parasitaemia compared with 3.13% without anaemia but with malaria parasitaemia, this was statistically significant ($p = 0.001$).

Insecticide Treated Nets (ITN) were found to be significantly protective against malaria parasitaemia ($p = 0.009$), none of the users had malaria parasitaemia. Education has significant association with the use of ITN (0.001).

None of the respondent who had used Intermittent Preventive Treatment with Sulphadoxine-Pyrimethamine (IPTp-SP) had malaria parasitaemia. HIV was significantly associated with more usage of IPTp-SP ($p = 0.001$).

CONCLUSION

The prevalence of patent peripheral parasitaemia among pregnant women was relatively lower than previously documented in previous studies. Prevalence of patent peripheral parasitaemia exhibits an inverse relationship with the use of insecticide treated nets (ITN) and intermittent preventive treatment with sulphadoxine-pyrimethamine. This makes it imperative to improve access to ITN and IPTp-SP with a view to improving antenatal care and ultimately reduction of maternal and possibly infant mortality.
CHAPTER ONE

INTRODUCTION

Each year approximately 25 million African women get pregnant in sub-Saharan Africa where malaria infection is endemic.\textsuperscript{1,2,3} Malaria infection in pregnancy causes up to 10,000 maternal deaths each year and contributes to high rates of maternal and infant morbidity and mortality.\textsuperscript{1,4,5} Pregnant women are four times more likely to suffer from complications of malaria than non-pregnant women.\textsuperscript{6} Pregnant women are vulnerable because their natural immunity is reduced.\textsuperscript{7} This reduction in immunity tends to be more in primigravidae than in multigravidae and results in more frequent episodes of parasitaemia and adverse effects.\textsuperscript{1,8} Age has also been implicated as epidemiological studies have shown that malaria in pregnancy is more prevalent in younger than older age groups.\textsuperscript{9,10}

In Nigeria, prevalence of malaria parasitaemia among pregnant women varies depending on the geopolitical region and the study population.\textsuperscript{3,11,12} Malaria transmission is said to be more intense in rural areas than urban areas.\textsuperscript{13} Poor socio-economic status has also been associated with increased burden of malaria infection in pregnancy.\textsuperscript{10,14}

The severity of clinical manifestations is determined by the level of immunity before pregnancy and the intensity of malaria transmission. In low endemic or unstable transmission areas, the degree of acquired immunity of women prior to pregnancy is low, and both the mother and her fetus are at risk for the most severe consequences of the infection. In areas of high malaria transmission (as in sub-Saharan Africa), adults including women have acquired some protective immunity prior to pregnancy. This however wanes during
pregnancy predisposing her to increased risk of complications of malaria infection.\textsuperscript{6,15,16}

The invasion of the placenta by malaria parasites results in sequestration of the parasites in the placental intervillous spaces and its attachment to the secreted chondroitin- sulphate-A. This together with other pro inflammatory cells and cytokines results in adverse pregnancy outcomes such as; abortion, premature labour, small for date babies and fetal/maternal deaths in some cases.\textsuperscript{17,18}

Although malaria in pregnancy is frequently asymptomatic, consequences of malaria infection in pregnancy comprise of maternal anaemia, abortion, stillbirth, intrauterine growth retardation, low birth weight (LBW), preterm delivery, and up to 200,000 attributable infant deaths per year.\textsuperscript{6,18-22} A recent study estimated that malaria may contribute 3–5\% of maternal anaemia, 8–14\% of LBW, and 3–8\% of infant mortality.\textsuperscript{20} Another study by Falade et al. also reported a high correlation between malaria parasitaemia and anaemia, and symptomatic malaria was associated with early booking.\textsuperscript{11}

Prevention of malaria encompasses a variety of measures that may protect against being bitten by the disease vector or against the development of the disease in infected individuals.\textsuperscript{20} World Health Organisation (WHO) recommends a three pronged approach to the prevention and management of malaria during pregnancy. These include prompt case management (diagnosis and treatment) of patients suffering from malaria, prevention of infection through vector control which include use of insecticide-treated bed nets, and intermittent preventive treatment with sulphadoxine-pyrimethamine.\textsuperscript{1}

Since the early 2000, prevention of malaria in pregnancy has been based on intermittent preventive treatment (IPTp) and insecticide-treated bed nets (ITNs).\textsuperscript{1} Although insecticide-treated bednets and curtains have emerged in recent years as promising tools, they are under utilised in Africa.\textsuperscript{23} Various studies have shown its effectiveness in control of malaria among pregnant
D’ Alessandro et al showed that use of ITNs significantly reduced the number of parasitaemia in villages where it was used compared to control villages. ter Kuile et al also showed that women who used ITN had significantly fewer pre-term deliveries and babies with higher mean weight than women who did not use ITN.

Intermittent preventive treatment during pregnancy (IPTp) with Sulfadoxine-pyrimethamine (SP) is the drug currently recommended for chemoprophylaxis. It has good safety profile, feasible for use, as it can be delivered as a single dose treatment under observation by the health worker and remains a good option for chemoprophylaxis in endemic areas in Africa.

WHO recommends that the first dose should be administered at the first ANC visit after quickening which ensures that the woman is in the second trimester of pregnancy subsequent doses should be given at least one month apart. There is currently no precision regarding the best timing for their administration as it entirely depends on the timing and frequency of ANC visits of the woman. The use of IPTp in pregnant women has been shown to be effective in reducing the prevalence of malaria infection in pregnancy as well as improving pregnancy outcome. In studies in eastern and southern Africa IPTp use has been associated with reduction in maternal anaemia, placental malaria and the incidence of low birth weight.

The aim of this study is to determine the point prevalence of malaria parasitaemia among pregnant women at booking and to evaluate malaria preventive measures undertaken by them.
CHAPTER TWO

2.1 LITERATURE REVIEW

Pregnant women are more susceptible to malaria than the general population: they are more likely to become infected, suffer a recurrence, develop severe complications and die from the disease. Malaria contributes very significantly to maternal and fetal mortality with at least 10,000 maternal deaths per annum attributable in Sub-Saharan Africa.\(^{38}\)

The burden of malaria infection during pregnancy is caused chiefly by *Plasmodium falciparum*, the most common malaria species in Africa,\(^1\) other species are *P. vivax, P. malariae*, and *P. ovale*. Every year at least 30 million pregnancies occur among women in malarious areas of Africa, most of who reside in areas of relatively stable malaria transmission.\(^{39,40}\)

Malaria is usually spread by the bite from an infected female anopheles mosquito but may follow transfusion of infected blood or use of syringe contaminated with infected blood, transplacental infection can also occur.\(^{41}\)

2.1.1. Life cycle of *Plasmodium*

The life cycle of genus *Plasmodium* consists of complex asexual reproductive phases in man and both sexual and asexual phases in female Anopheles mosquito. The biphasic asexual cycle in man begins with sporozoites inoculation when an infective mosquito attempts to take a blood meal. The sporozoites as soon as released into capillaries and venules disappear into the liver within 30-60 minutes to begin pre-erythrocytic schizogony. The sporozoites develop within the hepatocytes to form hepatic trophozoites and schizont with eventual rupture of the hepatocytes to release merozoites. This development within the liver usually lasts 5-7 days for *P. falciparum* and up to 15 days for *P. malariae* while *P. vivax and P. ovale*, the Plasmodium species responsible for malaria relapse require 8-9 days.
The merozoites released from the hepatocytes invade the red blood cells to begin the second phase of asexual cycle in man. Invasion of erythrocytes requires a specific surface receptor. In *P. vivax* this is related to Duffy blood group antigen (Fy\textsuperscript{a} or Fy\textsuperscript{b}) which is lacking in most West Africans.\textsuperscript{42,43,44} People of this region are therefore resistant to infection by this *Plasmodium* species. Erythrocytic cycle usually lasts 48 h except in *P. malariae* when it takes 72 h to complete. The immature trophozoites feed on host’s haemoglobin to develop to mature trophozoites then undergo nuclear fission (schizogony) and, eventual release of 6-8 merozoites in *P. falciparum* and 16-24 in the others. The resultant merozoites are capable of invading red cells and repeating the cycle. After a series of such asexual cycles some of the parasites develop into morphologically distinct sexual forms (gametocytes) which are long lived and incapable of further development in man.

Life cycle in female anopheles mosquito begins with the fusion of male and female gametocytes in the midgut following their ingestion with blood meal to form a motile zygote called ookinete this becomes encysted to form oocyte. The resulting oocyst expands by asexual division until it bursts to liberate myriad of sporozoites which then migrate to the salivary gland to await inoculation into another human at the next feeding.

2.1.2 Pathophysiology

Pregnant women are more susceptible to malaria infection than their non pregnant counterpart\textsuperscript{7,15,45} and the infection is more rampant among the primigravidae than the multigravidae\textsuperscript{9}. The preferential susceptibility of these sets of pregnant women may be related to some evidence that immuno-suppression associated with pregnancy, occurs more in the first than subsequent pregnancies.\textsuperscript{46,47} Several factors are known to retard the development of cellular immunity. These include the absence of major histocompatibility antigens on the surface of infected red cells, which precludes direct T-cell recognition,
malaria antigen-specific immune unresponsiveness, and the enormous strain diversity of malaria parasites and their ability to express variant antigens on the erythrocyte surface which change during the period of infection.\textsuperscript{47,48} These however, do not explain why multigravidae are still susceptible to malaria infection.

Currently, susceptibility to Plasmodium parasitaemia has been linked to the level of antibodies to placental sequestrated parasites.\textsuperscript{49} Indeed these parasites preferentially adhere to chondroitin sulphate-A receptors (CSA) expressed by the syncytiotrophoblasts in the placenta.\textsuperscript{50} Women in their first and second pregnancies are more susceptible as anti adhesion antibodies against CSA binding parasites develop after successive pregnancies.\textsuperscript{51} The parasites sequester along the surface of the placental membrane, specifically the trophoblastic villi, extravillous trophoblasts, and syncytial bridges. These changes impede oxygen-nutrient transfer and can contribute to the complications experienced by the pregnant woman.

### 2.1.3 Clinical Manifestations

Malaria infection with \textit{P falciparum} during pregnancy results in a wide range of adverse consequences for the pregnant women. The symptoms and complications of malaria differ with the intensity of malaria transmission, the level of immunity acquired before pregnancy and the efficacy of the immune responses during pregnancy. The prevalence and intensity of malaria infection during pregnancy is higher in women with HIV infection due to diminished immunity in them.\textsuperscript{52-54}

The presence of parasites in peripheral blood without symptoms is common in hyper-endemic areas, and is associated with chronic anaemia, placental sequestration and low birth weight babies.\textsuperscript{10,55} Previous studies have shown positive correlation between anaemia, low birth weight (LBW) and high infant mortality.\textsuperscript{22,35,56}
Anaemia tends to occur between 16-29 weeks - due to haemolysis of parasitised cells and increased demands of pregnancy with or without folate or iron deficiency. Five to ten percent of pregnant African women have severe anaemia; of which twenty six percent is thought to be attributable to malaria. Severe anaemia eliminates any physiological reserve to cope with haemorrhage, making the women more likely to die during childbirth.

In areas of low or unstable malaria transmission, women may have little acquired immunity to malaria hence pregnancy loss in the 1st trimester is common if infection occurs early in pregnancy, late infection may result in premature delivery.\textsuperscript{1}

Patients with malaria may present with chills and fever, often associated with headache and muscle aching. Fever may be low-grade or very high. Other presenting non specific symptoms include malaise, dry cough, abdominal pains, nausea, anorexia and vomiting. Splenomegaly may occur but tends to regress in the second half of pregnancy. Features of cerebral malaria (impaired consciousness, seizures) and jaundice can be the presenting features of an acute, severe illness\textsuperscript{36}. Acute pulmonary oedema, hypoglycaemia, diarrhoea and other complications may be seen in pregnancy.

Malaria in pregnancy is detrimental to the fetus. High grades fever, placental insufficiency, hypoglycaemia, anaemia and other complications can all adversely affect the fetus. Spontaneous abortion, pre mature birth, still birth, placental insufficiency, intrauterine growth restriction, low birth weight, fetal distress are the different problems observed in the growing fetus. Trans-placental spread of the infection to the fetus can result in congenital malaria.\textsuperscript{58}

2.1.4 Diagnosis

Presumptive diagnosis of malaria is clinical though, appropriate laboratory confirmation is desirable where facilities are available. Laboratory confirmation of malaria tests on the demonstration of asexual forms of the
parasite in the peripheral blood smears stained with one of the Romanowsky stains (Giemsa; Wright; Field, or Leishman’s at pH 7.2). Both thick and thin smears should be examined under oil immersion. The thin smear must be air dried and fixed with methanol. The parasitaemia is expressed as the number of parasitized erythrocytes in 1000 cells and then converted to the number per micro litre. In the case of thick smear, staining is done without fixing. The thick film has the advantage of concentrating the parasites, and therefore increasing the sensitivity of diagnosis. Both parasites and white cells are counted and the number of parasites per micro litre calculated from leukocyte count. A minimum of 200 white cells should be counted.

So far, microscopy remains the gold standard for qualitative and quantitative assessment of parasite load. The sensitivity is not 100% and occasionally, asexual forms may be missed in the thin film and, interpretation of thick smear may require experienced microscopist to avoid misdiagnosis.

Other laboratory diagnostic techniques include\textsuperscript{59-64} (i) Quantitative buffy coat (QBC) which requires far more financial resources and is less sensitive than microscopy; (ii) determination of parasite-specific lactate dehydrogenase (pLDH) (iii) detection of parasite deoxyribonucleic acid (PCR amplified DNA detection by gel electrophoresis) and, (iv) parasite specific antigen detection (parasight-F test), which has been found to compare favourably with microscopy. However, parasite quantification is less than perfect.

\textbf{2.1.5 Prevention and Management}

In areas of high or moderate transmission, most malaria infections in pregnant women are asymptomatic and infected women do not present for treatment. In such areas, the World Health Organization recommends a combination of interventions to prevent malaria in pregnancy including insecticide-treated bed nets (ITN), intermittent preventive treatment in pregnancy (IPTp) and effective case management and treatment.\textsuperscript{1,65} Sleeping
under ITN remains an important strategy for protecting pregnant women and their newborns from malaria-carrying mosquitoes. In addition, in areas of high and moderate transmission of malaria, intermittent treatment with an antimalarial drug has been established as a cost-effective means of preventing malaria infection in pregnancy.

IPTp consists of the administration of a single curative dose of an efficacious anti-malarial drug at least twice during pregnancy regardless whether or not the woman is infected. The drug is administered under supervision during antenatal care (ANC) visits. Sulphadoxine-pyrimethamine (SP) is the drug currently recommended by the WHO because of its safety and efficacy in pregnancy. Several studies have shown the high efficacy of IPTp with SP, compared to placebo or CQ prophylaxis, on placental infection, LBW and severe maternal anaemia.

WHO recommends the administration of at least two doses of SP during pregnancy. While two doses were found more efficacious than a single dose, few studies have investigated the efficacy of a higher number of intake, these studies showed that three or more SP doses were more efficacious than two in HIV-positive women, but that no benefit was found in HIV-negative women. The first dose should be administered at the first ANC visit after quickening, which ensures that the woman is in the second trimester of pregnancy. The following IPTp doses should be given at least one month apart.

The exact mechanism of action of IPTp has yet to be fully elucidated, however, both suppressive/treatment and prophylactic effects (opportunistic prophylaxis) are thought to be possible. During pregnancy IPTp provides intermittent clearance or suppression of existing asymptomatic infections from the placenta (the treatment effect) and slowly eliminated drugs, such as sulfadoxine pyrimethamine, may prevent new infections from occurring by maintenance of suppressive drug levels (the prophylactic effect).
If malaria is suspected in a pregnant woman drugs should be used at adequate doses according to clinical condition and local resistance patterns. Complicated cases should be immediately referred to a health care centre where obstetric and neonatal care is available. A recent Cochrane review pointed to the lack of quality data, particularly as regards drug safety in pregnancy.\textsuperscript{66}

Chloroquine and quinine can be used safely at any trimester during pregnancy, but resistance is common especially to the former. Artemisinins appear to be safe in the second and third trimesters.\textsuperscript{67} Mefloquine and pyrimethamine/sulphadoxine are safe in second and third trimesters. Primaquine, tetracycline, doxycycline and halofantrine are contra-indicated in pregnancy.

The treatment of choice for uncomplicated falciparum malaria is a combination of two or more antimalarial drugs with different mechanisms of action. Artemisinin based combination therapy (ACT) is the recommended treatment of choice, for example artemether-lumefantrine, artesunate-amodiaquine, artesunate-mefloquine and artesunate-sulphadoxine-pyrimethamine. ACTs are usually avoided in the first trimester except if it is the only effective treatment available. This is because of the in-utero toxicity reported in animals. Quinine is therefore preferred.

Fluid replacement needs to be very carefully monitored to prevent pulmonary oedema. If anaemia requires transfusion (Hb <7-8 g/dL) then packed cells are preferred to avoid fluid overload. The complications of malaria should be carefully and aggressively managed.
2.2 RATIONALE

Malaria infection during pregnancy is a major health problem in the tropics and sub-tropics. Malaria infection in pregnancy contributes to high maternal mortality rate in Nigeria. Pregnant women and their infants carry disproportionate burden of malaria. Placenta malaria has been shown to be a cause of low birth weight mainly through intra uterine growth restriction and preterm delivery thus, increasing the risk of neonatal and infant morbidity and mortality. Since data on placenta malaria are available only at delivery all efforts to reduce malaria infection during antenatal period in pregnancy cannot be overemphasized.

Despite serious impact of malaria infection during pregnancy being known for over half a century yet coverage of pregnancies at risk for malaria infection according to WHO and national guidelines has been low in Nigeria and other malaria-endemic regions. There is therefore need for continued survey of peripheral parasitaemia among pregnant women with a view to obtaining vital information to reduce the scourge of malaria and aim at achieving the 2015 target of WHO Millennium development goal of improving the maternal health and reducing infant mortality in Nigeria and sub Saharan Africa.

The findings from this research will help to develop and strengthen national capacity for control of malaria during pregnancy.
CHAPTER THREE

AIM

To determine the burden of malaria parasitaemia during booking visit

OBJECTIVES

1. To determine prevalence of malaria parasitaemia among pregnant women at booking.
2. To evaluate malaria preventive measures undertaken by the pregnant women at booking
CHAPTER FOUR

METHODOLOGY

4.1 Study Area

This was a descriptive cross sectional study conducted at the University College Hospital (UCH), Ibadan between August and November 2010. University College Hospital is a tertiary centre located in the heart of the ancient city of Ibadan which is the capital city of Oyo state. It serves as a referral centre for surrounding hospitals and other distant hospitals within the country. The population of Ibadan according to 2006 Census is 2,550,593. Ibadan lies between 7.3°N latitude and 3.4°E longitude in the guinea savannah belt with an average rainfall of about 1250mm annually. The area is hyper endemic for malaria transmission and transmission is intense year round with a peak during the raining season months of May to October which reflects the breeding rhythm of Anopheles vector.

4.2 Study Population

This consisted of pregnant women attending antenatal booking clinic at the University College Hospital, Ibadan.

4.3 Sampling

A simple random sampling of all consenting pregnant women at consecutive booking clinic was done using random numbers which were generated from a computer. Numbers were randomly assigned to the pregnant women during health education by each pregnant women picking a number from a set of sealed cards after explaining the procedure involved to them, those whose numbers were generated from the computer were recruited into the study. This process was done at each booking clinic until the sample size was completed.
4.4 Inclusion Criteria

All pregnant women who attended booking clinic and consented to participate in the study.

4.5 Exclusion Criteria

Women who refused consent.
4.6 Sample size

The sample size was estimated using the Kish and Leslie formula

\[ N = Z^2 \frac{p \times q}{d^2} \]

Where;

- \( N \) = minimum sample size.
- \( Z \) = area under the curve corresponding to 95% confidence interval (1.96)
- \( p \) = expected prevalence (8.4%)
- \( q \) = 1 - \( p \)
- \( d \) = is the precision of the study which is 0.05 (95% confidence interval)

\[ N = (1.96)^2 \times 0.084 \times (1 - 0.084) / (0.05)^2 \]
\[ = 0.295588 / 0.0025 \]

Sample size (N) was 119

With anticipated successful sample follow up rate of 90% (0.90), sample size (n) was calculated as

\[ n = N / 0.9 \]
\[ n = 131 \]
4.7 Data collection methods

At enrolment during antenatal booking, I calculated the gestational age of each pregnant woman recruited from her last menstrual period or early scan date. Information on the socio-demographic data, gestational age, parity, chemoprophylaxis and other malaria preventive practices of the pregnant women were collected at booking using an interviewer administered-questionnaire. Each participant had a complete obstetrics examination including weight, height, axillary temperature and symphysio-fundal height determined.

In addition to all the routine obstetric examinations and investigations each participant was screened for malaria parasitaemia during the booking visit. Two thick blood films were prepared from a finger prick blood sample of all the enrolled participants. The thick blood smears were sent to the Malaria Research laboratory of the Obstetrics and Gynaecology Department and Clinical Pharmacology laboratory both of the University College Hospital Ibadan for quality assurance. The slides were air dried and stained with 10% freshly prepared Giemsa stain at pH 7.2 and analysed. No slide was declared negative until and unless 200 contiguous oil immersion fields had been examined.

Parasite density was determined by counting the number of asexual parasites relative to at least 200 leukocytes in each thick blood film or 500 asexual parasites whichever occurs first and assuming a leukocyte count of 8000/ul of blood. Thus, parasite density was calculated from the following equation:

\[ \text{No of parasite} \times \frac{8000}{\text{no of leucocytes}} \]

Packed cell volume was determined by Hawksley™ microhaematocrit centrifuge and read on the microhaematocrit reader at the Obstetric and Gynaecology haematology laboratory of the University College Hospital Ibadan. Two readings were obtained and the mean of two readings was recorded as the packed cell volume for the patient. Packed cell volume was
graded as normal (≥30%); mild anaemia (27-29%); moderate anaemia (19-26%); and severe anaemia (≤18%). Parasitaemia was graded as low (Parasite count <250,000/µl) and hyperparasitaemia (Parasite count ≥ 250,000/µl).

Primary outcome measure: malaria parasitaemia.

Secondary outcome: Presence of anaemia, association between use of malaria preventive measures and malaria parasitaemia.

At the study centre, in addition to the health education given to the pregnant women at each antenatal visit they are also routinely counselled on the benefits of chemoprophylaxis with sulphadoxine-pyrimethamine in pregnancy. The drug is prescribed for pregnant women who are up to 20 weeks gestation to be taken under direct observation of the health provider and for a repeat dose at least 4 weeks later according to WHO protocol.
4.8 Data analysis

Data entry and analysis was performed using Statistical Package for Social Sciences 16 (SPSS 16 Inc., Chicago, IL. U.S.A). Data were summarized using frequency tables, graphs, mean and standard deviations. Bivariate analysis was done with chi-square test to compare proportions for categorical variables while continuous variables were analyzed by t-test both for equal and unequal variance. Level of statistical significance was p<0.05 for all analysis.
ETHICAL CONSIDERATIONS

In designing this study the following ethical issues were put into consideration.
The purpose of the study was explained to all the participants. Participation was voluntary and participants were asked to sign informed consent forms. They were informed of their freedom to withdraw or refuse to take part in the study without prejudice to the usually expected standard of care.
The participants were assured that their identity will be kept in confidence by the investigator.
No participant was made to pay for the investigations (the blood film for malaria parasites or packed cell volume estimation).
All precautions were taken to ensure that the procedure was not injurious to the participants.

ETHICAL APPROVAL

Ethical approval was got for the study from the University of Ibadan and University College Hospital (UCH) Ethical Review Board.
CHAPTER FIVE

RESULTS

Socio-biological characteristics of the 180 participants:

A total of one hundred and eighty pregnant women were enrolled at the booking clinic for the study.

The mean age for the participants was 30.5 ± 4.0 years and majority of the participants were 30 years of age and above 106/180 (58.9%) (Table 1 & 2). The mean weight and height were 70.8 ± 11.6 kg and 1.6±0.06 meters respectively (Table 1).

One hundred and thirty (72.2%) had tertiary education while fifty (27.8%) had secondary education and below (Table 2). Majority of the participants were professionals 69/180 (38.3%), 41 (22.7%) were artisans or into trading while 30 (16.7%) were unemployed (students, house wives and applicants were in this category) (Fig 1).

The modal parity was 0 and range between 0 - 4, 76/180 (42.2%) of the participants were primigravidae while the remaining 104 (57.8%) were multigravidae. Majority of the participants, 116 (64.4%) attended antenatal booking clinic during the second trimester, that is, 14-27 weeks while 44 (24.4%) participants reported for booking during the first trimester (gestational age < 14 weeks) (Table 2).

Thirteen (7.2%) of the pregnant women had peripheral parasitaemia at booking visit and the mean parasite density was 1459 ± 2671/µl. The mean packed cell volume of the pregnant women at booking was 32.2 ± 2.4% (Table 1).

One hundred and thirty (72.2%) participants had haemoglobin genotype A, five (2.8%) were SS while haemoglobin genotype AC and AS accounted for the remaining 25% (Table 1).
Factors associated with malaria parasitaemia at booking:

Malaria parasitaemia was commoner among participants in the age group 30 years and above with prevalence 8/106 (7.6%). This was not statistically significant when compared with other age group below 30 years (p = 0.586) (Table 2).

Peripheral parasitaemia was documented among the participants attending booking clinic during the 1st, 2nd and 3rd trimesters respectively as: 4/44 (9.1%), 5/116 (4.3%) and 4/20 (20%). The mean gestational age at booking was not associated with malaria parasitaemia (p = 0.353) (Table 2).

Prevalence of malaria parasitaemia among primigravidae versus multigravidae were 9/76 (11.8%) and 4/104 (3.9%) respectively. Primigravidity was significantly associated with malaria parasitaemia (p = 0.041) (Table 2). There was no statistically significant difference between mean parasite density and parity (p= 0.459). None of the respondents with malaria parasitaemia had hyperparasitaemia (mean parasite density greater than 250000 µl).

Twenty six (14.4%) of the respondents were HIV positive and 5/26 (19.2%) had malaria parasitaemia. This was statistically significant (p= 0.011) (Table 2).

Prevalence of malaria parasitaemia among participants with haemoglobin genotype SS (Hb SS) and haemoglobin genotype A were 1/5 (20%) and 12/130 (9.2%) (Table 2).

Malaria parasitaemia was commoner among respondents with secondary education and below 8/50 (16%) compare with those with tertiary education 5/130 (3.9%), this was statistically significant (p = 0.005).

Prevalence of anaemia in this study was 20/180 (11.1%). Eight (40%) of those with anaemia had positive malaria parasite compare with 5/160 (3.1%)
having normal haematocrits with positive malaria parasite on their blood film, this was statistically significant (p = 0.001) (Table 2).

**Effect of malaria preventive measures on malaria parasitaemia**

Uptake of intermittent preventive treatment with sulphadoxine-pyrimethamine (IPTp-SP) among the respondents was eleven (6.1%), 59/180 (32.8%) accessed Insecticide Treated Nets (ITN) while 46/180 (25.6%) reported use of untreated net. The use of insecticide spray, insecticide coil and mosquito repellent among the respondents were 114/180 (63.3%), 25/180 (13.9%) and 16/180 (8.9%) respectively (Fig 2).

None of the respondents who reported used of IPTp-SP before presentation for antenatal booking had malaria parasitaemia this was not statistically significant (p = 0.340). Also, none of the respondents who accessed ITN has malaria parasitaemia, this was statistically significant (p = 0.009) (Table 3).

Among the respondents with malaria parasitaemia ten (76.9%) reported use of insecticide spray, three (23.1%) reported use of insecticide coil while two (15.4%) and five (38.5%) reported use of mosquito repellent and untreated net respectively (Table 3).

**Socio-biological factors effect on uptake of ITN and IPTp**

Age has no significant association with the use of either ITN or IPTp. Thirty two (54.2%) of those who accessed ITN were 30 years old and above and five (45.5%) of those who had used IPTp were 30 years old and above (Table 4 &5).

Fifty-two (88.1%) of respondents using ITN had tertiary education while seven (11.9%) had secondary education and below, this was statistically significant (p = 0.001). Also, 10/11 (90.9%) of those who had used IPTp had
tertiary education whereas 1/11 (9.1%) had secondary education and below, though not statistically significant (Table 4 & 5)

Parity has gestational age at booking has no significant association with the use of ITN or IPT among the respondents.

Six out of the twenty six (23.1%) with retroviral infection had used IPTp compared with 5/154 (3.3%) without retroviral infection who had used IPTp prior to booking, this was statistically significant \( p = 0.001 \) (Table 5). Retroviral infection has no association with the access of ITN (Table 4).

There is no difference in use of IPTp or ITN among respondents with normal and abnormal genotype (Table 4 & 5).
<table>
<thead>
<tr>
<th>Table 1: Socio-biological characteristics of 180 pregnant women at booking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AGE (years)</strong></td>
</tr>
<tr>
<td>Mean + SD</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td><strong>WEIGHT (Kg)</strong></td>
</tr>
<tr>
<td>Mean + SD</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td><strong>HEIGHT (Metres)</strong></td>
</tr>
<tr>
<td>Mean + SD</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td><strong>PARITY</strong></td>
</tr>
<tr>
<td>Modal</td>
</tr>
<tr>
<td><strong>GESTATIONAL AGE (weeks)</strong></td>
</tr>
<tr>
<td>Mean + SD</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td><strong>TEMPERATURE °C</strong></td>
</tr>
<tr>
<td>Mean + SD</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td><strong>PACKED CELL VOLUME (%)</strong></td>
</tr>
<tr>
<td>Mean + SD</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td><strong>GENOTYPE</strong></td>
</tr>
<tr>
<td>AA</td>
</tr>
<tr>
<td>AS</td>
</tr>
<tr>
<td>AC</td>
</tr>
<tr>
<td>SS</td>
</tr>
<tr>
<td><strong>RETROVIRAL SCREENING</strong></td>
</tr>
<tr>
<td>Non Reactive</td>
</tr>
<tr>
<td>Reactive</td>
</tr>
<tr>
<td><strong>MEAN PARASITE DENSITY (µl)</strong></td>
</tr>
<tr>
<td>Mean + SD</td>
</tr>
<tr>
<td>Range</td>
</tr>
</tbody>
</table>
Figure 1: Distribution of occupational status of the respondents at Booking

- Business: 20.00%
- Professionals: 40.00%
- Trading/craft: 25.00%
- Unemployed: 15.00%
Table 2: Factors associated with malaria parasitaemia at booking and effect of malaria parasitaemia on haematocrits

<table>
<thead>
<tr>
<th></th>
<th>Malaria Positive</th>
<th>Malaria Negative</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;30</td>
<td>5 (38.5%)</td>
<td>69 (41.3%)</td>
<td>0.586</td>
</tr>
<tr>
<td>&gt;30</td>
<td>8 (61.5%)</td>
<td>98 (58.7%)</td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>31.0 ± 3.6</td>
<td>30.4 ± 4.0</td>
<td></td>
</tr>
<tr>
<td><strong>Parity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primigravida</td>
<td>9 (69.2%)</td>
<td>67 (40.1%)</td>
<td>0.041</td>
</tr>
<tr>
<td>Multigravida</td>
<td>4 (30.8%)</td>
<td>100 (59.9%)</td>
<td></td>
</tr>
<tr>
<td><strong>Trimester at booking (weeks)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>4 (30.8%)</td>
<td>40 (24.0%)</td>
<td>0.353</td>
</tr>
<tr>
<td>2nd</td>
<td>5 (38.5%)</td>
<td>111 (66.4%)</td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>4 (30.8%)</td>
<td>16 (9.6%)</td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>21.5 ± 7.9</td>
<td>19.3 ± 6.2</td>
<td></td>
</tr>
<tr>
<td><strong>Retroviral status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>5 (38.5%)</td>
<td>21 (12.6%)</td>
<td>0.011</td>
</tr>
<tr>
<td>Negative</td>
<td>8 (61.5%)</td>
<td>146 (87.4%)</td>
<td></td>
</tr>
<tr>
<td><strong>Genotype</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td>12 (92.3%)</td>
<td>118 (70.7%)</td>
<td></td>
</tr>
<tr>
<td>SS</td>
<td>1 (7.7%)</td>
<td>4 (2.3%)</td>
<td></td>
</tr>
<tr>
<td>AS &amp; AC</td>
<td>0 (0%)</td>
<td>46 (27%)</td>
<td></td>
</tr>
<tr>
<td><strong>Educational status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary &amp; below</td>
<td>8 (61.5%)</td>
<td>42 (25.1%)</td>
<td>0.005</td>
</tr>
<tr>
<td>Tertiary</td>
<td>5 (38.5%)</td>
<td>125 (74.9%)</td>
<td></td>
</tr>
<tr>
<td><strong>Packed cell volume</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaemia</td>
<td>8 (61.5%)</td>
<td>12 (7.2%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Normal</td>
<td>5 (38.5%)</td>
<td>155 (92.8%)</td>
<td></td>
</tr>
</tbody>
</table>
Figure 2: Distribution of various malaria prevention measures among the pregnant women at booking
Table 3: Effect of malaria preventive measures on malaria parasitaemia

<table>
<thead>
<tr>
<th>Measure</th>
<th>Malaria Positive N = 13</th>
<th>Malaria Negative N = 167</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insecticide Treated Net Usage</td>
<td></td>
<td></td>
<td>0.009</td>
</tr>
<tr>
<td>Yes</td>
<td>0 (0%)</td>
<td>59 (35.3%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>13 (100%)</td>
<td>108 (64.7%)</td>
<td></td>
</tr>
<tr>
<td>IPT Usage</td>
<td></td>
<td></td>
<td>0.340</td>
</tr>
<tr>
<td>Yes</td>
<td>0 (0%)</td>
<td>11 (6.6%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>13 (100%)</td>
<td>156 (93.4%)</td>
<td></td>
</tr>
<tr>
<td>Insecticides spray</td>
<td></td>
<td></td>
<td>0.290</td>
</tr>
<tr>
<td>Yes</td>
<td>10 (76.9%)</td>
<td>104 (62.3%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>3 (23.1%)</td>
<td>63 (37.7%)</td>
<td></td>
</tr>
<tr>
<td>Insecticide coil</td>
<td></td>
<td></td>
<td>0.320</td>
</tr>
<tr>
<td>Yes</td>
<td>3 (23.1%)</td>
<td>22 (13.2%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>10 (76.9%)</td>
<td>145 (86.8%)</td>
<td></td>
</tr>
<tr>
<td>Mosquito repellent</td>
<td></td>
<td></td>
<td>0.320</td>
</tr>
<tr>
<td>Yes</td>
<td>2 (15.4%)</td>
<td>14 (8.4%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>11 (84.6%)</td>
<td>153 (91.6%)</td>
<td></td>
</tr>
<tr>
<td>Untreated net</td>
<td></td>
<td></td>
<td>0.268</td>
</tr>
<tr>
<td>Yes</td>
<td>5 (38.5%)</td>
<td>41 (24.6%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>8 (61.5%)</td>
<td>126 (75.4%)</td>
<td></td>
</tr>
</tbody>
</table>
Table 4: Socio-biological factors effect on uptake of Insecticide Treated Nets (ITN)

<table>
<thead>
<tr>
<th></th>
<th>ITN Usage (YES)</th>
<th>ITN Usage (NO)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 59</td>
<td>N = 121</td>
<td></td>
</tr>
<tr>
<td><strong>Age (Years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 30</td>
<td>27 (45.8%)</td>
<td>47 (38.8%)</td>
<td>0.376</td>
</tr>
<tr>
<td>≥ 30</td>
<td>32 (54.2%)</td>
<td>74 (61.2%)</td>
<td></td>
</tr>
<tr>
<td><strong>Educational Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary &amp; Below</td>
<td>7 (11.9%)</td>
<td>43 (35.5%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Tertiary</td>
<td>52 (88.1%)</td>
<td>78 (64.5%)</td>
<td></td>
</tr>
<tr>
<td><strong>Parity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primigravidity</td>
<td>24 (40.7%)</td>
<td>52 (43.0%)</td>
<td>0.770</td>
</tr>
<tr>
<td>Multigravidity</td>
<td>35 (59.3%)</td>
<td>69 (57.0%)</td>
<td></td>
</tr>
<tr>
<td><strong>Gestational Age (weeks)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st trimester</td>
<td>13 (22.0%)</td>
<td>31 (25.6%)</td>
<td>0.320</td>
</tr>
<tr>
<td>2nd trimester</td>
<td>40 (67.8%)</td>
<td>76 (62.8%)</td>
<td></td>
</tr>
<tr>
<td>3rd trimester</td>
<td>6 (10.2%)</td>
<td>14 (11.6%)</td>
<td></td>
</tr>
<tr>
<td><strong>Retroviral Infection</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>8 (13.6%)</td>
<td>18 (14.9%)</td>
<td>0.814</td>
</tr>
<tr>
<td>Negative</td>
<td>51 (86.4%)</td>
<td>103 (85.1%)</td>
<td></td>
</tr>
<tr>
<td><strong>Genotype</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal (AA)</td>
<td>43 (72.9%)</td>
<td>87 (71.9%)</td>
<td>0.890</td>
</tr>
<tr>
<td>Abnormal (AS AC SS)</td>
<td>16 (27.1%)</td>
<td>34 (28.1%)</td>
<td></td>
</tr>
</tbody>
</table>
Table 5: Socio-biological factors effect on uptake of intermittent preventive treatment (IPT)

<table>
<thead>
<tr>
<th></th>
<th>IPT Usage (YES) N = 11</th>
<th>IPT Usage (NO) N = 169</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (Years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 30</td>
<td>6 (54.5%)</td>
<td>68 (40.2%)</td>
<td>0.350</td>
</tr>
<tr>
<td>≥30</td>
<td>5 (45.5%)</td>
<td>101 (59.8%)</td>
<td></td>
</tr>
<tr>
<td><strong>Educational Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary &amp; Below</td>
<td>1 (9.1%)</td>
<td>49 (29.0%)</td>
<td>0.153</td>
</tr>
<tr>
<td>Tertiary</td>
<td>10 (90.9%)</td>
<td>120 (71.0%)</td>
<td></td>
</tr>
<tr>
<td><strong>Parity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primigravidity</td>
<td>6 (54.5%)</td>
<td>70 (41.4%)</td>
<td>0.393</td>
</tr>
<tr>
<td>Multigravidity</td>
<td>5 (45.5%)</td>
<td>99 (58.6%)</td>
<td></td>
</tr>
<tr>
<td><strong>Gestational Age (weeks)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; trimester</td>
<td>1 (9.1%)</td>
<td>43 (25.4%)</td>
<td>0.410</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; trimester</td>
<td>8 (72.7%)</td>
<td>108 (63.9%)</td>
<td></td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; trimester</td>
<td>2 (18.2%)</td>
<td>18 (10.7%)</td>
<td></td>
</tr>
<tr>
<td><strong>Retroviral Infection</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>6 (54.5%)</td>
<td>20 (11.8%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Negative</td>
<td>5 (45.5%)</td>
<td>149 (88.2%)</td>
<td></td>
</tr>
<tr>
<td><strong>Genotype</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal (AA)</td>
<td>8 (72.7%)</td>
<td>122 (72.2%)</td>
<td>0.969</td>
</tr>
<tr>
<td>Abnormal (AS AC SS)</td>
<td>3 (27.3%)</td>
<td>47 (27.8%)</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER SIX

DISCUSSION

This study examined the prevalence of malaria parasitaemia over a decade after the launch of the program ‘Roll Back Malaria’ which was targeted at reducing the burden of malaria infection and the mortality related to it by increasing the uptake of insecticide treated nets and intermittent preventive treatment among pregnant women.\textsuperscript{72}

The overall prevalence of malaria parasitaemia in this study was found to be 7.2\%. Earlier studies conducted in this same study area had shown higher prevalence of 8.4\% and 21.3\%, respectively.\textsuperscript{11,73} Higher prevalence still has been reported from studies carried out among pregnant women in other geopolitical regions of the country ranging between 38.8 - 87.9\%.\textsuperscript{74,75} The prevalence of malaria parasitaemia among pregnant women in Ibadan, southwest Nigeria appears to be lower when compared with reported values from other parts of the country.

The low prevalence of malaria parasitaemia in this study might be due to the fact that; the pregnant women who participated constituted the urban population; the study site being a tertiary health care centre compared to a rural population where prevalence is expected to be higher because mosquito breeding and malaria transmission are more intense\textsuperscript{76,77}.

Also, majority as reflected in the study had at least tertiary education and their level of awareness and uptake of malaria preventive measures is higher. In this study tertiary education was found to be significantly associated with reduced prevalence of malaria parasitaemia. Easy accessibility and affordability of antimalaria drugs is another factor that could be responsible for the low parasitaemia prevalence.
This study also shows that the prevalence of malaria parasitaemia was significantly higher in primigravidae than multigravidae, similar to findings in previous studies in Nigeria and other parts of African continent74,75.

Prevalence of malaria parasitaemia has been observed in previous studies to be significantly higher in younger women than in older women9,11, this was not demonstrated in this study, there was no significant difference in proportion of malaria parasitaemia at booking between pregnant women less than 30 years and those that are 30 years and above.

HIV infection has been associated with increased risk of malaria infection; in this study prevalence of malaria parasitaemia among HIV positive women was 19.2%. The low prevalence could be because of the effective ‘Prevention of Mother to Child Transmission of HIV’ (PMTCT) program at the study centre where prevention of malaria infection by the use of Sulphadoxine-pyrimethamine by the pregnant women according to WHO protocol is effectively implemented. Also, some of the HIV positive pregnant women were already using co-trimoxazole to prevent opportunistic infections; this drug also possesses antimalarial activity.

A preference of the pregnant women to attend antenatal booking clinic in the second trimester was observed in this study, similar to observation in previous studies11,78. According to Nigeria Demographic and Health Survey (NDHS) 2008 average age of booking for antenatal care is 5.1 months (22 weeks)79, mean gestational age of booking in this study was 19.5± 6.4 weeks. Only 24.4% of the participants booked for pregnancy in the first trimester, and the reasons for early booking varied from complain of being unwell, high risk pregnancies etc. This supports findings of Okunlola et al80 and others that illness in current pregnancy was associated with early booking for antenatal care.

The implication of late booking is that the pregnant women would not maximally benefit from intermittent preventive treatment (IPT) with
sulphadoxine-pyrimethamine which is one of the effective malaria preventive interventions\(^1\).

The prevalence of anaemia at booking in this study was 11.1% and was lower than prevalence recorded in similar studies in the same region\(^{11,78}\). The reason was not immediately clear but may be connected with the high literacy level of the study population and the use of haematinics starting early in pregnancy. Anaemia was significantly associated with malaria parasitaemia, this was similar to findings in other studies\(^{11,81}\).

Majority of the pregnant women in this study were using insecticide spray as a means of vector control to prevent malaria infection, this is consistent with findings from Dare et al. they reported poor ITN usage and more usage of screens and sprays to protect against malaria\(^{82}\). The reason might be because insecticide sprays and other screens are cheaper and easily accessible compare to insecticide treated nets (ITN) which are more expensive, not readily available and its usage not convenient for some of the pregnant women.

Insecticide treated nets (ITN) and intermittent preventive treatment with sulphadoxine-pyrimethamine (IPT-SP) have been shown to be effective in the control of malaria in pregnant women\(^{1,24,25,83}\). According to NDHS 2008 the use of ITN among pregnant women improved from 1% to 5% over a period of 5 years\(^{79}\). Its use among pregnant women at booking in this study showed a remarkable improvement 32.7%, much higher than the reported value of 1.1% in a study among pregnant women in Ibadan in 2004 by Yusuf et al\(^{84}\). According to NDHS 2008, education and wealth has direct relationship with ITN usage, in this study majority 88.1% of those using ITN had tertiary education, and are professionals or into business. Similar trend was noticed among pregnant women who had used IPTp, however, the overall access to ITN and IPTp-SP were low.

Insecticide treated nets are estimated to be twice as effective as untreated net\(^{23}\) and offer greater than 70% protection compared with no net\(^{85}\). None of the
pregnant women who accessed ITN or IPT-SP at booking had malaria parasitaemia whereas, the use of other malaria preventive methods were not remarkably protective. This is comparable to the study by Yusuf et al\textsuperscript{84}.

In conclusion, the prevalence of peripheral parasitaemia among pregnant women was relatively lower that hitherto documented in the same study area although with different populations. Prevalence of peripheral parasitaemia exhibits an inverse relationship with the use of insecticide treated nets (ITN) and intermittent preventive treatment with sulphadoxine-pyrimethamine. The foregoing further makes it imperative to improve access to ITN and IPTp-SP with a view to improving antenatal care and ultimately reduction of maternal and possibly infant mortality.
CHAPTER SEVEN

7.1 CONCLUSION

Reducing the burden of malaria infection in pregnancy is achievable but concerted efforts needs to be made at implementing the various effective interventions proposed by concerned bodies both locally and internationally.

7.2 RECOMMENDATION

- There is need to intensify awareness campaign on the effectiveness of insecticide treated nets in the prevention of malaria infection.
- The Insecticide treated nets (ITN) should be made accessible and affordable.
- Government should make provision for free distribution of ITN at antenatal clinic; this will also encourage pregnant women to booking early for antenatal care.
- Health education during antenatal visits should emphasize on the effect of malaria infection in pregnancy and modes of prevention.
- Intermittent preventive treatment (IPT) with sulphadoxine-pyrimethamine should be encouraged at booking and follow-up as recommended.
- There is need for government to evaluate the various malaria preventive measures instituted on a regular basis.
- More research needs to be done at the community levels to find out why usage of the various malaria preventive interventions is still poor and how to eliminate malaria infection totally.
7.3 LIMITATIONS OF THE STUDY

1. It was difficult to know the vector human relationship of the participants in this study, some of them might be more exposed to mosquitoes than the other.

2. It was not possible to know whether the pregnant women that came for antenatal booking clinic were representative of those that did not come but have malaria parasitaemia.

DISSEMINATION OF RESULTS FROM STUDY

The outcome of this study was presented to the National Postgraduate Medical College of Nigeria as part of fulfilment of the requirement for the Part 11 FMCOG Fellowship award. This study was also presented at the Department of Obstetrics and Gynaecology University College Hospital Ibadan where the study was carried out. The result of the study will also be published in a reputable biomedical journal.
REFERENCES


53. Verhoeff FH. Increased prevalence of malaria in HIV-infected pregnant women and its implications for malaria control. Tropical medicine and international health, 1999; 4:5-12.


APPENDIX I

THE CONSENT FORM
ASSESSMENT OF MALARIA PARASITAEMIA AT BOOKING

Dear Ma,

We are conducting a research titled as above, if you decide to participate in the study you will be asked some questions about your personal data and others relating to this pregnancy through our questionnaire. We will take blood sample from you along with your routine antenatal investigations which will be analysed to determine the presence of malaria parasite in your blood. We will follow you up at the antenatal clinic at the designated time and similar procedure will be done. This study does not impose extra burden on you apart from the blood sample that will be taken, you will be seen during your routine antenatal clinics. The blood film for malaria parasite and haematocrit estimation will be done for you free of charge.

There may be direct or indirect benefits derive from participating in this study. 1. If malaria parasite is found in your blood film you will be contacted and advised accordingly. 2. You will be contribution to achieving the global objectives of Roll Back Malaria and the Millennium Development Goal of reducing maternal and child mortality by 2015.

Any information you provide during the study period will be kept confidential. You are free to choose whether or not you wish to participate. You are also free to withdraw from the study at any time should you wish to do so for any reason. If for any reason you are not eligible for the study, or decide not to participate, you will still receive normal care and standard treatment and medications before, during and after birth.

You questions will be fully attended to by one of the researchers during the study procedure, and you can contact me Dr E.T Osinuga, Phone No 08052141417. E.Mail Address: tunene2ng@yahoo.com

Thank you for your participation.

HEAD OF INSTITUTION: Prof A. Ilesanmi.

University College Hospital Ibadan Tel: 02-2410088

APPENDIX II
CONSENT FORM

I have read/had someone read to me the entire explanation about this study and have been given the opportunity to discuss any question. I understand the nature, risk and benefits of this study and I may withdraw at any time without prejudice. Likewise I have received a copy of this informed consent document. I hereby consent to take part in this study.

.................................................  .........................
SIGNATURE OR THUMBPRINT OF SUBJECT   DATE SIGNED

.................................................  .........................
SIGNATURE OF INVESTIGATOR              DATE SIGNED

APPENDIX III
THE CONSENT FORM

ASSESSMENT OF MALARIA PARASITAEMIA AT BOOKING

We dey do research for how malaria dey on top woman wey get bele. If you gree say you too go follow join for this research, dem go ask you some questions on top youself and some on top dis ya bele with dis question paper. We go con collect small blood from your body together join the test wey you dey always do for antenatal. We go con carry this blood, check am to see if malaria dey inside. We go see you again for clinic at a time we go give you. This research no carry wahala put for ya head o, apart from the small blood wey we go collect, dem go still see you for your antenatal.

Small gain fit dey for joining dis research o.

1. If dem see malaria inside for ya blood, dem go hala you and give you advice.
2. You too go follow be part of those wey go help win the battle wey Roll Back Malaria program and Millenium Development Goal dey fight to nack for ground mama and pikin death by half by the year 2015.
3. This malaria test and blood level test na free of charge o.

Any tory wey you tell us about yasef, anoda ear no go hear am. we go keep ya tory safe pam pam. But dis research no be by force o, you fit talk weather you wan do abi you no wan do. Even if say, u don agree to do before, you fit comot anytime if you no wan do again for any matter. If for any matter, you no wan partake, you go still get your correct treatment and drugs before, during and after you born finish.

All ya question na him our people go help you answer as you dey partake for this study, and you fit reach me: Dr E.T Osinuga, Phone No 08052141417.

E.Mail Address: tunene2ng@yahoo.com. We thank you o, as you gree join.

HEAD OF INSTITUTION: Prof A. Ilesanmi.

University College Hospital Ibadan  Tel: 02-2410088
APPENDIX IV

CONSENT FORM

I don read/dem don read am to me, all the tory wey dey about this study and dem don give me chance to ask any question.

I don understand well well everything about the study, plus the risk and gain wey dey inside.

And also say i fit comot anytime i like without fight.

Also i don collect this paper wey explain everything to me.

For this junction, i don agree to join and partake for this research.

.................................................. ........................................
SIGNATURE OR THUMBPRINT OF SUBJECT DATE SIGNED

.................................................. ........................................
SIGNATURE OF INVESTIGATOR DATE SIGNED
APPENDIX V

THE CONSENT FORM

ASSESSMENT OF MALARIA PARASITAEMIA AT BOOKING

A nse iwadi lori bi aisa iba se wojo si laarin awon alaboyun. Ti o ba setan lati kopa ninu ayewo yi, a o bere awon ibere kan lowo re lori ara re ati awon miran ti onise pelu oyun yi ninu iwe ibere wa. A o gba eje kekere lara re pelu awon ayewo miran ti oloyun ni lati se ti a o wa lati mo boyo kokoro aisan iba wa ninu eje re. Iwadi yi o la wahala lo rara fun yin leyin eje kekere ti a o gba fun ayewo a o ma ri yin ni gbogbo igba ti o ba ye fun itoju alaboyun

E leyi ni awon ajemonu kan tabi omiran nipa kikopa ninu iwadi yi.

1. Ti aba ri kokoro iba ninu eje yin, a o ranse si yin, ao si gba yin ni iyanju bi oti se ye.
2. E o tun je agbateru bi a sele gbogun ti aisan iba ti oje eto ajo ilera agbaye ati bi ao se din iku aitojo iya ati awon omode wa ku si idaji n ti oje bayi ni odun 2015.
3. A o se ayewo eje fun kokoro iba ati bi eje se posi lara fun yin ni ofe

A o ni so nkankan ti e ba so fun wa ninu iwadi yi fun eni Kankan. A o mu gbogbo oro ti e ba so fun wa ni ashiri. E ni ominira lati pinu lati kopa tabi ki eni e ko fe kopa ninu iwadi yi. E si ni ominira lati ma kopa mo ninu iwadi yi ni igbakugba ti e ba fe fun idi kan tabi omiran.

Ti e ko ba ye lati kopa ninu iwadi yi fun idi kan tabi omiran tabi e ba pinu lati ma kopa, e o si gba itoju ti o pe perepere ninu oyun ati nigba ti e ba ti bimo tan.

A o ma dahun gbogbo ibere yin nigba ti awon oluforowanulenuwo ba wa pelu yin, e tu le kan mi lara ti e ba fe Dr E.T Osinuga, Ero alagbeka 08052141417. E.Mail Address: tunene2ng@yahoo.com. E se fun iyonda yin.

HEAD OF INSTITUTION: Prof. A. Ilesanmi.

University College Hospital Ibadan Tel: 02-2410088
APPENDIX VI

Iwe Iyanda
Mo ti ka/gbo nigba ti won ka gbogbo alaye lori iwadi yi a si ti fun mi ni anfani lati beere gbogbo ibere mi. Mo ni oye gbogbo abuda, nti ope fun ati anfani ti o wa ninu iwadi yi mo si le pinnu lati ma kopa mo lai si konu n koho ninu. Bakan na, mo ti gba.

……………………………………..……………………………………
IFIWOSIWE TABI ITEKA AKOPA OJO TI A FOWOSIWE

……………………………………..……………………………………
IFIWOSIWE TABI ITEKA AYENIWO OJO TI A FOWOSIWE
APPENDIX VII

ASSESSMENT OF MALARIA PARASITAEMIA AT BOOKING

QUESTIONNAIRE

Name………………………………………………….. Hospital Number ……………………..
Date…………………………………………………..

1. Serial Number 2. Age
3. Temp (°C) 4. Height 5. Weight
7. What is your highest level of education? a. None b. Primary School
c. Junior secondary (JSS) d. senior secondary (SSS) e. NCE f. OND
g. HND h. University i. Post graduate j. Others(pls specify).
d. Living with partner but not married d. Widowed e. Separated f. Divorced
14. Gestational age at booking…………………………
18. Which of the following complaints do you have now? (tick all the correct ones)
f. Cough g. Loss of appetite h. Chills & rigor i. Others pls specify………………
19. Which of the following drugs have you taken in this pregnancy to treat malaria? (tick all the right ones)
e. Artesunate f. Artemether-lumefantrin (coartem) g. Local herb h. Others pls specify.
20. How many times have you treated malaria in this pregnancy? Pls specify …………..
21. When was the last time you treated malaria in this pregnancy (in days)? ……..
22. How was the malaria diagnosed? a. Laboratory test b. Symptoms c. others specify…
23. Have you been hospitalised since you got pregnant? a. Yes b. No
24. If yes (to question 22) why? ………………………………..
25. How do you protect yourself from malaria? (tick all the correct ones)
a. Use of insecticide spray b. Use of insecticide coil c. Use of mosquito repellant
d. Use of insecticide treated net (ITNs)
e. Use of plain window and door nets
f. Use of anti-malaria drugs (pls specify which one)………………………………
g. Use of local herbs
h. Good sanitation (clean gutters, avoiding bushy surrounding)
i. Others pls specify

26. PCV ..........................
27. MP result.......................  

Phone number .............................