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# Composite Risk Behaviors that Enhance the Transmission of Malaria in Pregnancy

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Abstract

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MPH, University of Ibadan.

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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## Abstract

Malaria causes high morbidity and mortality, especially among the most vulnerable populations, including pregnant women. Malaria in pregnancy (MiP) can be prevented by compliance with the 3 core measures: sleeping under insecticide-treated nets (ITNs), 3 doses of sulfadoxine-pyrimethamine as intermittent preventive treatment (IPTp-SP), and effective case management of malaria and anemia. The purpose of this cross-sectional household survey was to examine the composite risk behaviors that enhance the transmission of MiP. Stratified and multistage sampling methods were used to select a sample of 300 pregnant women in Abuja, Nigeria. Bivariate and multivariate analysis were conducted. According to study findings, participants' mean age was 28.6 years, many (117 or 68.0% of the participants) used an ITN the night before the survey, and some (113 or 38.0%) had used SP for IPTp. Many participants (183 or 61.0%) were of high malaria risk status (MRS). The predictors of MRS were knowledge, *OR* 3.282, 95% *CI* [1.091, 9.873], *p*=0.03; number of pregnancy, *OR*=5.589, 95% *CI* [1.465, 21.316], *p*=0.01; attendance at antenatal clinic, *OR*= 3.777, 95% *CI* [1.119, 12.746], *p*=0.03; level of education, *OR*=0.050, 95 *CI* [0.013, 0.197], *p*=0.000; perceived barriers of ITN, *OR*=0.308, 95% *CI* [0.165, 0.575], *p*=0.000; and perceived benefits of SP for IPTp, *OR*=3.156, 95% *CI* [1.879, 5.301], *p*=0.000 . Perceived seriousness, perceived severity of malaria, age, and religion were not significantly related to MRS. This study leads to positive social change by providing information for policy makers to review MiP-related policies and programs to ensure quality messages, providers, and products are accessible and affordable across rural and urban settings where the target population live and work.

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# Dedication

This work is dedicated to God, my late parents, and my wife. God, the source of wisdom, the omniscience, and the author of life who in his mercy spared me till date. My father, Eusebious Mathew Oladipo Dada, who made the education of his children a top priority, but did not live long enough to witness their contribution to social change. My mother, Elizabeth Abiodun Dada, who was unflinchingly dedicated to proper upbringing of her children, and provided the kind of support that made life worth living. My wife, Francisca Abosede Dada, who's understanding, encouragement, and support actually made this work possible.

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Special thanks to the pregnant women who participated in the study, and the research assistants who worked with me for the interviews.

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# Chapter 1: Introduction to the Study

## Introduction

Malaria is preventable, treatable, and curable; yet, it remains an endemic disease in parts of Asia and the entire sub-Saharan Africa (World Health Organization [WHO], 2010). Although some progress has been made in the efforts to prevent and control malaria, the disease is still a cause of morbidity and mortality in countries where it is endemic (WHO, 2014). The entire population of these countries is at risk; but, children under 5 years of age and pregnant women are more vulnerable (WHO, 2016). Pregnant women make up a substantial population segment in Africa, whose annual population is estimated at 32 million (Dellicour et al., 2010). The malaria burden, and the high population of pregnant women in Africa who are vulnerable to the disease make MiP a concern at the household, community and national levels, and among international development organizations.

The widespread concern about malaria, and the risk of MiP, was underscored at the first summit on malaria in Nigeria in 2000, where African heads of state identified malaria as priority health problem, especially for more vulnerable population such as pregnant women (WHO, 2000). One of the goals decided at that summit was to increase coverage of the core measures for prevention of MiP so that at least 60% of pregnant women in the African continent would be reached by 2005 (WHO, 2000). The current national malaria strategic plan, 2014-2020, the goal has been revised upwards, to reach 80% of pregnant women with preventive measures for MiP (FMOH, 2014).In addition, the prevention and control of malaria have been deemed a priority because it is one of the

diseases that compromise socioeconomic development in developing countries (United Nations Development Program [UNDP], n.d.).

MiP can be prevented by adopting and maintaining the three-pronged approach recommended by WHO: (a) sleeping under insecticide-treated nets (ITNs), (b) two doses of sulphadoxine-pyrimethamine as intermittent preventive treatment (IPTp-SP), and (c) effective case management of malaria and anemia (WHO, 2004). In response to the WHO recommendation, a majority of African countries have adopted national policy on routine distribution of ITN and IPTp-SP to pregnant women (van Eijk et al., 2011; WHO, 2014)

Although many African countries have adopted policy on routine distribution of ITN and IPTp-SP for preventing MiP, as recommended by WHO, the uptake of these two measures has not been satisfactory (Akinleye, Falade, & Ajayi, 2009; National Malaria Control Program [NMCP], 2011; Ng'ang'a et al., 2009; NPC, 2016; van Eijk et al., 2011). The prevention of MiP depends on compliance with all of these three core preventive measures. Scholars have generally focused on only one of the recommended measures among pregnant women, either the use of ITN or IPTp-SP. Because researchers have focused on only one of the recommended preventive measures for MiP. In this study, I focused on the level of compliance with the three core measures and the factors that encourage or discourage compliance.

Chapter 1 covers the introduction and the background to the research problem, the problem statement, the purpose of the study, research question(s) and hypotheses,

theoretical framework, definitions, assumptions, scope and delimitations, limitations, and significance.

## Background of the Study

Malaria is caused by a parasite transmitted through the bite of female Anopheles mosquitoes (Autino, Noris, Russo, & Castelli, 2012). Pregnant women are among the population segment that are more vulnerable to the disease because pregnancy lowers immunity, and malaria parasite can stick to the placenta (Takem & D'Alessandro, 2013). Some of the consequences or complications of MiP include maternal anemia, low birth weight, preterm delivery, and increased infant and maternal mortality (Takem & D'Alessandro, 2013).

One of the measures recommended for the prevention of MiP is the use of ITNs (Eisele et al., 2012; WHO, 2004). The factors that significantly caused variation in bed net use in Kenya were occupants' relationship to the household head, age, occupation, gender, and education levels of the household head or spouse (Ng'ang'a, 2009). In Nigeria, ownership and use of ITN was low among pregnant women, and the key predictors of ITN ownership include knowledge that ITNs prevent malaria, registration at antenatal clinics, and urban residence (Ankomah et al., 2012). In households where ITN is available, the use of the net remains low because of discomfort with use, problems with hanging nets, low awareness of need, and seasonal variations in use (Singh, Brown, & Rogerson, 2013

Regarding IPTp-SP, the WHO (2012) reaffirmed the efficacy of three doses of IPTp-SP as a preventive measure for MiP. In a recent meta-analysis of data from

37 countries in Sub-Saharan Africa, Kayentao et al. (2013) indicated that completion of the doses of IPTp-SP is associated with a higher birth weight than the usual two doses. Gomez, Dickerson, & Roman (2012), reported low coverage of second dose of IPTp-SP in five sub-Saharan African countries (Kenya, Mozambique, Mali, Tanzania, Uganda), based on analysis of the National Demographic and Health Survey(NDHS) of these countries. In Nigeria, only 18.4% of all mothers in Nigeria used SP for IPTp, in spite of knowledge of the burden of MiP (Tongo, Orimadegun, & Akinyinka, 2011). The low level of use of IPTp-SP has been attributed to several factors, on the side of both the service providers and pregnant women (Onoka, Onwujekwe, Hanson, & Uzochukwu, 2012; Onyeneho, Orji, Okeibunor, & Brieger, 2013; Stanley & Nsabagasani, 2014).

The other preventive measure for MIP is prompt diagnosis and treatment of malaria and anemia (WHO, 2004). There are faults in the diagnosis and treatment of suspected cases of MiP. Luz et al. (2012) noted that in Brazil, few pregnant women (6.8%) were tested for malaria, and only few of the treatment prescriptions for MiP (10.2%) were in compliance with the national guidelines in Brazil. Onwujekwe et al. (2012) reported inadequate knowledge of current recommendation for treatment and chemoprophylaxis for MiP, especially in the private sector in Nigeria. The potential for the case management of MiP can be realized when pregnant women regularly attend antenatal care (ANC) services. Most of the pregnant women in Sub-Saharan Africa still record more than average ANC visits, although there are regional and country variations (Babalola & Fatusi, 2009; Bouyou-Akotet, Mawili-Mboumba, & Kombila, 2013). Factors related to the use of ANC services include socioeconomic status, urban residence,

community media saturation, and woman's age at last birth (Babalola & Fatusi, 2009; Bouyou-Akotet et al., 2013).

There is a low level of compliance with the use of the recommended measures for the prevention of and control of MiP. However, the research gap is on the composite measurement of the malaria risk behavior of pregnant women and their malaria risk status (MRS). An analysis of composite malaria risk behavior is important because researchers have also shown that malaria remains a problem during pregnancy in areas with high bed net coverage, but with low uptake of IPTp-SP (Kabanywanyi et al., 2008).

## Problem Statement

Malaria poses a high risk to the pregnant woman, the fetus, and the neonate (Diamond-Smith et al., 2009). The uptake of the recommended measures for prevention of MiP is low (Akinleye et al., 2009; Ankomah et al., 2012; Onwujekwe et al., 2012; Tongo et al 2011). For effective prevention of malaria, pregnant women need to comply with all three recommended measures of prevention of MiP (WHO, 2004).

Scholars have focused on either the use of ITNs or IPTp-SP. A comprehensive analysis of compliance with three elements of the recommended preventive measures for MiP is needed for better explanation of the malaria risk behavior of pregnant women. There is little research on composite malaria risk behavior of pregnant women to reveal their malaria risk status (MRS). Although scholars know that the uptake of each of the recommended measures for prevention of MiP is low, they do not know the level of compliance with all the core preventive measures by pregnant women. The proportion of

pregnant women that are of high, moderate, or low MRS is not known in countries where malaria is endemic.

## Purpose of the Study

The purpose of this study was to examine the composite risk behavior for malaria among pregnant women in order to explain the low uptake of core preventive measures for MiP. In this quantitative study, I measured the MRS among pregnant women based on their composite risk behavior for MiP, and I classified pregnant women into high, moderate, and low MRS. I also analyzed the socioeconomic, demographic, and contextual factors related to MRS; and assessed the perception and attitudes of pregnant women regarding malaria and the recommended measures for prevention of MiP. The analysis of composite risk behavior for MiP could provide evidence for public health workers to determine the level of success by MiP interventions. The study findings could also provide a basis for a review of policies and interventions at policy, service delivery, and community levels to increase the uptake of the recommended measures for prevention of MiP.

## Research Questions and Hypotheses

There were two research questions (RQs) and eight hypotheses for this study. Each RQ is followed by the related hypotheses. RQs 1 has three hypotheses, while RQ2 has five hypotheses

RQ1: Do perception and attitude of pregnant women to malaria, and measures for prevention of MiP, influence their MRS?

$H_1$1a: Pregnant women who perceive MiP as a serious and severe problem will be of low MRS while those who perceive MiP as ordinary will be of high MRS.

$H_0$1a: There is no difference in the MRS of pregnant women who perceive malaria as a serious and severe problem and those who perceive malaria as ordinary.

$H_1$1b: Pregnant women who believe that recommended measures for prevention of MiP are effective and comfortable to use will be of low MRS, while those who perceive the recommended measures as ineffective or uncomfortable to use was be of high MRS.

$H_0$1b: There is no difference in the MRS of pregnant women who believe that recommended measures for prevention of MiP effective, are comfortable to use and those who perceive the recommended measures as ineffective and uncomfortable.

$H_1$1c: Pregnant women who believe that recommended measures for prevention of MiP are beneficial to use will be of low MRS, while those who perceive the recommended measures as not beneficial to use was be of high MRS.

$H_0$1c: There is no difference in the MRS of pregnant women who believe that recommended measures for prevention of MiP are beneficial to use and those who perceive the recommended measures as uncomfortable.

RQ2: To what extent are cognitive, sociodemographic, and economic factors associated with the MRS of pregnant women?

$H_1$2a: Pregnant women, with adequate knowledge of malaria and MiP, will be of low MRS while those with poor knowledge of malaria was be of high MRS.

$H_0$2a: There is no difference in the MRS of pregnant women who have adequate knowledge of malaria and MiP and those with inadequate knowledge.

$H_1$2b: Pregnant women who are of high socioeconomic status will be of low MRS while those who are of low socioeconomic status was be of high MRS.

$H_0$2b: There is no difference in the MRS of pregnant women who are of high socioeconomic status and those who are of low socioeconomic status.

$H_1$2c: Pregnant women who live in urban and semiurban areas will be of low MRS while those who live in the rural areas was be of high MRS.

$H_0$2c: There is no difference in the MRS of pregnant women who live in rural areas and those who live in semiurban and urban areas.

$H_1$2d: Pregnant women whose living situations are supportive of prevention of MiP will be of low MRS, while those whose living situations are unsupportive of prevention of MiP was be of high MRS.

$H_0$2d: There is no difference in the MRS of pregnant women who are in supportive living situations and those who living in unsupportive living situations.

$H_1$2e: Pregnant women who are adolescents (15-19years) and young adults (20-34 years) will be of low or moderate MRS while those who are of middle age (35years and older) was be of high MRS.

$H_0$2e: There is no difference in the MRS of the pregnant women who are young adults and those who are of middle age.

## Theoretical Framework

Two theories were used to support the research design: the health belief model (HBM) and the theory of planed behavior (TPB). Champion and Skinner (2008) noted that the essential elements of the HBM are the following: (a) individual perception (including perceived susceptibility) and perceived severity of the disease, perceived barriers, and perceived benefits of recommended actors; (b) modifying factors that include sociodemographic, and psychological characteristics; and (c) the action factors that include cues to action and self-efficacy (see Figure 1).

The examination of malaria risk behavior can also be based on the TPB. Proponents of TPB identified behavioral intension as the most important determinant of behavior, and an intention is determined by the attitude towards the behavior and the subjective norms regarding the behavior (Montano & Kaspiprzyk, 2008). The TPB is illustrated in Figure 2 below.

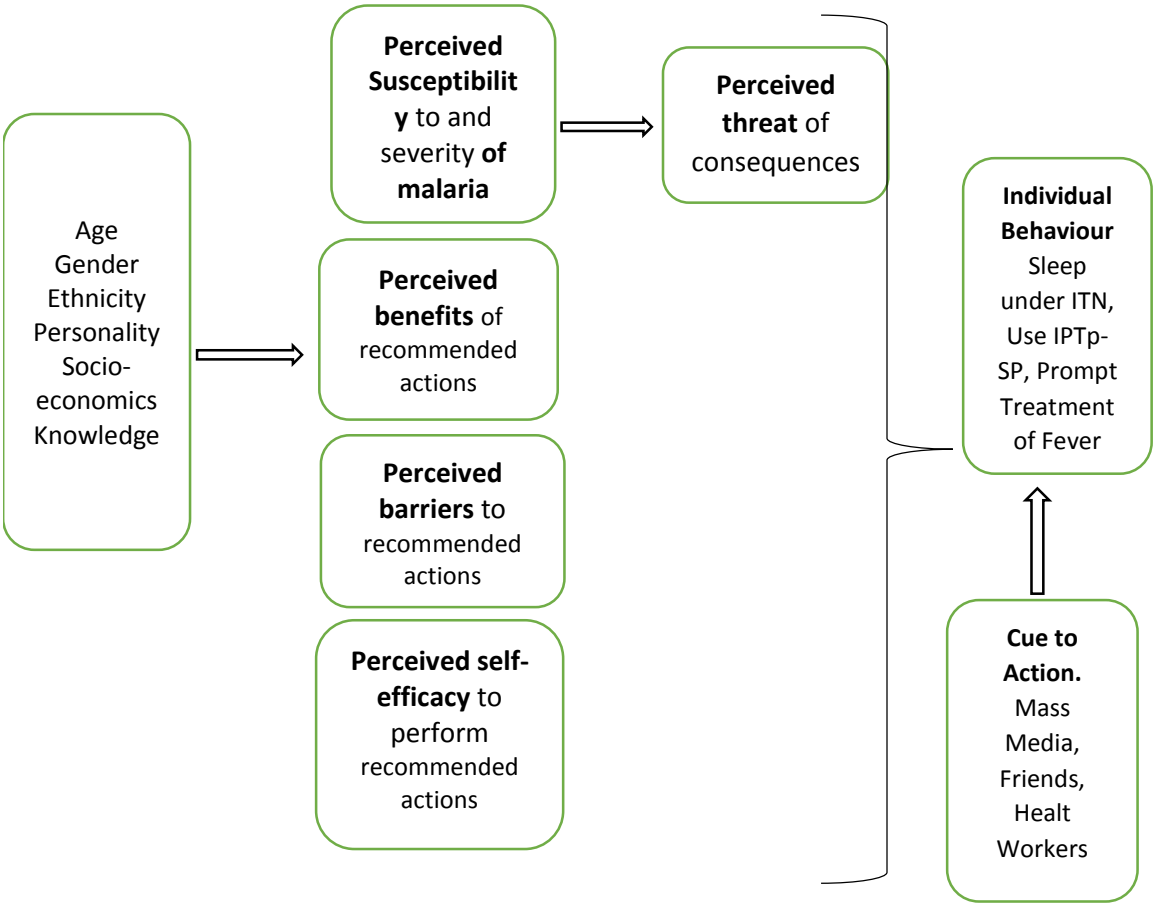


*Figure1*. The health belief model components and linkages for prevention of malaria in pregnancy. Adapted from *Health Behavior and Health Education: Theory, research and practice* p.49 by V. L. Champion, and C.S. Skinner, In K Glanz, B.K .Rimer, & K. Viswanath (Ed.), 2008, California: Jossy –Bass Copyright 2008 by John Wasey and Sons. Adapted with permission.

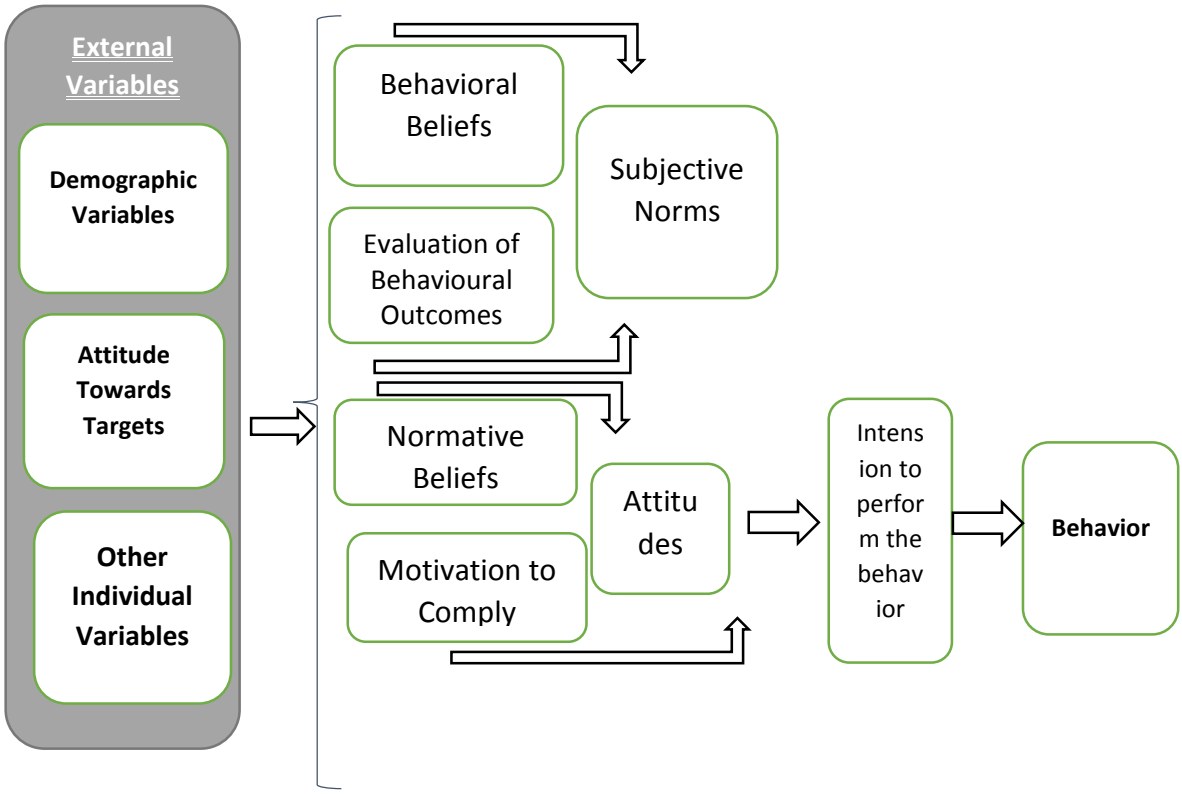


*Figure 2. The* theory of planned behavior adapted for prevention of malaria in pregnancy. Adapted from *Health Behavior and Health Education: Theory, research and practice* p.70 by D. E. Montano, and D. Kasprzyk, In K Glanz, B.K. Rimer, & K. Viswanath (Ed.), 2008, California: Jossy –Bass Copyright 2008 by John Wasey and Sons. Adapted with permission.

**Major Theoretical Propositions and Major Hypotheses**

Based on the HBM, a pregnant woman will only engage in recommended action if she perceives malaria as serious, with the possibility of severe effects, especially in pregnancy. Similarly, a pregnant woman will only engage in the recommended behavior if she appreciates the personal benefits derivable from engaging in the recommended behavior. If she can appreciate the benefits, she also needs to have the means (money, knowledge, and skill) and ability to overcome any barrier against the recommended behavior. It is equally important for a pregnant woman to have people who will positively influence her to adopt and maintain the recommended measures to prevent MIP (cues to action). In addition, the self-efficacy of a pregnant woman to engage in the recommended measures for prevention of MiP is important. In the context of MiP, self-efficacy refers to the ability of pregnant women to hang the ITN correctly, and sleep under it every night.

The TPB also focuses on individual behavior, but the key constructs of the TPB are the behavioral intention, attitudes towards the behavior, and subjective norms (Montano & Kaspiprzyk, 2008). The intention of a pregnant woman to comply with the recommended behavior for the prevention of MiP is determined in part by her attitude to the recommended behavior and the norms of the behavior (the subjective norm). The significant others (relatives, service providers, and members of social support networks) can positively influence a pregnant woman to engage in recommended behaviors for prevention of MiP**.**

The desire of a pregnant woman to be accepted by significant others will motivate her to comply with the recommended behavior. However, if a pregnant woman evaluates

the recommended behavior as unnecessary, unaffordable, challenging, or uncomfortable, then she may be reluctant to comply with recommended behavior. Certain socio-psychological factors are considered important in relation to attitude and normative beliefs (Figure 2).

### The Relationship between the Theories, Approach, and Research Questions

The key constructs of the HBM and the TPB make up the independent variables. The HBM constructs are the elements of individual perception, namely perceived susceptibility, severity of the disease, perceived barriers, and perceived benefits of the recommended action. The elements of the TPB are the attitude towards malaria and the subjective norms regarding the recommended measures for prevention of MiP. The modifying variables are sociodemographic, economic, and contextual factors and knowledge of malaria and the MiP. The dependent variable was the MRS, determined by the action factors, namely the use of ITN, IPTp-SP, and attendance at ANC.

The elements of the HBM and the TPB guided the development of the RQs. Assessment of the perceptions of malaria and the preventive measures among pregnant women, in relation to MRS as the dependent variable, are reflected in RQ1. RQ 2 includes determinants of MRS by the possible effects of the modifying factors of the HBM on MRS. RQ2 is also informed by other determinants of MRS, such on attitude and subjective norms, which are elements of TPB.

## Nature of the Study

This research was a cross-sectional survey designed to measure the MRS of pregnant women. For a study on the risk behavior for MiP, it would be unreasonable and

unethical to ask some pregnant women, as an experimental group, to adopt and use malaria prevention commodities and services and request others, as the control group, not to use such commodities and services. A cross-sectional study enabled the assessment of the MRS of pregnant women at the time of the study, and the attribute of the study sample can be projected to the larger population (Frankfort-Nachmias & Nachmias, 2008).

**Description of the Key Study Variables**

The independent variables were the elements of perception as the constructs of the HBM, and attitude, and subjective norms as the constructs of the TPB. The intervening variables were the modifying factors of the HBM including sociodemographic and economic characteristics, geographical location, and knowledge of the disease, including the preventive measures for MiP, cue to actions, and self-efficacy. The dependent variable was the MRS of pregnant women, which was determined by the extent of compliance with the three core recommended measures for prevention of MiP. The recommended preventive measures were the use of ITN, the use of IPTp-SP, and the prompt treatment of fever and malaria.

**Summary of the Methodology**

Data were collected from pregnant women who resided in the Federal Capital Territory (FCT), Abuja, the administrative capital of Nigeria. At an annual growth rate of 9%, the FCT population for 2015 was estimated 3,051,947, of which 47.3% were female (National Population Commission [NPC], 2008). Based on the NPC data, the 2015 estimated population of the women of child bearing age (WCBA) in the FCT was

671,260, of which 152,376 were pregnant. A combination of multistage and stratified random sampling techniques were applied to select the sample size.

Based on the geographical characteristics of urban, semi-urban, and rural areas, the six area councils (ACs) in the FCT are stratified into three zones. Each of the ACs is divided into enumeration areas (EAs) by the NPC, with a total of 3,590 EAs in the FCT (NPC, 2008; NDHS, 2014). For the purpose of this study, the EAs were grouped into clusters, with an average of 2 EAs per cluster. The grouping yielded about 1,795 clustered EAs, about 96 households (HHs) per cluster, and a total of 172,320 HHs for the FCT. The sampling frame covered households with WCBA. The inclusion criteria were women who were visibly pregnant or indicated that they were pregnant at the time of data collection and had been living in the selected HH for at least 3 months.,

The sample size was calculated based on the use of a sample size calculator, which yielded of 227 pregnant women as the minimum sample (Creative Research System review, n.d.). Trained research assistant (RAs) were engaged to identify households with WCBA in the selected EAs and for the data collection. Each selected participant gave a formal consent. Data were collected through personal, face-to-face, structured interviews. The questionnaire was administered by the trained and supervised RAs.

The independent variables were measured by Likert scale type of items. MRS, as the dependent variable, was assessed by the extent of compliance with the recommended measures for the prevention of MiP. Each participant was required to answer yes or no to three questions as the key questions related to the prevention measures for MiP. The

Statistical Package for the Social Sciences (SPSS) was used to analyze the data. The hypotheses were tested with the use of appropriate test statistics including the chi-square, and regression analysis.

## Definition of Terms

*Composite knowledge of malaria*: The knowledge of the cause and transmission of malaria, as well as measures for the prevention of MiP aggregated as one score. Knowledge of malaria can be adequate, inadequate, or poor.

*Cue to action:* The source of information, such as the mass media, health service provider, or significant others, who motivate a pregnant woman to practice desired behavior to prevent MiP.

*Living situation*: The current living arrangement of a pregnant woman, as indicated by whether she lives with the spouse or not. Living situation may be supportive or unsupportive of prevention of malaria.

*Malaria risk status (MRS):* Refers to the chance of a pregnant woman having malaria infection. MRS may be low, moderate, or high.

*Self-efficacy:* The feelings of an individual that she or he can engage in a recommended action or behavior.

*Socioeconomic status (SES):* Refers to the living circumstances of an individual, which is measured in terms of wealth index, determined by household characteristics and assets. SES is reflected in the classification of households into five wealth quintiles, according to their index value

*Supportive living situation:* When the pregnant woman reports that her spouse and other relations support her to ensure she engages in recommended preventive measures for prevention of MiP.

*Unsupportive living situation:* When the pregnant woman reports that neither her spouse nor any other relations support her to engage in recommended preventive measures for prevention of MiP.

## Assumptions

The study sample was selected among pregnant women residing in the selected study sites. The assumption was that many pregnant women would be available and willing to participate in the study and that their spouses would approve their participation. I assumed that the pregnant women will give reliable accounts of their behavior regarding the prevention of MiP. The assumption was necessary because it is neither reasonable nor feasible to wait till bedtime or clinic days to observe the use of ITN or IPTp-SP respectively. However, I provided the pregnant women an explanation of the purpose and the need for the research to make them feel comfortable to participate in the study. Although the study did not involve any invasive procedures, it was still mandatory to obtain Walden's Institutional Review Board (IRB) approval.

## Scope and Delimitations

The delimitations of the study were age, rural, semiurban, and urban domicile in the FCT, Abuja, Nigeria. The focus of the study was on the numeric measurement of compliance with the three recommended measures for the prevention of MiP. The study was limited to women who were within the reproductive ages of 15-49 years, who were

visibly pregnant or confirmed to be pregnant at the time of data collection, and who were interested in the study. The participants were pregnant women who were domiciled in semiurban and urban areas of the FCT, Abuja, Nigeria, who were selected through a random sampling process. I focused on the individual behavior of pregnant women regarding malaria. The HBM and TPB were selected as relevant individual behavior change theories because they have been used in similar studies. The trans-theoretical model (TTM) which also focuses on individual behavior, has six stages, one of which is the contemplation stage that may last for up to 6 months (Prochasca, Reddings, & Evers, 2008). The duration of the contemplation stage of the TTM makes the model inappropriate for a study that focuses on behavior during pregnancy, which lasts for 9 months.

**Study Boundaries and Potential Generalizability**

The study involved the application of research validity and reliability processes that was make the results generalizable to the population with similar SES and geographical characteristics (Salkind, 2009).

## Limitations

Although the quantitative method was applied to the study, the nature of the study did not allow for an experimental research design (Frankfort-Nachmias & Nachmias, 2008). It is unethical to put some pregnant women in the control group and ask them not to protect themselves from malaria. A potential limitation was that I depended on reported account of the use of ITN, IPTp-SP, and attendance at ANC. The accuracy of the data depended on the respondents' ability to recollect and accurately report on their

behavior, which cannot be verified. Notwithstanding, valuable data have been generated from reported human behavior when validity and reliability are assured in the study (Frankfort-Nachmias & Nachmias, 2008).

## Significance

The literature gap addressed in this study was the lack of evidence on composite MRS among pregnant women in malaria endemic countries. I assessed the compliance with the three recommended measures for prevention of MiP in order to determine the MRS of pregnant women and to identify the SES and contextual factors related to MRS. The findings may enhance the development or review of policies and programs to address the low uptake of malaria prevention products and services. In addition, the results could contribute to ongoing efforts aimed at the reduction of infant and maternal morbidity and mortality, a key target of the sustainable development goals (SDGs; United Nations Development Program [UNDP], n.d.). Achievement of MDGs is a significant social change, which requires evidence, such as the findings from this research.

## Summary

Despite the modest achievement of international efforts to prevent and control malaria, the disease remains a major contributor to infant and maternal morbidity and mortality in countries where it is endemic (WHO, 2014). Pregnant women are more vulnerable to malaria, which causes poor pregnancy outcomes. The recommended measures for the prevention of MiP are sleeping under ITNs, use of IPTp-SP, and effective case management of malaria and anemia (WHO, 2004). There is a low uptake of

each of the three recommended measures for prevention of MiP. However, there is a lack of evidence on composite malaria risk behavior of pregnant women.

In this study, I assessed the level of compliance with all three recommended measures for prevention of MiP, which enabled the measurement of MRS of pregnant women. The measurement of MRS enabled the classification of pregnant women into proportions that are of high, moderate, and low risk malaria behavior. The determinants of MRS were identified, and the attitudes of pregnant women regarding malaria and the recommended measures for its prevention were assessed. The study supports social change because the findings can enhance a review of policy judgment, decision, and MiP interventions. The results can contribute to ongoing efforts aimed at the reduction of infant and maternal morbidity and mortality, a key target of the SDGs.

Chapter 2 was be devoted to the literature review.

# Chapter 2: Literature Review

## Introduction

Malaria poses a high risk to a pregnant woman, her fetus, and the neonate after birth (Diamond Smith et al., 2009). For effective prevention of MiP, there should be full compliance with all three core measures recommended by the WHO (2004): (a) sleeping under ITN, (b) three doses of IPTp-SP, and (c) effective case management of malaria and anemia. Adequate understanding of the prevention of MiP requires comprehensive, in-depth analysis of all aspects of the recommended preventive measures to explain the malaria risk behavior of pregnant women

Available studies on the behavioral aspect of prevention of MiP were focused only on ITN or IPTp_SP. There was little research on a composite malaria risk behavior for pregnant women. The proportion of pregnant women who are of high, moderate, or low MRS was not known. In order to fill the gap in the literature, the quantitative approach was applied to determine the MRS of pregnant women and to analyze the relationship between MRS and related sociodemographic and economic factors. I sought to gain deeper insights into the attitude and perceptions of malaria and what preventive measures pregnant women take to prevent MiP.

Evidence on MRS could provide a better explanation of the low uptake of core preventive measures for MiP. The analysis of composite risk behavior for MiP could provide evidence for the review of interventions at the policy, service delivery, and community levels. The findings could provide the needed evidence to enhance the increase in the uptake of the recommended measures for prevention of MiP.

Pregnant women are more vulnerable to malaria because pregnancy lowers the immunity, and there is sequestration of the malaria parasite-infested blood cells in the placenta (WHO, 2010a). Some of the consequences of MiP include maternal anemia, low birth weight, preterm delivery, and increased infant and maternal mortality (McGready et al., 2012; Takem & D'Alessandro, 2013). Prevention of MiP depends on the adoption and maintenance of all three of the recommended preventive measures (WHO, 2014). Research studies on the behavioral aspect of MIP have been focused on either the use of ITN or IPTp-SP (Ankomah et al., 2012; National Malaria Control Program [NMCP], 2011; Onwujekwe, Soremekun, Uzochukwu, Shu, & Obinna, 2012; Tongo et al., 2011).

Researchers have established that there is a low level of compliance with the use each of the recommended measures for prevention and control of MiP (Akinleye et al., 2009; NMCP, 2011; Singh et al., 2013; van Eijk et al., 2011; Vanga-Bossonet al., 2011). Malaria remains a problem during pregnancy in areas with high bed net coverage, when the uptake of IPTp-SP is low (Kabanywanyi et al., 2008). However, there is a dearth of research on composite malaria risk behavior of pregnant women to show the extent of compliance with the three core recommended preventive measures for MiP. An analysis of composite malaria risk behavior could yield the evidence needed for effective program and policy review regarding MiP.

The review of the literature has five sections. Section 1 is on the introduction, followed by the literature search strategy, the theoretical foundation on the risk behavior about the prevention of MiP, literature related to the epidemiology of malaria, the

socioeconomic impact of malaria, vaccine development and malaria control, and behavior for the prevention of MiP. The chapter ends with a summary and conclusion.

## Literature Search Strategy

Medical, health, social, or natural science researchers have shown interest in malaria as a health and socioeconomic problem. The interest in malaria and the nature of the subject warranted the literature search for peer-reviewed articles and books in numerous databases. The databases searched were as follows: (a) Academic Search Complete/Premier, (b) ProQuest Central, (c) CINAHL, (d) Communication and Mass Media Complete, (e) Dissertation and Thesis at Walden University, (f) Health and Medical Complete, (g) Health Science, (h) Medline, (i) Nursing and Allied Health Source, and (j) Science Direct. The search was limited mainly to the years 2009-2015, using the following keywords: *malaria, pregnancy*, *risk*, and *prevention*.

I used Boolean operators, including "AND" and "OR," to maximize the results. The other strategy was the Index Search, which provided access to articles that were related to the keywords used for the search. For instance, Index Search on databases within the Walden Library system was done using a combination of name of publication, name of authors and title of articles, date of publication, page range, digital object identifier (doi), and subject terms or subject areas.

At the commencement of the literature review, an outline of the subtopics for the study was developed. Some of the topics in the outline were developed as the level headings in the literature review. Other documents found outside the databases but

considered as relevant were also selected. Over 140 articles were selected as relevant and current, out of over 600 that emerged from the search.

## Theoretical Foundation

### The Selected Theories and Their Origin

Two theories were selected to guide the research design: the HBM and the TPB. The HBM was originally introduced in the mid-1950s by Rosenstock and later refined by Rosenstock and Hoishbaun in 1974 and 1990 (Champion & Skinner, 2008). Other health and social scientists have applied the model directly or adapted it to explain and predict other health-related behavior, including self-breast examination, sexual risk behaviors, and use of ITN for malaria prevention (Ankomah et al., 2012; Tavafian, Hasani, Aghamolaei, Zar, & Gregory, 2009). The other selected model, the TPB, was introduced as an improvement to the theory of reasoned action in the mid-1960s by Fishbein and Ajzen (Montano & Kasprzyk, 2008). The TPB has been used to explain and predict health-related behavior including smoking, health service use, use of contraceptives, seatbelts, and HIV and AIDS preventive behaviors (Montano & Kasprzyk, 2008).

### Major Theoretical Propositions

The major constructs of the HBM are (a) individual perception, with the elements of susceptibility and severity of the disease, perceived barriers, and benefits of the recommended action; (b) modifying factors, including sociodemographic and psychological characteristics; and (c) action factors, including cues to action and self-efficacy (Champion & Skinner, 2008).

Based on the HBM, a pregnant woman was only engage in recommended action if she perceives malaria to be serious with real potential for severe effects. Similarly, a pregnant woman was only engage in the recommended behavior if she can readily identify the personal benefits derivable from engaging in the recommended behavior. If she can identify the personal benefits, she also needs to have the means (money and skill) and ability to overcome any perceived barrier against the recommended behavior. It is important for a pregnant woman to have people to positively influence her to adopt and maintain the recommended measure to prevent MIP. The influencing acts are known as cues to action. The self-efficacy of a pregnant woman to engage in the recommended measures for prevention of MiP is equally important. In the context of MiP, self-efficacy refers to the ability of a pregnant woman to hang the ITN correctly and sleep under it every night.

The other relevant theory was the TPB, which also focuses on individual behavior, but the key constructs of the TPB are behavioral intention, attitudes towards the behavior, subjective norms, and perceived behavioral control (Montano & Kaspiprzyk, 2008). Proponents of TPB assert that actions are predicted by intentions to engage in the behavior, while intentions are determined by the variables of attitudes, subjective norms, and perceived behavioral control (PBC). If a pregnant woman has the intention to comply with the recommended behavior, such intention is determined in part by her attitude to the recommended behavior and the norms of the behavior (the subjective norm).

A pregnant woman’s desire to be accepted by her significant others can motivate her to comply with the recommended behavior. If the health service providers and

members of her social support networks influence a pregnant woman to engage in recommended behaviors for the prevention of MiP, then she is more likely to comply. However, if a pregnant woman evaluates the recommended behavior as unnecessary, unaffordable, or uncomfortable, based on cultural background and poor knowledge, then she may be reluctant to comply with recommended behavior. PBC can predict behavior directly or indirectly through intentions. Certain social and psychological factors are considered important about attitude, normative beliefs, and PCB. The factors include age, level of education, religion and family background, and personality traits

**Previous Application of the Theories in Ways Similar to this Study**

Tavafian et al. (2009) tested the revised HBM scale and found it to be reliable for measuring beliefs and practice in relation to breast cancer. Tavafian et al. applied Likert scales to measure the HBM constructs of perceived severity, seriousness, benefits, and barriers with five response choices that ranged from *strongly agree* to *strongly disagree*. The constructs were entered into logistic regression analysis as the independent variable and tested as predictors of breast self-examination (BSE). Ankomah et al. (2012) applied the HBM to explain the relationship between ownership and use of ITN. Ankomah et al. developed a composite indicator of the knowledge of preventive measures for MiP as part of independent variables and identified the key predictors of ownership and use of ITN.

The other theory, the TPB, has been used by researchers to explain and predict health-related behavior (Montano & Kasprzyk, 2008). Rhodes, Stein, Fishbein, Goldstein, and Rotheram-Borus (2007) conducted multisite randomized control trials in which the constructs of the TPB in combination with HBM and other models were

integrated to explain and predict condom use. Rhodes et al. reported that the integrated model predicted condom use, but with variation in the contribution of the constructs in the integrated model.

The constructs of the HBM and the TPB were used to guide the identification of the independent variable and the intervening variables of this study. The dependent variable was the MRS of pregnant women, which depended on the compliance or noncompliance with the three recommended measures for the prevention of MiP. The HBM was used to explain the relationship between the independent variables and the MRS. Likert scale was applied to measure the constructs of the HBM and TPB, which made up the independent variables of the study

**Rationale for the Choice of the Theory**

The level of compliance with the use of each of the recommended measures for prevention and control of MiP was the behavioral phenomenon of interest. The results of this study could be used to explain the risk behavior by the application of the HBM, which was developed to aid the understanding and explanation of why people engage in health-related behaviors (Champion & Skinner, 2008). The TPB was also used to explain other key elements of health-related behavior, such as attitude and the subjective norms, which were not covered by the HBM.

**Selected Theory, Research Questions, and Existing Theories**

The HBM was used to guide the identification of the independent variables and the hypotheses and to explain the relationship between the independent variable and the composite risk behavior for MiP. Both the HBM and the TPB were applied for the

development of the RQs. The first RQ was on the assessment of the potential relationship between perceptions, which were the belief factors and the health action as postulated in the HBM. For this study, the health actions were the recommended measures for the prevention of MiP. The level of compliance with the three recommended measures for MiP determines the MRS of the pregnant women, which was analyzed in relation to perception. The second RQ on the determinants of MRS was informed by the possible effects of the modifying variables of the HBM and TPB on the MRS of pregnant women. The key variable of TPB considered as potential determinants of MRS were attitude and subjective norms.

## Literature Review Related to Key Variables and Concepts

A part of the literature review is related to the key variables under the epidemiology of malaria. The review on epidemiology of malaria covers the nature of the disease, the cause, the transmission, the magnitude in terms of morbidity and mortality, spread, distribution, and frequency of malaria occurrence. I also reviewed the factors that encourage or discourage the adoption and maintenance of the recommended measures for prevention of MiP.

### Nature, Cause and Transmission of Malaria

Malaria is preventable, treatable, and curable; yet, it remains an endemic disease in the entire Sub-Saharan Africa and parts of Asia. The disease is caused by Plasmodium, a parasite transmitted among the human population through the bites of female Anopheles mosquitoes (WHO, 2010a). There are several species of malaria parasites; but, only five are known to infect the human population: Plasmodium falciparum,

Plasmodium vivax, Plasmodium ovale, Plasmodium malariae, and Plasmodium knowlesi (Guerra et al., 2008; WHO, 2013). The falciparum parasite is the most common in areas of high transmission in Sub-Saharan Africa, Papa New Guinea, and Haiti (Guerra et al., 2008). The development of the malaria parasite in the mosquitoes is hampered at the temperature of 15°C and below, but enhanced at 19-35°C, and prolonged at a high humidity of 60% (Blanford, et al., 2013)

**Magnitude, Spread, Distribution, and Frequency of Malaria.** Although virtually the entire population in malaria-endemic countries are at risk of the disease, children under 5 years of age (Cu5), travelers to an endemic region, people with coexisting infection such as HIV, sickle cell anemia, and pregnant women are more vulnerable (Luzatto, 2012; WHO, 2010). The increased vulnerability to malaria among these population segments is due to immunity factors, which could be inadequate, suppressed, or compromised immunity (WHO, 2010).

Malaria is endemic in locations where the transmission is stable. The stability of malaria means it is transmitted virtually all year round, with over 90% of the population exposed to risk and with moderate to high level of immunity against the disease (Guerra et al., 2008). An estimation of the magnitude of malaria is a challenge because the disease is widespread within and across several countries, many cases are not reported at health facilities, and the reported cases are not adequately documented (WHO & UNICEF, 2003). The prevalence of malaria is highest in Sub-Saharan Africa, but in other parts of Africa, the transmission occurs less frequently, with low levels of immunity among the population, and with potential for epidemics.

Table 1 shows the trend in the distribution of malaria cases and death in selected countries for 2005 and 2015 in the five regions: Sub-Saharan Africa, South America, Eastern Mediterranean, South East Asia, and Western Pacific (WHO, 2013a). The data for the selected Sub-Saharan African countries (DRC, Malawi, Nigeria, Tanzania [Mainland], and Zambia) shows that the region has the highest number of malaria cases and deaths. In 2015, the regional malaria prevalence for Africa was a total of 191,000,000 cases and 394,000 deaths, compared to 20,200,000 cases and 35,490 deaths for all other four regions of the world (Table 1). The cases of malaria in Africa were over nine times the total for all other four regions, while the reported deaths were over 11 times more than that of other four other regions.

**Table1**
*Malaria Cases and Deaths in Selected Countries*

| WHO Countries and Regions | Country Population, UN (2015) | Population at Low and High Risk/ (%) | Reported Cases | | Reported Deaths | |
|---|---|---|---|---|---|---|
| | | | 2005 | 2015 | 2005 | 2015 |
| Demo. Rep. Congo | 77,266 814 | 100 | 29,000,000 | 19,000,000 | 110,000 | 42,000 |
| Malawi | 17,215,232 | 100 | 4,100,000 | 3,300,000 | 9,700 | 7,200 |
| Nigeria | 182,201, 962 | 100 | 59,000,000 | 61,000,000 | 190,000 | 110,000 |
| Tanzania (Mainland) | 51,957,514 | 100 | 9,700,000 | 5,300,000 | 7,000 | NA |
| Zambia | 16,211,767 | 100 | 2,900,000 | 2,800,000 | 7,900 | 7,100 |
| | Sub Saharan Africa: Regional Summary | | 2015 Cases: | 191,000,000 | 2015 Deaths: 394,000 | |
| Brazil | 207,847,528 | 20.30 | 82,000 | 79,000 | 180 | <50 |
| Mexico | 127,017,224 | NA | 3,200 | 560 | 0 | 0 |
| Peru | 31,376,690 | 16.05 | 160,000 | 150,000 | <10 | <10 |
| | South America: Regional Summary | | 2015 Cases: | 800,000 | 2015 Deaths: 490 | |
| Afghanistan | 32, 526, 562 | 77.40 | 580,000 | 390,000 | 280 | 190 |
| Iran | 79, 109, 272 | NA | 16,000 | 180 | <10 | <10 |
| Pakistan | 188, 924, 874 | 98.30 | 3,900,000 | 1,000,000 | 4,400 | 740 |
| | Eastern Mediterranean: Regional Summary | | 2015 Cases: 3,800,000 | | 2015 Deaths: 7,300 | |
| Bangladesh | 160, 995, 642 | 10.35 | 120,000 | 84,000 | 250 | <50 |
| India | 1, 311, 050, 527 | 89.00 | 29,000,000 | 13,000,000 | 41,000 | 24,000 |
| Nepal | 28, 513, 700 | 83.60 | 82,000 | 24,000 | 62 | <50 |
| | South East Asia: Regional Summary | | 2015 Cases: 14,400,000 | | 2015 Deaths: 26,200 | |
| China | 1, 383, 924, 532 | 41.82 | 23,000 | <50 | <50 | 0 |
| Philippines | 100, 699, 395 | 79.78 | 140,000 | 13,000 | 300 | <50 |
| Viet Nam | 93, 447, 601 | 37.49 | 39,000 | 13,000 | 79 | <50 |
| | Western Pacific: Region Summary | | 2015 Cases: 1,200,000 | | 2015 Deaths: 1500 | |

*Note:* Estimated malaria cases and deaths. Adapted from WHO, 2016 *World Malaria Report*, 118-129. Copyright 2016 by WHO.

**Socioeconomic Impact of Malaria**

The social and economic impact of malaria is related to the effects of the disease on lives and living situation at the individual, household, community, and national levels. In 2005, malaria negatively affected the return on investment in about three quarters of the companies in Africa (WHO, 2006). At the individual level, malaria makes the infected person weak and lethargic (Centre for Disease Control [CDC], 2010; WHO, 2006). Malaria-induced lethargy and weakness are responsible for absenteeism at work, school, and social events (Usman & Adebayo, 2011).

At the family level, the available resources are spent to treat and care for an individual having malaria, while the infected and affected family members experience loss of work days (Usman & Adebayo, 2011). The direct cost of malaria treatment is enormous. Jimoh, Sofola, Petu, and Okorosobo (2007), estimated that on monthly basis, one household in Nigeria, spends an average of about Naira 685:00 ($2.24) on malaria treatment, and willing to pay Naira 1,112:00 ($3.60) on the treatment, and Naira 7,324 ($24:00) on malaria control. Nearly two fifth (37.3%) of pregnant women in Abuja, FCT, Nigeria, lives on $2.0 or less per day, as this study indicated.

At the country level, the direct and the indirect loss of investment and tourism are estimated at $12 billion per annum (Gallup, & Sachs, 2001). Okorosobo et al. (2011) reported that in the six African countries studied, malaria caused loss of growth to the national economy, estimated at a range of 0.41% in Ghana to 8.9% in Chad per annum.

The implication of the socioeconomic burden of malaria is that the disease is a contributor to the poverty level in endemic countries. Substantial household and

government resources spent on the treatment of repeated episodes of malaria could have been spent to support the basic needs of the family and the government. A substantial percentage of the Global Fund contributed by international donors is being spent on malaria (Global Fund, n. d). The concerns about the socioeconomic impact of malaria have informed the quest and international effort for the development of a potent malaria vaccine.

**Vaccine Development and Malaria Control**

The development of a malaria vaccine (MV) has witnessed renewed commitment, international partnership and support (WHO, 2013a). The commitment to MV development is mainly due to the emergence of resistant forms of malaria, and the side effects associated with prevention and treatment commodities (Dhanawat, Das, Nagarwal, & Pandit, 2010). Similarly, the gradual reduction of malaria-related morbidity and mortality is a motivating factor for scientist and stakeholders to sustain efforts on the search for ideal MV (Greenwood, & Targett, 2009).

There are over 20 MV candidates on clinical trials (Dhanawat, Das, Nagarwal, & Pandit, 2010; WHO, 2013a). Among the MV candidates, the RTS, S/AS01 is ahead of others, currently being assessed at phase three in seven African countries (WHO 2013a). The RTS, S/AS01 is a Plasmodium parasite-specific vaccine, developed for children in malaria endemic regions (Ballou, 2009). The vaccine has been evaluated in two groups of children aged 6-14 weeks, and 5-17 months (The RTS, S Clinical Trials Partnership [TRSCTP], 2014). Results indicate that the vaccine effectiveness at 18 months' follow-up was significant for clinical and severe malaria but insignificant for severe malaria among

those aged 6-14 weeks (TRSCTP (2014). The findings of the trials of the RTS/AS01 vaccine were corroborated by other reported trials on MV (Sacarlal, et al., 2009; Aide et al., 2010).

As the efforts for the development of the MV is yielding promising results, the on-going research and international partnership only need to be sustained until the WHO approves RTS, S/AS01 vaccine or any other MV for mass and routine immunization. The approval and availability of MV for routine immunization will be a major social change for maternal and child health in countries where malaria is endemic.

**Behavior for Prevention of MiP**

The prevention of MiP depends on the adoption and maintenance of the desired behavior as recommended for prevention of MiP (WHO, 2004). This section focuses on review of literature on the adoption and maintenance of the recommended measures for prevention of MiP.

**The use of ITN.** One of the three-pronged measures recommended for the prevention of MiP is the use of ITNs (WHO, 2004; Eisele, et al., 2012). The ITN acts as a physical barrier that protects individuals that sleep under it from the bites of mosquitoes, and repels or kills the mosquitoes that come in contact with it (WHO, n.d). With the dual purpose of ITN, the widespread use of the net reduces the mosquito population at the community level (WHO, n.d)

The use of ITN has continued to receive attention. At the first summit on malaria in 2000, the African Heads of States declared that 60% of the at-risk population of women and children population be covered with protective products including ITN

(WHO, 2000). The WHO has since recommended universal coverage strategy with the target of 80% coverage of all population segments with key malaria control interventions in at-risk countries (WHO 2010, WHO, n.d). In conformity with WHO recommendation, many countries in sub Saharan Africa have adopted various mechanisms to distribute ITN, including campaigns, and continuous distribution in clinics, hospital, schools and through other community-based channels (WHO, 2013b). As at 2012, 88 countries, including 39 in Africa, have distributed free ITN (WHO 2013a). As a result of the distribution of ITN through campaigns and routine systems, the households that own at least one ITN in malaria-endemic countries has increased from 56% in year 2012 to 79% in 2015 (WHO, 2013a; WHO, 2016).

Similarly, there has been steady increase in the use of ITN for countries in sub Saharan Africa, from 5% in 2005, to 30% in 2010, and to 53% in 2015 (WHO, 2013a, WHO, 2016). In 2015, only 33.6% of pregnant women in Nigeria slept under ITNs the previous night (NPC, NMEP, MEASURE DHS, & ICF, 2016; Singh, Brown, & Rogerson (2013), also reported low rate of use of ITN among the population including pregnant women in five sub-Saharan African countries: Nigeria, Tanzania, Ghana, Kenya, and Ethiopia.

Researchers have also focused on the determinants of the use of ITN. In Kenya, the low ITN use was related to occupants' relationship to the household head, age, occupation, education levels of the household head or spouse (Ng'ang'a 2009). In Nigeria, only 28.8% of pregnant women owned ITNs, and key predictors of ITN use include knowledge that ITNs prevent malaria, registration at antenatal clinics, and urban

residence (Ankomah et al., 2012). In households where ITNs are available, the use remains low because of several factors, including discomfort with use, problems with hanging nets, lack of space, low awareness of need, and seasonal variations in use (Singh, Brown, & Rogerson, 2013). Many of the factors related to the use of ITN are either socioeconomic or behavioral in nature.

**Use of IPTp-SP.** A recent review of guidelines on prevention of MiP reaffirms the efficacy of SP and recommends three doses of IPTp-SP (WHO, 2012). Also, a recent meta-analysis of data from 37 sub-Saharan Africa countries indicated that the use of three-dose regimen of IPTp-SP is associated with a higher birth weight and lower risk of low birth weight than the usual two doses (Kayentao, et al., 2013). The malaria indicator survey (MIS) for 2015 indicated only 14.6% of pregnant women used SP for IPTp, despite high levels of knowledge of the burden of MiP (NPC, NMEP, MEASURE DHS, & ICF, 2016). Gomez et al. (2012), noted that the coverage of the second dose of IPTp-SP is low in five sub-Saharan African countries, namely Kenya, Mozambique, Mali, Tanzania, and Uganda.

The low uptake of IPTp-SP has been attributed to supply and demand factors. The demand factors determine the choices made by patients while the supply factors determine the choices of the service providers (Getzen, 2010). The supply factors contributing to the low usage of IPTp-SP include low level of knowledge of the relevant guidelines among health service provider; unclear guidelines; inadequate focus and supervision for IPTp services (Onoka et al.,2012; Stanley & Nsabagasani, 2014). The demand factors are related to low utilization of IPTp-SP are knowledge of malaria, and

benefits of IPTp-SP; living with a partner, ever married, and wealth (Onyeneho, Orji, Okeibunor, & Brieger, 2013).

**Prompt Malaria Diagnosis and Case Management.**

Effective case management of malaria and anemia is one of the core preventive measures for the prevention of MiP (WHO, 2004). Prompt proper diagnosis of malaria is an integral part of effective case management (WHO 2010). Wrong malaria diagnosis and inappropriate treatment are precursors to the development of resistant strains of malaria parasites (Bell & Peeling, 2006; Wilson, 2013).

**General malaria diagnosis.** A major element of malaria treatment guideline of WHO is that all cases of fever suspected to be malaria should be tested by microscopy or with malaria rapid diagnostic test (mRDT) before treatment (WHO, 2010). The test-directed malaria treatment guideline has been adopted by 90 out of 99 countries in Africa and other WHO regions (WHO, 2013). Across endemic countries, reported fever cases tested for malaria in public sector facilities increased from 37% in 2010 to 61% in 2013 (WHO 2013). The regular types of malaria diagnostic tests (DTs) include syndromic diagnosis (SD), microscopy, and mRDT (Ndao, 2009; Wilson, 2013).

Malaria SD, which is based on patients' history of fever, signs and symptoms, and physical examination, has been a popular diagnostic test in many settings with poor diagnosis facilities (Wilson, 2013). In recent times, malaria SD has been criticized because fever is not specific to malaria, parasitemia may exist without being the cause of fever, and patients with other diseases may be treated with malaria drugs (Wilson, 2013). As such, malaria SD is a precursor of wrong diagnosis and treatment and is discouraged

by the WHO in settings where there are appropriate diagnostic facilities (WHO, 2010). Some of the shortcomings of malaria SD are addressed by microscopy, which is another regular malaria DT

Malaria microscopy (MM) is based on the examination of thick and thin blood films and prepared from peripheral blood smears in the laboratory (Wilson 2013). MM has high sensitivity rate of about 75% in detecting clinical malaria, when it is correctly done, under good quality assurance, and with the correct interpretation of results (WHO, 2010). In addition, malaria microscopy is decisive for identification of infecting species of parasites, which is valuable for the determination of the extent of parasitemia; the progress of treatment; and needs minimal equipment (WHO, 2010).

The need to discourage malaria SD and increase access to effective and efficient malaria diagnosis, led to the development of mRDT (Kheang, Duong, & Olkkonen, 2011; Ndao, 2011). The mRDT is based on the use of assays, the application is rapid, it is easy to use, without electricity; and the result is easy to interpret by trained providers (Mayor et al., 2012; Wilson, 2013). The mRDT differentiates between different species of falciparum, which is most crucial in the selection of appropriate antimalarial drugs for the treatment (Wilson 2013). There are over 200 mRDT available on a commercial basis, which made WHO to issue criteria for selection of mRDT for procurement (WHO, 2014).

The implementation of the policy on test-directed-treatment has witnessed promising results across endemic countries. In southeast Nigeria, service providers and community members recognize the need for fever cases to be tested for reasons of differential diagnosis and proper treatment (Ezeoke, et.al, 2012). Similarly, some studies

reported high uptake and acceptance of the mRDT, and its cost effectiveness while CHWs correctly performed the test and adhered to the results (Ruizendaal et al., 2014). However, the challenges regarding the uptake of the malaria DTs include (a) inadequate resources and support, (b) unaffordable cost, (c) providers doubts of sensitivity and specificity of the tests, and (d) incompetence of technicians to apply the test (Abreha et al., 2014; Ezeoke, et.al, 2012).

While most health facilities had equipment and infrastructure for malaria DTs, many lacked supplies and reagents, training and supportive supervision to assure high quality and coverage of malaria diagnosis (Abreha et al., 2014) The challenges to the application of the malaria DTs made community members and service providers consider presumptive diagnosis as valuable rather than malaria tests (Ezeoke, et.al., 2012).

**Diagnosis of MiP**. The increased vulnerability of pregnant women to malaria and the changing epidemiology of malaria call for accurate diagnosis of MiP (Rantala et al., 2010). The major challenge in the diagnosis of MiP is that malaria parasites may not be present in the peripheral blood but may be sequestrated in the placenta (Mayor et al., 2013). Mayor et al. (2013) noted that cases of MiP with low parasite density in the peripheral blood, not detected by MM, may have a severe effect on pregnant women. This diagnostic challenge is addressed by the MiP sensitive, and specific tests namely placental histology (PH), fluoresce microscopy (FM), quantitative polymerase chain reactors (qPCR) and detection of histidine-rich protein 2 (HRP2) (Hassan, Haggaz, Mohammed-Elhassan, Malik, & Ishag, 2011; Mayor et al., 2012).

In placenta histology, placenta blood or placental tissue collected at delivery is examined for detection of malaria parasites (Mayor et al., 2012). Although histology of placental tissue is more effective than examination of the peripheral or placental blood, it cannot be conducted on a routine basis because the placenta is not readily accessible (Mayor et al., 2012). The qPCR is also highly sensitive for detection of MiP (Rantala et al., 2010). In Mozambique, an evaluation of four diagnostic tests for detection of Plasmodium falciparum in peripheral or placental blood of pregnant women revealed that three of the tests: PH, FM, and HRP2 failed to identify most of the falciparum detected by qPCR (Mayor et al., 2012). However, qPCR cannot be conducted on a routine basis in many settings because of inadequate resources.

FM involves the use of Plasmodium nucleic acid fluorescent dyes to enhance the detection of malaria parasites, regardless of parasite density (Hassan et al., 2011). FM is appropriate in resource-limited settings, particularly in rural areas because the cystoscope used for it is a mobile battery operated microscope, and the reagent used does not need storage. The comparison of FM with Giemsa-stained light microscopy for the detection of Plasmodium falciparum among pregnant women showed that FM had 97.6% sensitivity and specificity of 89.1 % (Hassan et al., 2011).

**Treatment of Malaria**

Between year 2006 and 2010, the treatment policy in many endemic countries has evolved, from the long-standing use of chloroquine to the now recommended Artemisinin-based Combination Therapy (ACT) (WHO, 2010). The malaria treatment guidelines (MTGs) issued by the WHO have been adopted by 79 countries (WHO, 2006;

2010; 2013). The MTGs includes the treatment of uncomplicated malaria, severe malaria, and MiP.

In patients with Plasmodium falciparum, severe malaria is an emergency due to the effect of the disease on virtually all the physiological functions (WHO, 2010). The treatment of severe malaria involves comprehensive clinical assessment including all body functions that could be affected. Intravenous Artesunate is used to treat severe malaria it is preferred to quinine in adults; followed-up with a full course of ACT, and supportive care (WHO 2010).

The treatment of malaria is an essential part of prevention, and both prevention and treatment have behavioral implications factors. The current literature on the behavioral factors is reviewed below under ideation and malaria.

**Ideation About Malaria**

Ideation, which refers to the important variables that influence behavior change, is broadly classified into cognitive, emotional and social domains (Kinciad, 2000). There are several factors across the ideation domains, but four are selected for review: Knowledge, attitudes, belief, and social influence. These ideation variables were selected because they are listed among the key variables in the HBM and TPB, the two theoretical models adopted for this study (Champion & Skinner, 2008; Montanoo, & Kasprzyk, 2008).

**Knowledge of malaria and prevention of MiP.** Knowledge of the cause, transmission, treatment, prevention and control of malaria varies by population segments, within and across endemic countries (Forero et al., 2014; Pell, Straus, Andrew, Menaca,

& Pool, 2011). Forero et al. noted that in Columbia, respondents had adequate knowledge of cause, transmission, signs and symptoms of malaria, but some had poor knowledge of preventive measures. Many respondents listed friends and family as their main source of information, while a few mentioned community health promoters as their information source (Forero et al., 2014).

In Mpumalanga province, South Africa, knowledge of heads of household about the cause and transmission of malaria was high, their treatment seeking behavior was desirable, but knowledge of sign and symptoms was low (Longwana, Zitha, Mabuza, & Maharaj, 2011).In Papua New Guinea, majority of residents of the surveyed island had adequate knowledge of the cause and transmission of malaria, many used bed nets to prevent malaria, while their level of education was significantly associated with knowledge of malaria, and bed net use (Ataka, Inaoka, & Ohtsuka, 2011). In a district in Tanzania, most respondents had adequate knowledge of malaria, but few used preventive measures, with household location and knowledge of cause of malaria as significant predictors of a household affected by malaria epidemic (Kinunghi, et al., 2010).

Regarding knowledge and utilization IPTp-SP, many ANC attendees in southwest Nigeria (52.2%) have heard about IPTp, but less than one-quarter (23.9%) could define it (Akinleye et al., 2009). Similarly, respondents in a large-scale population survey in Nigeria had average knowledge of the cause and transmission of malaria but knowledge of the use of preventive measures was inadequate (Wright et al., 2013).

In many malaria endemic countries, knowledge of malaria is high in some and low in others. However, as Kinkaid et al. (2000) noted, knowledge works along with

other ideation factors in adoption of desired behavior, hence the need to review available literature on other aspects of ideation, including attitude to malaria and MiP

**Attitude and beliefs about malaria and recommended behavior.** Attitude is one of the key elements of the theory of planned behavior (Montanoo, & Kasprzyk, 2008). Attitude to malaria is reflected in the local nomenclature of the disease, and belief about the cause, transmission, prevention, and treatment. Pell, Straus, Andrew, Menaca, & Pool (2011), noted that different nomenclature that connotes varying degrees of fever are used for malaria in endemic countries. Pell et al. also noted that the local nomenclature and the perceived mildness or severity of fever determine the attitude to, and course of treatment. The treatment could be either orthodox for severe fever or traditional for mild to moderate fever. There are also different attitude and beliefs regarding the cause, transmission, prevention and treatment.

Across countries in sub-Saharan Africa, studies indicate that many respondents correctly believed that mosquito bites transmit malaria, and the disease can be prevented by sleeping under ITN and by environmental management (Asante et al., 2010; Mazigo, et al., 2010; Ndo, Menze-Djantio, & Antonio-Nkondjio, 2011, Wright et al., 2013). But, others erroneously believed that malaria is caused by eating bad food, dirty environment, standing long hours in the sun, and excessive labor; while many resort to self-medication (Asante et al., 2010; Mazigo, et al., 2010; Ndo, Menze-Djantio, & Antonio-Nkondjio, 2011; Wright et al., 2013). The mixed attitude to malaria among the general population is also reflected in the attitude to MiP.

Attitude to MiP and its preventive measures has attracted attention of researchers. In a systemic review of 37 studies on MiP in Africa, Pell, et al. (2011) noted that many respondents in Kenya, Nigeria, Uganda, Ethiopia, and Zambia associated malaria with lack of food, poor hygiene, inadequate blood, evil spirits, excessive rain and cold. The respondents also believed that pregnant women are vulnerable to malaria.

Pell et al. (2011) noted that pregnant women in Malawi did not perceive MiP as serious, while those in Tanzania attributed the complications of MiP such as low birth weight and anemia, to other causes and not malaria. In Nigeria, many respondents in two states perceived malaria to be dangerous to the mother and the unborn baby, and was go to the hospital if they think they have malaria (Diala, Pennas, Marin, & Belay, 2013). Diala et al. reported that some respondents acknowledged traditional therapy as an effective treatment for MiP, while a key barrier to effective IPTp-SP is the attitude of health workers.

To a large extent, the attitude and beliefs regarding the cause, transmission, seriousness and severity of malaria and MiP have been less than optimal, which has negative implication for malaria prevention among pregnant women.

**Social influence and malaria.** Social influence refers to what some individual think others expect them to do and what they think others are doing (Kinciad, 2000). Important components of social influence are cue-to-action, and subjective norm, listed as intermediate variables in the HBM and the TPB, the selected theories for this study (Champion & Skinner, 2008; Montanoo, & Kasprzyk, 2008).

One common practice that is suggestive of negative social influence in malaria prevention and treatment is self-medication. In Tanzania, most respondents engaged in self-medication, with either monotherapy or local herbs for malaria treatment, and seek other options only when symptoms worsen (Metta, Haisma, Kessy, Hutter, & Bailey, 2014). Metta et al. noted that the respondents attributed self-medication to poor patient-provider relationship, and costs related to treatment in health facilities. Similarly, Ferrero et al. (2014), noted that in Columbia, self-medication and poor adherence to malaria treatment were common and are significantly associated with malaria risks. The self-medication and poor adherence to treatment as recommended, have been implicated in the development of drug resistant malaria parasites (Bell & Peeling, 2006; Wilson, 2013). Self-medication can be discouraged when community members, including pregnant women attend health facilities and adhere to treatment regimen

High attendance at ANC clinic is one of the common practices that presents opportunity for positive social influence among pregnant women. Pell et al. (2013), reported that in Kenya, Ghana, and Malawi, many pregnant women attend ANC clinic at least once, while pregnant. Distribution of ITN through ANC clinic has enhanced increase in ownership of ITN in many endemic countries, but the use of the product still lags (WHO, 2016). ANC attendance is gradually becoming a social norm, which provides an avenue for pregnant women to collect ITN and IPTp-SP distributed at the clinic, as part of measures for prevention of MiP.

Studies in malaria-endemic countries indicate that the ideation factors have both positive and negative effects on malaria prevention and control. High knowledge of

malaria, which enhances the prospects of desired behavior exist concurrently with undesirable attitudes and beliefs regarding malaria and MiP. The social influence around ANC attendance, on the one hand, provides avenue for collecting products and for prevention of MiP. On the other hand, pervasive self-medication and none adherence to the treatment regime are social influences that have negative effects on the overall achievement of malaria control targets, including the target for prevention of MiP.

## Summary

The literature review (LR) which was conducted through dedicated search in at least 10 multidisciplinary databases, covered a restatement of the research problem, and the current literature that established the problem. The two theories selected for the study, namely the HBM and the TPB were described in relation to the study design, and how the use of the models from previous research were of benefits to this research. The LR also covers the epidemiology of malaria including the cause, the transmission, and its prevention, especially the behavior aspects of prevention of MIP. Other aspects of the LR include the socio-economic impact of the disease and the ideation factors related to malaria prevention and control. The information on the epidemiology of malaria and the ideation factors provides context for the understanding of the key variables of the study.

The LR revealed paucity of research on composite malaria risk behavior of pregnant women (Akinleye et al., 2009; van Eijk et al., 2011; Singh, Brown, & Rogerson, 2013). Available research indicates low compliance with the recommended malaria preventive measures including low usage of ITN at an average of 36% across endemic countries (WHO, 2013). Similarly, there is low coverage of the second dose of IPTp-SP,

attributed to several factors, both on the side of service providers and pregnant women (Onoka et al., 2012; Onyeneho, Orji, Okeibunor, & Brieger, 2013). The LR also indicates low uptake of the test directed policy on treatment of malaria, and the challenges of diagnosis of MiP (Mayor et al., 2013). Some studies indicate that the ideation factors have both positive and negative effects on malaria prevention and control

Chapter 3 below is on the methodology for the study, which covers the details of the research design and process.

# Chapter 3: Methodology

## Introduction

The uptake of measures for the prevention of MiP is low. However, the extent of the risk of malaria for each pregnant woman in Nigeria and in other countries where the disease is endemic has not been quantified. The purpose of the study was to provide evidence on the composite risk behavior for MiP among pregnant women. This quantitative study involved the measurement of the MRS among pregnant women and their categorization into high, moderate, and low MRS. I analyzed the SES, demographic, and contextual factors related MRS, and I assessed the perception and attitudes of pregnant women regarding malaria and the recommended measures for its prevention.

This chapter is divided into three sections. Section 1 covers the research design, the connection between the design and the research questions, and the consistency of the design with the advancement of knowledge in public health. In Section 2, the study methodology is described, including the target population, the sampling and sampling procedures, recruitment of participants, and the data collection process. Other aspects of Section 2 include the description of how the study instrument was developed, the definition and measurement of the variables, and the plan for data analysis. In Section 3, the issues relating to threats to validity, and ethical considerations are described.

## Research Design and Rationale

This research was a quantitative, cross-sectional survey designed to measure the MRS of pregnant women and the related socioeconomic and demographic factors. The independent variables were the elements of perception, attitude, and subjective norms as

constructs of the HBM and TPB. The intervening variables were the intermediate factors of the HBM including sociodemographic and economic characteristics, geographical location, knowledge of malaria and MiP, cue to actions, and self-efficacy. The dependent variable was the MRS of pregnant women, determined by the extent of compliance with the recommended measures for prevention of MiP (Figure 3).

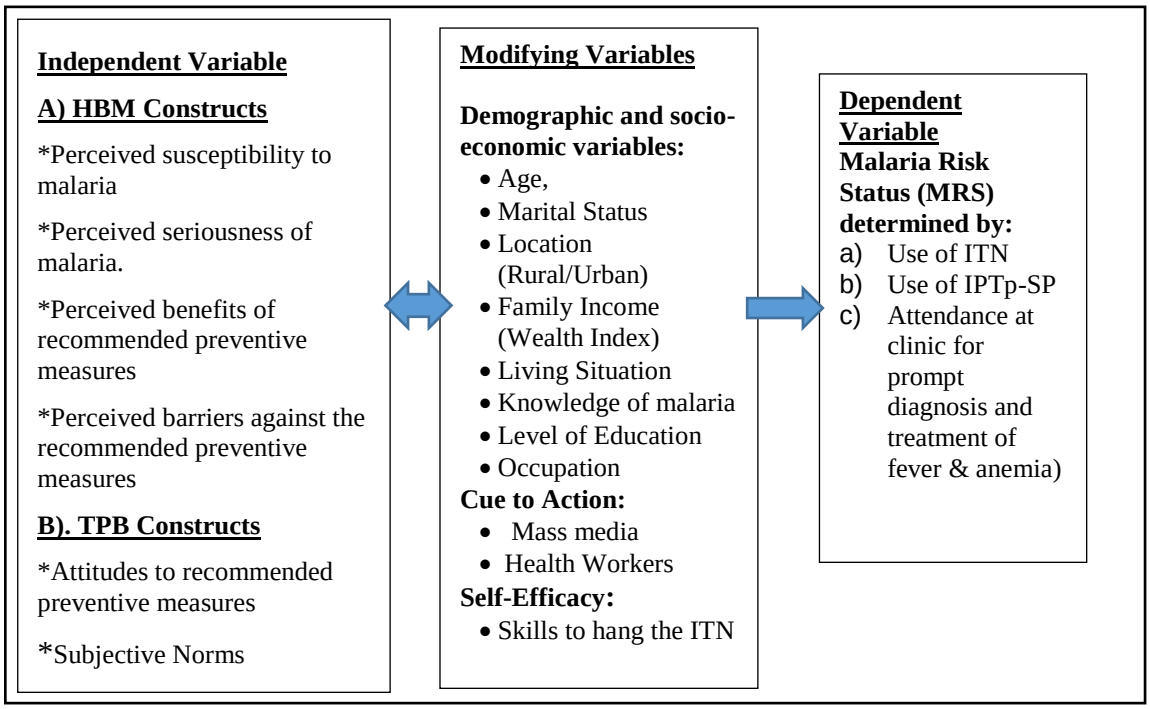


*Figure 3*. The Study Variables and Their Relationship.

The nature of the study made a cross-sectional survey design appropriate. For a study on the risk behavior for MiP, it was unreasonable and unethical to ask some pregnant women, as the experimental group, to use malaria preventive measures and request others, as the control group, not to use such measures. Also, it was neither reasonable nor appropriate to subject independent variables, such as attitude and

perception, to experiments because they were developed over a long period. A cross-sectional study enabled the point-in-time assessment and description of the MRS of pregnant women at the time of the survey, and the attribute of the study sample can be projected to the larger population (Frankfort-Nachmias & Nachmias, 2008).

**The Research Design and its Connection to the Research Questions**

The study variables in the model were reflected in the RQs. RQ 1 reflected the independent variables of perception and attitude to malaria and to the recommended measures for prevention of MiP, with MRS as the dependent variable. RQ 2 was used to generate data on the independent and modifying variables of knowledge, SES, and demographic factors and their effects on the MRS as the dependent variable.

**Time and Resource Constraints Consistent with the Design Choice**

The cross-sectional design was a household survey that required appreciable time and efforts. The study involved the application of sampling process and field work for the practical management of sampling procedure and for data collection. Resources were devoted to planning, field work for sampling and data collection, and to assure reliability and validity of the study.

**Design Choice to Advance Knowledge**

Effective protection of pregnant women from malaria can be better assured by the concurrent adoption and maintenance of the three core preventive measures (WHO, 2004). In studies on the behavior of pregnant women about MiP, scholars focused on one of the of the three recommended measures for the prevention of MiP: either the use of nets or the use of IPTp-SP. The extent of the composite risk of malaria for each pregnant

woman has not been quantified. In order to advance knowledge on risk behavior for MiP, there was a need for a design that allowed for the composite measurement of the extent of concurrent use or nonuse of the three recommended measures for prevention of MIP. The explorative, quantitative, cross-sectional study design allowed for the measurement of composite risk behavior for MiP. The design helped to classify pregnant women into three categories: low, moderate, and high MRS. The findings on MRS and the associated factors contributed to advancing the knowledge needed for the improvement of policies and programs for the prevention of MiP.

## Methodology

### The Population

The description of the population includes the target population for the study and the sampling procedures to arrive at the sample size.

**The target population.** The target population was made up of WCBA, 15-49 years, who were pregnant or who may be pregnant, and who resided in the FCT, Abuja, Nigeria. The FCT is the administrative capital of Nigeria, and it comprised of people of different cultural backgrounds and SES from within and outside Nigeria. The FCT population spread across the six Area Councils (ACs), the lowest tier of government, similar to a county in the United States. As shown in Figure 4, the six ACs are Abuja Municipal Area Council (AMAC), Abaji, Bwari, Gwagwalada, Kwali, and Kuje (Federal Capital Territory Administration, n.d.).


*Figure 4.* Map of the FCT, Nigeria.

AMAC is where over half (55.2%) of the FCT population resides (NPC, 2008), and it is also the location of the offices of the federal ministries, major public and private companies, agencies, and major nongovernmental organizations. The other 44.8 % of the FCT population resides in the satellite towns and villages. The high income top civil and public servants, professionals, and the top business class live and work in and around the city center in AMAC. The majority of the low- and middle-income population commutes from the semi urban and rural areas of the FCT, and from neighboring Niger and Nassarawa states commute to the city center to work. Many of the workers were civil servants, professionals, traders, technicians, and artisans in the formal and non-formal

sectors. In the rural areas, the population was mainly low literate and engaged in small scale artisanship, farming, fishing, and petty trading.

**The Size of the Target Population**

The estimation of the size of the target population was based on the 2006 census figures (NPC, 2008). In 2006, the FCT population was estimated at 1,406,239 (NPC, 2008). The WCBA made up 46.5% of the female population, while pregnant women made up 22.7% of WCBA (NPC, 2008). At an annual growth rate of 9%, the FCT population for 2015 was estimated at 3,051,947, of which 47.3% were female. As of 2015, the estimated population of the WCBA in the FCT was 671,260, of which 152,376 were pregnant.

**Sampling and Sampling Procedures**

A combination of multistage and stratified random sampling techniques were applied. Randomization is important in a population survey because resource limitation and logistics challenges make it impossible to study the entire population (Creswell 2008). The stratification, by geographical spread, was important because scholars have indicated that malaria risk behavior and its determinants may be influenced by rural or urban characteristics (Ankoma et al., 2012). Multistage sampling was also important because the process gave each unit of the population an equal chance of being included in the sample (Frankfort-Nachmias & Nachmias, 2008).

**How the sample was drawn.** The FCT has urban, peri-urban, and rural areas. The city center and the immediate surrounding residential areas were regarded as urban. The satellite towns were regarded as semiurban, while the villages distal to the satellite

towns were considered as rural. Based on these geographical characteristics, the six ACs in the FCT were stratified into three zones. The AMAC AC, mainly urban with some semiurban areas, made up Zone 1. Bwari and Gwagwalada ACs, which were mainly semiurban with some rural segments, made up Zone 2. Kuje, Kwali, and Abaji ACs, which were mainly rural with some semiurban segments, made up Zone 3. Each of the ACs was divided into EAs by the NPC, with a total of 3,590 EAs in the FCT (NPC, 2014).

The EAs are made up of households (HHs), with an average of 391 people in each EA (NPC, 2014). Each EA has about 48 HH, which is considered as a small population cluster in a population survey (NPC, 2014). For the purposes of this study, the EAs were grouped into clusters, with an average of two EAs per cluster. The grouping yielded about 1,795 clustered EAs, about 96 HHs per cluster, and a total of 172,320 HHs for the FCT. A description of the multistage sampling process follows the stratification.

***Stage 1.*** The selection of the ACs: Fifty percent of the six ACs were selected. AMAC was automatically selected because it was the only AC in Zone 1 and had over half of the estimated target population. Also, one AC each was randomly selected from Zones 2 and 3, which made three selected ACs (See Table 2). At each of the subsequent stages, the selection was done with proportional allocation by urban, semiurban, and rural characteristics of the population within each selected AC

***Stage 2.*** The selection of EAs: Clustered EAs were randomly selected. One hundred and twenty clustered EAs were selected, of which 50% were allotted to and randomly selected from the AMAC. The other 50% of the EAs were allotted to and

randomly selected from the other two selected ACs, of which 30% were allotted to Gwagwalada AC, while 20% were allotted to Abaji AC (See Table 2).

***Stage 3.*** The selection of HHs: The HHs with WCBA in the selected EA were listed to make up a sampling frame of 3,000 HHs. Fifty percent of the HHs were listed in AMAC, and the other half were selected and listed in the other two ACs. The WCBA in the listed HH were screened to indicate whether they were pregnant or not. All of the households with pregnant women were selected (see Table 2).

***Stage 4.*** Selection of HH with pregnant women: A minimum of 300 HHs with pregnant women were randomly selected, with 50% of the HHs selected from AMAC, and the other 50% selected from the other two ACs (See Table 2).

**The Sampling Frame**

The sampling frame covered HHs with WCBA, including pregnant women within the households. The inclusion criteria were women who were visibly pregnant or who indicated that they were pregnant at the time of data collection and who had been living in the selected HH for at least 3 months, before and while pregnant. Living in the selected HH for at least 3 months allowed for documentation of the malaria risk behavior in relation to the geographical location. The sampling frame excluded all males, children below the age of 15 years, and women who were not pregnant. Also excluded from the sampling frame were pregnant women who had not lived in the selected HH for at least 3 months before the survey.

Table 2**.**
*Sampling Procedure*

| **Population Parameters-Estimation** | **Mainly Urban AC** | **Mainly Peri-Urban ACs** | | **Mainly Rural ACs** | | | **Total** |
|---|---|---|---|---|---|---|---|
| | **Zone 1** | **Zone 2** | | **Zone 3** | | | |
| | **AMAC** | **Bwari** | **Gwagwalada** | **Abaji** | **Kuje** | **Kwali** | **6ACs** |
| a) 2015 Estimated Population | 1,690,964 | 493,489 | 342,660 | 126,943 | 211,471 | 186,429 | 3,051,947 |
| b) Each AC -As a percentage of total population of FCT | 55.20 | 16.30 | 11.28 | 4.17 | 6.91 | 6.13 | 100.00 |
| c) Enumeration Areas (EAs) in each AC | 1,982 | 585 | 405 | 150 | 248 | 220 | 3,590 |
| d)Clustered EAs-2 EAs per cluster | 991 | 293 | 202 | 75 | 124 | 110 | **1,795** |
| e) Number of HH at 80-90 HH per Clustered EA | 89,182 | 26,339 | **90** 18,222 | 6,737 | 11,170 | 9,900 | **161,550** |
| f) Population of WCBA per AC | 371,919 | 108,540 | 75,366 | 27,919 | 46,512 | 41,004 | 671,260 |
| g) Population of Pregnant Women in Each AC -22.7% of WCBA | 84,426 | 24,639 | **0.227** 17,108 | 6,338 | 10,558 | 9,308 | **152,377** |
| **STAGES** | | | **SELECTION** | | | | **In the 3 ACs Selected** |
| 1.Selection of 50% of the 6 ACs | **AMAC** | | **Gwagwalada** | | **Abaji** | | |
| 2. Selection of 120 Clustered EAs | 0.5*120<br>60 | | 0.3*120<br>36 | | 0.2*120<br>24 | | 120 |
| HHs with WCBA listed in the selected EAs | 50%<br>1500 | | 30%<br>900 | | 20%<br>600 | | 3000 |
| 3.Selection of HHs with Pregnant women | 50%<br>500 | | 30%<br>300 | | 20%<br>200 | | 1000 |
| 4.Selection of Pregnant women | 0.5x300<br>150 | | 0.3x300<br>90 | | 0.2x300<br>60 | | 300 |

*Note:* Area Councils (ACs), Enumeration Areas (EAs), Women of child bearing Age (WCBA), Households (HHs)

**Power Analysis for Sample Size**

In sampling, the effect size is an indication of how the relationship between variables is large or strong, such that an intervention with a large effect would require an assessment of fewer people to detect this effect (Frankfort-Nachmias & Nachmias, 2008). The determination of the effect size for the study depended on the extent of a key malaria risk behavior among the study population, such as nonuse of ITN every night. In a national survey in Nigeria, only 18% of pregnant women slept under ITN the night before the survey (NPC, 2014). With a reasonable assumption that 82% of pregnant women are engaging in a risk behavior of not sleeping under ITN, an assessment conducted on a moderate sample size will show the relationship between variables.

To obtain the minimum sample size, a formula was applied based on the sample size calculator software developed by the Creative Research Systems (n.d.). The calculation requires the determination of the confidence interval, confidence level, and the estimated proportion of the population that has the characteristics, at risk (Creative Research System, n.d.). The confident interval is the margin of error acceptable for the study findings. The confidence level is expressed as the percentage of the population, which represents how often the true percentage of the population whose responses lie within the confidence interval (Creative Research System, n.d.).

For this study, the Alpha (α) level, the margin of the Type 1 error, was set at 0.05, which meant that there was possibility of a 5% chance that the result for the test statistics may be due to chance.

The sample size formula applied was as follows

$$S = \frac{Z^2 \times (p) \times (1-p)}{c^2}$$ (Creative Research Systems, n.d.)

Where

*Z*= 1.96, for 95 % confidence interval

*p*= estimated proportion of the population that has the characteristics (at risk)

*C*= Confidence interval expressed as decimal

With the assumption that the proportion of pregnant women engaging in risk behavior for malaria is 82% or 0.82, the minimum sample size was be

$$S = \frac{(1.96)^2 \times (0.82) \times (0.18)}{(0.05)^2}$$

The minimum sample size was 227.

**Recruitment, Participation, and Data Collection**

Trained research assistant (RAs) were engaged to identify HHs with WCBA in the selected EAs. In the identified houses, the RAs informed the heads of HH about the proposed study, the purpose, and the possibility that the WCBA in the HH may be selected as participants. Based on the inclusion and exclusion criteria for the sampling frame, the RAs documented the houses with eligible WCBA, the contact details of the pregnant women and the heads of HHs. The list of HHs with eligible WCBA made up the sampling frame. After the sample was determined, the schedule of survey interview was developed. The socioeconomic and demographic information collected were age, marital status, religion, trimester (stage) of pregnancy, level of education, area of residence, living arrangement, and family situation, and occupation, estimation of family income, HH characteristics and assets.

**Informed Consent**

Each selected participant was informed about the study, gave formal consent in writing or thumb printed before personal interview was conducted. At the commencement of each interview, the RAs provided each participant with standardized introductory information as contained in the questionnaire, after which the participant was expected to either give or not give consent. The information which was provided in the language the participant understands, included research purpose, the source of administrative and financial support for the study, and the estimated duration of the interview. A consent form was developed and used to elicit information on

- identity of the researcher and the supporting institutions
- assurance of confidentiality regarding information shared by participants
- the research purpose
- the level of involvement of participants
- the benefits of participation
- contact for follow-up questions and
- the freedom to participate, and withdraw from the interview, any time (Creswell, 2008, p 89).

Each participant either signed or thumb-printed on the consent form as a mark of consent.

**Data Collection**

Data was collected through personal, face-to-face structured interview with the selected pregnant women. The interview was very important because many pregnant women especially in the semiurban and rural parts of the FCT were low literate, and may

not be able to fill out a questionnaire. About 61% of the female HH population in the FCT either had no education or had some secondary education (NPC, 2014). The other benefit of the personal interview was the high response rate, since interviewers controlled the interview situation, and followed up with participants as appropriate (Frankfort – Nachmias & Nachmias, 2008).

The questionnaire was divided into sections, and the sequence of items on the questionnaire was the same for each participant. The interviewers were trained, not to reword the questions and not to provide suggestive information or explanations. The structured interview helped to ensure that the differences in the response to questions was due to actual difference among participants, and not difference in the conduct of the interview (Frankfort –Nachmias & Nachmias, 2008).

**Participants' Exit from the Study**

The consent form also indicated among other points, that a participant was at liberty to withdraw from the interview at any time, and exit the study. There was no special process to exit the study other than for the participants to inform the interviewer of her wish to exit. The few participants that indicated a wish to exit the interview were not persuaded, cajoled, or pressured to continue. To ensure that sample size was not affected by the drop out of some respondents, at least 300 participants were selected, which was 73 participants above the minimum sample size of 227.

**Follow-up procedures**

The interview sessions were scheduled at a convenient date and time for each participant. However, some unforeseen circumstances made few participants not able to keep to the appointment, and their interviews were re-scheduled, as convenient for them.

**Instrumentation and Operationalization of the Constructs**

The process for the instrumentation and operationalizing of the constructs covered the description of how the instrument was developed, the evidence, and possible threats to reliability and validity; and the supervision of the RAs.

**Development of the instrument.** The study instrument was the questionnaire, which was developed based on current literature and consultations with experienced researchers on MiP. The meta-analysis performed by Harrison et al. (1992) revealed that the HBM provides a good basis for the development of the instrument. The development of the questionnaire was also by guided by the malaria behavior change indicator reference guide (MBCIRG) (Roll Back Malaria (RBM) Partnership (RBM, 2014). The questionnaire covered the areas of malaria target behaviors, knowledge and awareness, risk and efficacy, as contained in nine out of the ten malaria indicators in the MBCIRG (RBM, 2014).

I divided the questionnaire into four sections, with an average of 13 questions for each section. Section ‘A’ contained close-ended questions, to elicit information on the socio- demographic characteristics of participants, identified in the conceptual framework as the modifying variables (see Figure 3). Close-ended questions are important for eliciting factual answers on the background of participants in a survey (Frankfort –

Nachmias & Nachmias, 2008). Section ‘B’ contained multiple-choice questions (MCQs) on the knowledge of malaria, a key modifying variable in the conceptual framework (see Figure 3). The section reflects the RBM core indicators on the knowledge of the cause, transmission, prevention and treatment of malaria, and MiP. MCQs are used to assess knowledge level regarding the content of a particular subject (Salkind, 2007).

Section ‘C’ of the questionnaire contained items on perception and attitude about malaria and MiP. The questionnaire items for the section were on (a) perceived seriousness (b) perceived susceptibility, (c) perceived barriers, and (d) perceived benefits. Other items in the section were on attitude and subjective norms, which were variables in the conceptual framework (see figure 3). The questions this section were framed as Likert scale type of questions. Likert’s scale is commonly used to assess attitude on a 5-point or 7-point scale, with weight assigned to each point along the scale (Joshi, Kale, Chandel & Pal, 2015). Section ‘D’ featured questions either in the MCQs and true or false formats. The items for this section were on self-reported accounts of behavior regarding the prevention of MiP, including the use of ITN, use of IPTp-SP, and attendance at an ante-natal clinic.

**Evidence for reliability.** Reliability refers to the function of a test to yield the same result, when applied to measure the same thing, at different times (Salkind 2008). Several steps were taken to ensure reliability. The selection of the minimum sample based on probability sampling helped to achieve standardized effect size, while application of sampling formula enhanced representativeness and reliability. Questionnaire items were stated to avoid leading, threatening, or double-barred questions

(Frankfort –Nachmias & Nachmias, 2008).

***Pilot testing.*** The questionnaire was pilot-tested among few respondents whose socioeconomic and demographic characteristics are similar to that of the actual participants. The pretest was done in EAs in Gwagwalada AC that were not used for actual data collection, so as not to sensitize potential participants to the questionnaire. The trained RAs used the opportunity of the pretest to hone their skills for proper data collection. The pilot test enhanced reliability, through avoidance of method error (Salkind, 2008).

The survey questionnaire was pretested with 24 participants, but only 22 were available to complete the survey for the second time, as the re-test. As such, only 22 matched survey forms were used for reliability rating. The same set of participants responded to the questionnaire for the test-retest reliability rating, conducted at an interval of nine days. Scores in figures were assigned to each participant's responses in both the test and re-test completed questionnaires. The test-retest reliability was assessed with Pearson's coefficient of correlation (r), aided by the Pearson correlation calculator (Social Science Statistics (n.d)). A value of at least 0.70 was considered for this correlation test statistics. The Cronbach's alpha reliability coefficient was computed to assess the internal consistency reliability of some question items with Likert scale responses.

**Supervision of research assistance.** I trained and supervised the RAs. The supervision started from the period of mapping the study setting, and continued throughout the period of data collection. During mapping, I monitored the RAs to ensure

proper documentation of HHs. During data collection, the filled-out questionnaires were cross checked at the end of each day, and areas of ambiguities and mistakes were corrected after clarification with the RAs.

**Privacy, no interruption or distraction.** The personal interviews were scheduled for a convenient time for the participants, which made them devote the required time, and attention. The interview took place around the resident of participants, at choice places devoid of distractions or interruptions. Respondents' names were not written on the questionnaire, but the number and other identification items for each questionnaire were filled out at commencement of each interview. The RAs emphasized the need for attention, and that questionnaire items were not to be discussed with the others in the neighborhood.

**Sufficiency of instrumentation.** At an average of 13 items for each of the four sections, the questionnaire had 53 items to address the two RQs. RQ1 was addressed in Section 'C' of the questionnaire, with items on perception and attitude regarding malaria and MiP. Section 'D' on risk behavior for MiP, had items on level of compliance or non-compliance with the three recommended preventive measures for MiP (WHO, 2004). Section 'D' also featured items on the constructs of self-efficacy and cue to actions, which are two of modifying variables of the HBM.

RQ2 was addressed in Sections 'A', 'B' and 'D' of the questionnaire. The questionnaire items in Section 'A' were on the socio-economic and demographic factors that may be associated with the MRS of the participants. The key socio-economic and demographic characteristics were included as part of the modifying variables of the study

(see Figure 3). The questionnaire items in Section 'B' were on knowledge of malaria and MiP, which covered nine out of the 10 knowledge items on the RBM reference indicators (RBM, 2014).

**Operational Definitions of the Study Variables.**

The independent variables, intermediate and dependent variables are defined below

*Perception*: A construct of the HBM, which refers to a particular belief or thought about a recommended behavior, product or service. The key elements of perception are described as follows:

- *Perceived susceptibility:* Belief about the chances of contracting malaria
- *Perceived seriousness:* Belief about the severity of a malaria
- *Perceived benefits:* Belief that the recommended measures for the prevention of malaria was be of personal benefit
- *Perceived barriers:* Belief about the cost and discomfort associated with the recommended measures for the prevention of malaria

*Attitude:* An element of the theory or planned behavior (TPB), which refers to the belief about the outcome of performing an action, as determined by personal evaluation of the outcome as positive or negative.

*Subjective norm:* The feeling of an individual concerning what significant others such as friends, relations, and authority figures consider as the normal or the right thing to do.

*Sociodemographic characteristics:* The distinguishing features of an individual as seen physically, in the relationships, and in the socio-economic status. The features include age, religion, marital status, area of residence, average household income, occupation, living situation, level of education, knowledge of malaria, and malaria in pregnancy.

*Socioeconomic status (SES):* The socioeconomic status refers to the living circumstances of an individual, which is measured in terms wealth index, determined by of household characteristics and assets. SES is reflected in the classification of households into five wealth quintiles, according to their index value.

*Living situation:* The current living arrangement of a pregnant woman, as indicated by whether she currently lives with the spouse or not. Living situation may be supportive or unsupportive.

*Supportive living situation*: A situation in which the pregnant woman is supported by her spouse to engage in recommended behaviour for prevention of MiP.

*Unsupportive living situation:* A situation in which the pregnant woman is not supported by her spouse to engage in recommended behaviour for prevention of MiP.

*Cue to action:* Refers to the source of information such as the mass media, health service provider, or significant others that motivate a pregnant woman to practice desired behavior to prevent MiP.

*Self-Efficacy* refers to the ability of an individual that she or he can engage in a recommended action or behavior.

*Malaria risk status:* Refers to the current indication of the likelihood that an individual is having or is likely to have malaria infection. MRS may be low, moderate or high.

**How Independent Variables was Measured**

Perception as an independent variable and its various elements; attitude and subjective norms were measured by 11 items of the Likert scale type. Specifically, each participant was asked to indicate the extent to which she agrees or disagrees with statements regarding malaria, MiP, and the recommended measures for its prevention. Where the statement is made in the positive, selection of the option of strongly agree was be scored as 5, while strongly disagree was be scored as 1. Where the statement was made in the negative, the scoring was reversed. An example of the Likert type of item, with the statement made in the negative, is as in Table 3 below

**Table 3.**
*Illustration of the Likert's Scale*

| Item | Rating | | | | |
|---|---|---|---|---|---|
| | Strongly agree | Agree | Undecided | Disagree | Strongly disagree |
| Malaria is a serious problem for a pregnant woman and her baby in the womb. | | | | | |

The selected option under the rating was ticked, and the proportion of the respondents that selected each option was determined.

Knowledge of malaria is a key intermediate variable that was measured. Responses to the questions on the knowledge by each participant was scored. Each

correct response was score as one mark. There were four items with more than one correct answers, which made the maximum score to be 14 for the 9 items. The total score for each participant was her composite knowledge score on malaria and MiP.

**Measurement of the dependent variable.** MRS is the dependent variable, which was measured as the indicator for composite risk behavior for MiP. MRS was assessed by the extent of compliance with the three recommended measures for the prevention of MiP (WHO, 2004). Each participant was required to answer yes or no to three questions as follows:

1. Did you sleep under ITN last night?
2. Have you taken the dose of IPTp-SP as appropriate for your stage of pregnancy?
3. Did you attend ANC regularly as appointed at least once a month/ since you registered?

The third question was a proxy, to indicate the potential for effective case management of malaria and anemia. The response to each of the question was used to classify each pregnant woman as being of high, moderate or low MRS (see Table 4).

**Table 4.**
*A Guide for Classification of Pregnant Women by Malaria Risk Status*

| | Malaria Risk Status | | |
|---|---|---|---|
| | High | Moderate | Low |
| Yes, to the 3 questions | | | X |
| No to the 3 questions | X | | |
| No to Q1, and Yes to Q 2 and 3 | X | | |
| Yes, to Q1, and No to Q 2 and 3 | | X | |
| Yes, to Q2, and No to Q 1 and 3 | X | | |
| No to Q2, and Yes to Q 1 and 3 | | X | |
| Yes, to Q3, and No to Q 1 and 2 | X | | |
| No to Q3, and Yes to Q1 and 2 | | X | |

**Data Analysis Plan**

The Statistical Package for the Social Sciences (SPSS) was used to analyze the data. SPSS is a statistical package designed for data transformation and analysis (Frankfort –Nachmias & Nachmias, 2008). Data cleaning started during data collection when filled-out questionnaire was cross checked at the end of each day. Data obtained were sorted, before computer data entry was done.

The hypotheses were tested with appropriate test statistics. Chi-square test was applied to determine the association between each categorical variable such as residential location, SES, living arrangement, family income; and MRS, the dependent variables. Also, considering that the study analyzed multiple factors in relation MRS, a regression analysis was conducted to explain the relationship between variables. The odds ratio was calculated to determine the odds of a pregnant woman having high MRS, based on the SES, living arrangement, age, and other modifying variables

**Potential Confounding Variables**

Age and living arrangement could be confounding variables. Young adults, who were pregnant for the first time, may comply with the recommended measure for prevention of MiP, better than women who were pregnant for the second or more times. Regarding living arrangement, it is possible that pregnant women whose living situation were supportive were more likely enjoy better emotional and financial support, compared with those whose living situations that were not supportive. Such support to the pregnant women can extend to prevention of MiP. The potential confounders were controlled for and analyze, as part of the study analysis. The research questions and hypotheses.

There were two research questions (RQs) and eight hypotheses. RQ 1 has three hypotheses, while RQ2 has five hypotheses

RQ1: Do perception and attitude of pregnant women to malaria, and measures for prevention of MiP, influence their MRS?

$H_1$1a: Pregnant women who perceive MiP as a serious and severe problem will be of low MRS while those who perceive MiP as ordinary was be of high MRS.

$H_0$1a: There is no difference in the MRS of pregnant women who perceive malaria as a serious and severe problem and those who perceive malaria as ordinary.

$H_1$1b: Pregnant women who believe that recommended measures for prevention of MiP are effective and comfortable to use will be of low MRS, while those who perceive the recommended measures as ineffective or uncomfortable to use will be of high MRS.

$H_0$1b: There is no difference in the MRS of pregnant women who believe that recommended measures for prevention of MiP are comfortable to use and those who perceive the recommended measures as uncomfortable

$H_1$1c: Pregnant women who believe that recommended measures for prevention of MiP are beneficial to use will be of low MRS, while those who perceive the recommended measures as not beneficial to use was be of high MRS.

$H_0$1c: There is no difference in the MRS of pregnant women who believe that recommended measures for prevention of MiP are beneficial to use and those who perceive the recommended measures as un uncomfortable

RQ2: To what extent are cognitive, sociodemographic, and economic factors associated with the MRS of pregnant women?

$H_1$2a: Pregnant women, with adequate knowledge of malaria and MiP, will be of low MRS while those with poor knowledge of malaria was be of high MRS.

$H_0$2a: There is no difference in the MRS of pregnant women who have adequate knowledge of malaria and MiP and those with inadequate knowledge.

$H_1$2b: Pregnant women who are of high socioeconomic status will be of low MRS while those who are of low socioeconomic status was be of high MRS.

$H_0$2b: There is no difference in the MRS of pregnant women who are of high socioeconomic status and those who are of low socioeconomic status.

$H_1$2c: Pregnant women who live in urban and peri-urban areas will be of low MRS while those who live in the rural areas was be of high MRS.

$H_0$2c: There is no difference in the MRS of pregnant women who live in rural areas and those who live in semiurban and urban areas.

$H_1$2d: Pregnant women whose living situations are supportive of prevention of MiP will be of low MRS, while those whose living situations are unsupportive of prevention of MiP was be of high MRS.

$H_0$2d: There is no difference in the MRS of the pregnant women who are young adults and those who are of middle age.

$H_0$2e: There is no difference in the MRS of pregnant women who are supportive living situations and those who living in unsupportive living situations.

$H_1$2e: Pregnant women who are adolescents (15-19years) and young adults (20-34 years) will be of low or moderate MRS while those who are of middle age (35years and older) was be of high MRS.

**How Results Were Interpreted**

The *p*-value and the confidence interval (*CI*) were calculated for the test statistics, with *p*-value significant level set at 0.05. The *p*-value was used to determine the point at which to accept or not to accept the null hypothesis. The *CI* was set at 95%, which showed the true measure of association. (Frankfort –Nachmias & Nachmias, 2008).

## Threats to Validity

The study was a cross-sectional design. The results can only be generalized in the context of time, the setting of the survey, and a population with similar characteristics. External validity will be threatened if any inference is made or results generalized to other population, settings, and to the past or future situations (Creswell, 2008). The possible sources of threat to the internal validity of the study can be through the processes of sample selection, data collection, and instrumentation (Creswell, 2008). I avoided a threat to internal validity that can be due to sampling and maturity, by inclusion of 73 participants as addition to the minimum sample, to cover for possible drop-out. Also, the application of stratified and multistage sampling procedures helped to prevent possible threat to internal validity.

The selection of participants with likely extreme score could also be a threat to internal validity (Creswell 2008). ANC clinic attendees were likely to have better knowledge of MiP than irregular or non-attendees, because they were more likely to be

exposed to information and skills about the prevention of MiP. As part of measures to prevent threat to internal validity, sampling procedures were applied at the community level, which ensured inclusion of both ANC clinic and non-clinic attendees in the sample.

Possible threats to construct validity can be due to inadequate or wrong definitions and measurement of research variables (Creswell, 2008). The independent variables and the intermediate variables were defined based on the HBM and TPB (Champion & Skinner, 2008,). The *t*-test, the chi-square, and multiple regression were properly applied, to avoid threat to construct validity.

**Ethical Procedures**

I obtained ethical approval for the study, both from Walden IRB, and the research ethics committee of the FCT, Nigeria. The questionnaire was submitted as a supporting document to the official application for the approval. I addressed the queries raised on consent and use of appropriate consent form by Walden IRB during the approval process, until the study was approved. At each stage of the research, due research ethics process was followed. A major aspect of the recruitment of the participants was that the spouses of pregnant women were contacted to give approval for their spouse to participate in the study. Culturally, in the African setting, most pregnant women will only engage in an activity with the expressed approval of their spouse.

All completed, and cleared questionnaire were collected daily, placed in an envelope, which I safeguarded until the time for computer data entry. The data were entered to the computer, the files were pass-worded and protected, with access codes known only to me and one other authorized person. All electronic records of the research

were safely kept in the computer, and in the external backup drive, which I will safeguard for a minimum period of 5 years.

## Summary of the Methodology

The research was a cross-sectional survey, designed to assess the composite risk behavior that enhance the transmission of MiP. The choice of the design was because of the irrationality and unethicality of an experiment regarding behaviour for prevention of MiP. The conceptual framework for the study shows the relationship between the independent, intermediate and the dependent variables. The variables were reflected in the two research questions (RQs), and the hypotheses.

Stratified and multistage sampling procedures were applied to select pregnant women in the FCT, Nigeria as the sample for the study. With due consideration for power size, alpha and power level, and with the application of the sample size formula, a minimum sample of 227 pregnant women was considered appropriate, but he actual sample interviewed was 300. The recruitment of the participants involved trained and supervised research assistant (RAs). Data were collected through personal interviews. The questionnaire had 53 items, which focused on all key variables in the conceptual framework. Appropriate steps were taken to ensure validity and reliability of the study

As part of ethical considerations, each participant gave formal consent, and the approval of both the Walden IRB and that of the research ethics committee of the FCT, Nigeria were obtained. Appropriate test statistics namely *t*-test, chi-square, and regression analysis were conducted with the use of SPSS. Data collected were saved as electronic

files, pass-worded, with external drive backup, to be safeguarded for a minimum period of 5 years.

The details of the results and the analysis of the findings are narrated in chapter 4. MRS of the selected pregnant women was determined, and the relationship between perception, socio-economic and demographic factors, and MRS were analyzed. The detail findings are presented by the research questions, and the outcome of the test of the research hypotheses. The results are illustrated by tables and figures, as appropriate.

# Chapter 4: Results

## Introduction

Chapter 4 of this study starts with a synopsis of the purpose, a restatement of the research questions and the hypotheses, a description of the pilot study, the data collection process, and the sampling procedures. The details in this chapter are on the descriptive and the analytic statistics of the findings.

This study was designed to provide evidence on the composite risk behavior for malaria among pregnant women. A cross-sectional, quantitative study was used to measure the MRS of pregnant women, based on their composite risk behavior for MiP, and to classify the women into high, moderate, and low MRS. The classification of the pregnant women by their MRS was conducted to gauge the response of the women to the interventions for the prevention of MiP. The factors related to MRS were analyzed, and the findings could provide a basis for a review of policies and interventions at policy, service delivery, and community levels to increase the uptake of the recommended measures for prevention of MiP.

I developed two RQs and eight hypotheses.

RQ1: Do perception and attitude of pregnant women to malaria, and measures for prevention of MiP, influence their MRS?

$H_1$1a: Pregnant women who perceive MiP as a serious and severe problem will be of low MRS while those who perceive MiP as ordinary will be of high MRS.

$H_0$1a: There is no difference in the MRS of pregnant women who perceive malaria as a serious and severe problem and those who perceive malaria as ordinary.

$H_1$1b: Pregnant women who believe that recommended measures for prevention of MiP are effective and comfortable to use will be of low MRS, while those who perceive the recommended measures as ineffective or uncomfortable to use will be of high MRS.

$H_0$1b: There is no difference in the MRS of pregnant women who believe that recommended measures for prevention of MiP are effective and comfortable to use, and those who perceive the recommended measures as in effective and uncomfortable.

$H_1$1c: Pregnant women who believe that recommended measures for prevention of MiP are beneficial to use will be of low MRS, while those who perceive the recommended measures as not beneficial to use willbe of high MRS.

$H_0$1c: There is no difference in the MRS of pregnant women who believe that recommended measures for prevention of MiP are beneficial to use and those who perceive the recommended measures as uncomfortable

RQ2: To what extent are cognitive, sociodemographic, and economic factors associated with the MRS of pregnant women?

$H_1$2a: Pregnant women, with adequate knowledge of malaria and MiP, will be of low MRS while those with poor knowledge of malaria will be of high MRS.

$H_0$2a: There is no difference in the MRS of pregnant women who have adequate knowledge of malaria and MiP and those with inadequate knowledge.

$H_1$2b: Pregnant women who are of high socioeconomic status will be of low MRS while those who are of low socioeconomic status will be of high MRS.

$H_0$2b: There is no difference in the MRS of pregnant women who are of high socioeconomic status and those who are of low socioeconomic status.

$H_1$2c: Pregnant women who live in urban and semiurban areas will be of low MRS while those who live in the rural areas will be of high MRS.

$H_0$2c: There is no difference in the MRS of pregnant women who live in rural areas and those who live in semiurban and urban areas.

$H_1$2d: Pregnant women whose living situations are supportive of prevention of MiP will be of low MRS, while those whose living situations are unsupportive of prevention of MiP will be of high MRS.

$H_0$2d: There is no difference in the MRS of pregnant women who are supportive living situations and those who living in unsupportive living situations.

$H_1$2e: Pregnant women who are adolescents (15-19years) and young adults (20-34 years) will be of low or moderate MRS while those who are of middle age (35years and older) was be of high MRS.

$H_0$2e: There is no difference in the MRS of the pregnant women who are young adults and those who are of middle age.

## Pilot Study

The pretest of the questionnaire was the pilot study. The pretest was conducted in the selected urban and rural areas of Gwagwalada AC, a location that was different from the actual study site. The urban and rural residents in Gwagwalada AC had similar characteristics with residents in other urban and rural areas of the FCT. The pretest was done in a location that was different from where the sample of the study was drawn to

avoid sensitizing the respondents to the items in the questionnaire. The pretest also provided the trained research assistants the opportunity to test their skills in data collections. The questionnaire was administered for an average duration of 35 minutes.

The pretest was conducted among 24 respondents; but, only 22 filled-out questionnaires were used for the test-retest reliability assessment because two of the pretest participants were not available for the retest. The test-retest was the process in which I administered the questionnaire twice on the same participants at 9-day intervals. After the two rounds of the administration of the questionnaire, the scores for each participant were paired to enable calculation of the of the Persons correlation coefficient *r*, aided by the Pearson correlation calculator (Social Science Statistics (n.d.). The mean test score (*m*) = 46.46, standard deviation (*SD*) = 14.54. The *m* retest score =47.61, *SD* = 14.68. The test-retest value was 0.970 (see Table 5).

The scores for the set of eight questions, Q 24 to Q 31, related to the knowledge of malaria and MiP had a *m* test score of = 50.53, *SD* = 38.43. The test- retest value was 0.829. The set of 14 questions, Q32 to Q 45, related to perceptions had a *m* = 62.88%, *SD* = 72.01. The test- retest value was 0.975. The perception-related question was of the Likert's type; hence, Cronbach's α internal consistency of the question was conducted with a value of 0.927. The set of eight questions, Q46, Q47A, Q48, Q49A, Q50A, Q51, Q52, Q53A, related to actions taken for prevention of MiP had a *m* =32.58, *SD* = 52.3. The test- retest value was 0.941 (Table 5).

**Impact of the Pilot Study on the Main Study**

After the initial test, some questions were modified while others were deleted. In Section C on perception and attitudes to malaria and MiP, the initial Question 33 was split into two, as Question 33 and 34. The revised Question 33 was "I don't worry about malaria because I am healthy, I don't do too much work, and I don't work in the sun." Question 34 was revised as "I don't worry about malaria because it is an ordinary problem that can be easily treated." In Section D of the questionnaire, an item was added as Question 52: "What is the purpose of the malaria medicine(s) you used?" This addition was based on the comments from some pretest participants who indicated that some of them may be using a particular medicine either for prevention or treatment of MiP or both. Five items were modified for clarity of personal intension and thought about malaria and MiP. The modification was for Questions 38, 39, 40, 41, and 42, to start with "I think" or "I always." After the initial test, few changes, as described above, were made in the questionnaire, and number of items increased by three, from 50 to 53. The findings of the test and retest reliability showed correlation and internal consistency of the items on the questionnaire (Table 5).

**Table 5.**
*Test-retest reliability of the instrument on Composite Risk Behaviour for Malaria n Pregnancy*

| Number of Participants | Parameters of Assessment | Number of Items | | Mean Scores (%) | | Standard Deviations | | Pearson's *r* Values |
|---|---|---|---|---|---|---|---|---|
| | | Test | Re-test | Test | Re-test | Test | Retest | |
| 22 | Preventive Action. | 8 | 8 | 32.58 | 31.82 | 52.3. | 43.89 | 0.941. |
| | Perceptions | 12 | 14 | 62.88 | 61.65 | 72.01. | 73.01 | 0.975. |
| | Knowledge. | 8 | 8 | 50.35 | 49.35 | 38.43 | 25.73 | 0.829. |
| | Composite risk. | 28 | 30 | 46.46 | 47.61 | 14.54 | 14.68. | 0.970 |

There was no discrepancy from the proposed plan for data collection. The eight RAs engaged and trained for the study worked for 3 weeks to collect the data. Before the actual data collection, I supervised the RAs to develop the sampling frame and to conduct the actual sampling based on the multistage sampling procedures. The listing of housing units in the selected EAs was done for the development of the sampling frame, from which the sample was selected. The listing exercise was conducted in the first week of data collection. During the listing of housing units, eligible pregnant women and their HH were identified. The eligible pregnant women were informed of the study, and they were told to expect the return of the RAs for the actual interview the following week.

## Descriptive Statistics

The descriptive statistics cover the details of the general characteristics of the data set, regarding respondents' socioeconomic, and demographic characteristics, personal actions taken for prevention of malaria, and their MRS.

### Sociodemographic Characteristics

I present the socioeconomic and demographic characteristics of the respondent in a frequency distribution (see Table 6). A majority of the pregnant women 97 % ($N$ = 296) were married, of which over three-quarter 77.3 % ($n$ = 296) were in monogamous unions. Most respondents 78 % ($N$ = 300) were young adults between 20 and 34 years of age, with a mean age of 28.6years. About half of the respondents 50.5% ($N$ = 300) were Christians, while almost two-thirds 62% ($N$ = 300) lived in urban areas. In the last 6 months before the survey, a majority of the pregnant women 84.5% ($N$ = 296) lived with their husbands or spouse. Within this category, 90.0% ($n$ = 271) reported adequate care including support for the use of ITN. Many participants 35.0% ($N$ = 300) were educated up to secondary level; just as many 41.2% ($N$ = 296) were at mid-stage (second trimester) of their pregnancy. Most respondents 75% ($N$ = 277) resided in areas that were less than 30 minutes walking distance from the nearest health facility.

SES was measured by wealth index (WI), created by principal component analysis (PCA) of employment status, personal income, and 10 other items on HH characteristics and assets. Many participants 60.6% ($N$ = 292) were not employed; about one-fifth 19.0% ($N$ = 300) spent over 40% of their income on food, while 37.3% earned a monthly income of N19, 000 ($63.33) and below. The PCA had five categories of WI,

from the lowest to the highest. Nearly two-fifth of the participants 39.9 % ($N$ = 300) were of the fourth WI, about one-fifth 20.3% ($N$ = 300) were of the highest WI, while 12.7% were of the lowest WI. A majority of respondents 82.0% ($N$ = 300) had heard messages on malaria, and its prevention, at 6 months before the survey. The popular sources of the messages among respondents were clinics or hospitals for a majority (71.3%), and the radio for some (39.7%).

**Table 6.**
*Socioeconomic and Demographic Characteristics of Pregnant Women, Abuja, August 2016*

| Variable | Frequency | Percent |
|---|---|---|
| Location of Residence (*N* = 300) | | |
| Urban | 189 | 62.0 |
| Semiurban | 3 | 1.0 |
| Rural | 111 | 37.0 |
| Age in years (*N* = 300) | | |
| 15-19 | 12 | 4.0 |
| 20-34 | 234 | 78.0 |
| 35 and above | 54 | 18.0 |
| Education (N = 300) | | |
| No formal Education | 46 | 15.3 |
| Primary | 67 | 22.3 |
| Secondary | 105 | 35.0 |
| Polytechnic: OND | 68 | 22.7 |
| Graduate & Post Graduate | 14 | 4.7 |
| Marital Status (N = 300) | | |
| Married | 267 | 89.0 |
| Never married | 16 | 5.3 |
| Divorced | 2 | 0.7 |
| Separated | 11 | 3.7 |
| Widowed | 4 | 1.3 |
| Type of Marriage(N=296*) | | |
| Polygynous | 58 | 19.6 |
| Monogamous | 229 | 77.4 |
| Others | 9 | 3.0 |
| Living Situation (*N* = 296*) | | |
| Living alone | 21 | 7.1 |
| Living with spouse/husband | 250 | 84.5 |
| Living with extended family members | 21 | 7.1 |
| Others | 4 | 1.4 |
| Employment Status (*N* = 292*) | | |
| Yes, | 115 | 39.4 |
| No | 177 | 60.6 |
| Stage of Current Pregnancy (*N* = 300) | | |
| Months 1-3 of pregnancy (1st Trimester) | 72 | 24 |
| Months 4-6 of pregnancy (2nd Trimester) | 122 | 40.7 |
| Months 7-9 of pregnancy (3rd Trimester) | 92 | 30.7 |
| Not Sure | 14 | 4.6 |

*table continues*

| Variable | Frequency | Percent |
|---|---|---|
| Walking distance in between residence and nearest health facility (*N* = 300) | | |
| More than thirty minutes | 208 | 69.3 |
| Thirty minutes or less | 69 | 23.0 |
| Not Sure | 23 | 7.7 |
| Living Situation and support for malaria prevention (*N* = 271*) | | |
| Living with spouse with adequate support, during pregnancy | 244 | 90.0 |
| Living with spouse without adequate support, during pregnancy. | 5 | 1.8 |
| Living with extended family member with adequate support during pregnancy | 17 | 6.3 |
| Living with extended family members without adequate support during pregnancy | 3 | 1.1 |
| Not indicated | 2 | 0.7 |
| Personal Regular Income (*N* = 300) | | |
| N19,000 and Below | 112 | 37.3 |
| N20,000- 40,000 | 60 | 20.0 |
| N41,000- 60,000 | 21 | 7.0 |
| N61,000- 80,000 | 10 | 3.3 |
| N81,000- 100,000 | 1 | 0.3 |
| Not Specified | 96 | 32.0 |
| Monthly income spent on food (*N* = 300) | | |
| Less than 40% | 140 | 46.7 |
| More than 40% | 57 | 19.0 |
| Not sure | 70 | 23.3 |
| Others | 33 | 11.0 |
| Seen/heard messages about malaria prevention in the last 6 months (*N* = 300) | | |
| Yes | 246 | 82.0 |
| No | 32 | 10.7 |
| Not sure | 16 | 5.3 |
| Others | 6 | 2.0 |
| Source of information(N=300) (Multiple Responses) | | |
| Clinic/Hospital | 214 | 71.3 |
| Community Health Worker | 44 | 14.7 |
| Friends or Family | 77 | 25.7 |
| Work Place | 4 | 1.3 |
| Drama Groups | 1 | 0.3 |
| Poster Bills | 12 | 4 |
| Television | 81 | 27 |
| Radio | 119 | 39.7 |
| Newspaper | 7 | 2.3 |

*Note*. The frequency varied because of some missing values.

**Prevention of Malaria in Pregnancy**

The participants' responses to questionnaire items on prevention of MiP are presented in Table 7. Nearly three-fifth 57.0% (*N* = 300) owned an ITN, of which 68.4% (*n* = 171) slept under the net the night before the survey. Among those who did not sleep under ITN, nearly three-quarter 74.1% (*n* = 54) did not do so because of discomfort, including heat, and feeling of suffocation associated the use of ITN. Many participants 54% (N = 275) were confident in their ability to hang and sleep under the ITN. Most participants 72.3% (*N* = 300) were registered at an ANC clinic at the time of the survey. Some of those who registered at an ANC clinic 30.9 %( *n* = 217) attended all clinic appointments, while few, 20.7%, attended only once, and at delivery (Table 7).

Most of the participants 68.3% (*N* = 300) had taken one medicine or the other for the prevention of MiP. Fansidar and Panadol (trade names for Sulfadoxine Pyrimethamine and Paracetamol respectively) were the common medicines taken for the prevention of MiP by 60.0% and 21.0% (*N* = 205) of the participants respectively. Each participant was shown a sample of a Sulfadoxine Pyrimethamine (SP) tablet, with the same size and color as the one given to pregnant women in most public health facilities in the FCT. Less than two-fifths of the participants 37.7% (*N* = 300) were certain that they had taken SP, while about the same proportion 37.0% (*N* = 300) were not sure.

A majority of the participants 83.7% (*N* = 300) were motivated to take action to protect themselves from MiP. The sources of motivation (*n*=251) to take action varied, the main source was self-motivation (35.1%), spouses (32.7%), and health workers (23.5%).

**Table 7**

*Measure Taken by Pregnant Women to Prevent Malaria in Pregnancy, Abuja, August, 2016*

| Measures taken by pregnant women to prevent MIP | Frequency | Percent |
|---|---|---|
| Owns a mosquito net (ITN) (N = 300) | | |
| Yes | 171 | 57.0 |
| No | 129 | 43.0 |
| Slept under the ITN last night (*n* = 171) | | |
| Yes | 117 | 68.4 |
| No | 54 | 31.6 |
| Reason for not sleeping under IT last night (*n*= 54) | | |
| I don't have ITN | 2 | 3.7 |
| ITN causes discomfort to use | 40 | 74.1 |
| I forgot to sleep under ITN | 4 | 7.4 |
| My husband doesn't like to sleep under ITN | 2 | 3.7 |
| I don't know | 3 | 5.6 |
| Others | 3 | 5.6 |
| Confidence in ability to hang and sleep under ITN every night (*N* = 275) | | |
| Do not know how to hang ITN | 63 | 23.3 |
| I am not sure I can hang ITN, and not certain if I can sleep under it every night | 38 | 14.1 |
| I am confident I can hang the net and sleep inside it every night | 148 | 54.0 |
| Somewhat confident but may sleep under it regularly if there is help/support | 26 | 9.6 |
| Registration at an antenatal care (ANC) clinic (*N* = 300) | | |
| Registered | 217 | 72.3 |
| Not Registered | 83 | 27.7 |
| Frequency of attendance at ANC appointments (*n*= 217) | | |
| Attended ANC appointment only once, and when about to deliver baby | 45 | 20.7 |
| Attended some ANC appointments (about 50% of the appointments) | 59 | 27.2 |
| Attended most ANC appointments (more than 50% of the appointments) | 36 | 16.6 |
| Attended all ANC appointments | 67 | 30.9 |
| Not sure | 10 | 4.6 |
| Whether any medicine was taken for self-protection against malaria (*N* = 300) | | |
| Yes | 205 | 68.3 |
| No | 78 | 26.0 |
| Not Sure | 17 | 5.7 |

*table continues*

| Measures taken by pregnant women to prevent MIP | Frequency | Percent |
|---|---|---|
| Name of medicine taken for protection against malaria (n=205) | | |
| Chloroquine | 6 | 2.9 |
| Fansidar (Sulfadozine Pyrimethamine) | 123 | 60.0 |
| Panadol (Analgesic) | 43 | 21.0 |
| Native medicine | 14 | 6.8 |
| Not sure | 15 | 7.3 |
| Others | 4 | 2.0 |
| Purpose of malaria medicine taken (n=205) | | |
| Prevention of malaria | 93 | 45.4 |
| Treatment of malaria | 20 | 9.8 |
| Prevention and Treatment of malaria | 92 | 44.9 |
| Ever taken IPTp-SP (Sulfadozine Pyrimethamine) during this pregnancy (N=300) | | |
| Yes | 113 | 37.7 |
| No | 76 | 25.3 |
| Not Sure | 111 | 37.0 |
| Any motivation from any source to take action for prevention of malaria in pregnancy? (N=300) | | |
| Yes | 251 | 83.7 |
| No | 38 | 12.7 |
| Not Sure | 11 | 3.7 |
| Major source of motivation encouragement (251) | | |
| Self | 88 | 35.1 |
| Spouse | 82 | 32.7 |
| Friends | 12 | 4.8 |
| Colleagues | 2 | 0.8 |
| Health worker | 59 | 23.5 |
| Mass media | 4 | 1.6 |
| Not sure | 1 | 0.4 |
| Others | 3 | 1.2 |

**Malaria Risk behavior and Malaria Risk Status**

MRS of the pregnant women was measured as indicative of their malaria risk behavior. MRS was measured by the responses of the participants to the questions on the use of ITN, use of SP for IPTp, and frequency of attendance at ANC clinics. Many participants used ITN (68.0%), some (38.0%) used SP for IPTp, while few (27.2) attended at least half of all ANC clinic appointments (see Figures 5, 6, and 7). The participants were categorized into three: low, moderate, and high MRS. Findings indicate that 183, 108, and 9 participants were of high, moderate, and low MRS respectively. For meaningful analysis, the 9 participants in the low MRS category were merged with those in moderate MRS category. Many participants (61.0%) were at high risk of malaria (see Figure 8)

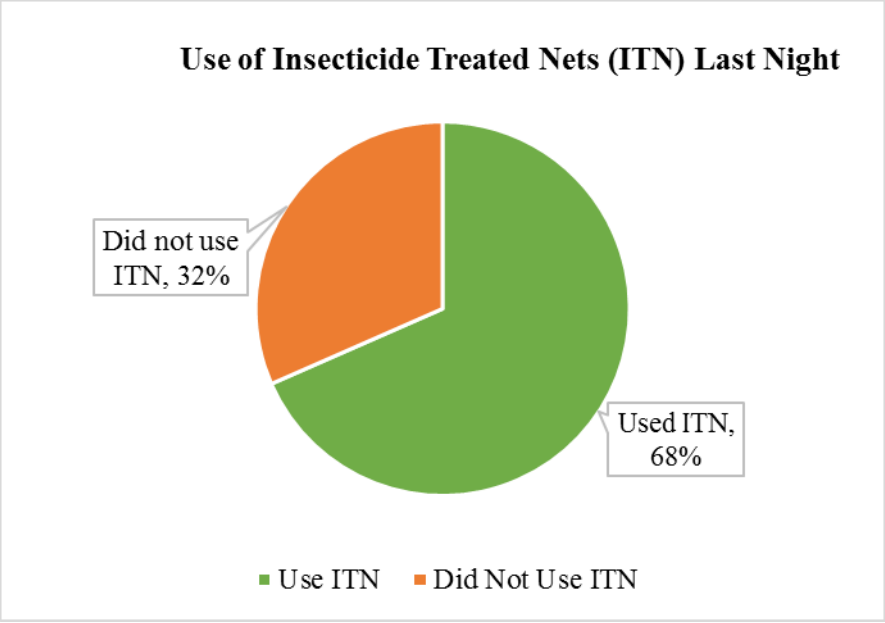


*Figure 5*. Pregnant women's use of insecticide treated net by owners of the net, Abuja, August 2016,

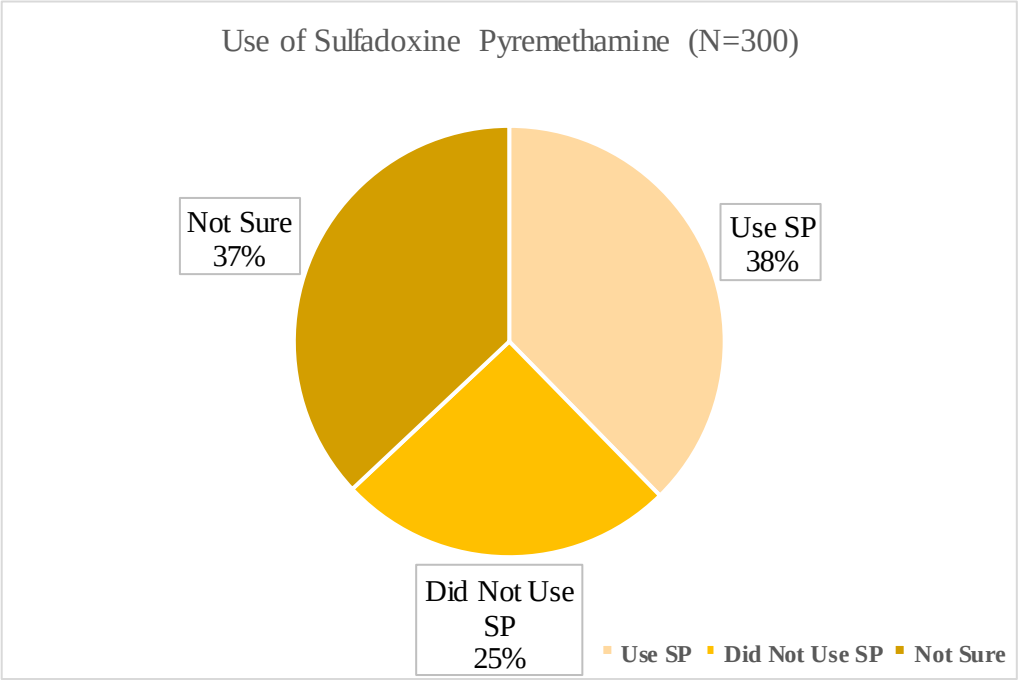


*Figure 6*. Use of at least one dose of Sulfadozine Pyrimethamine (SP) among pregnant women, Abuja, August 2016.

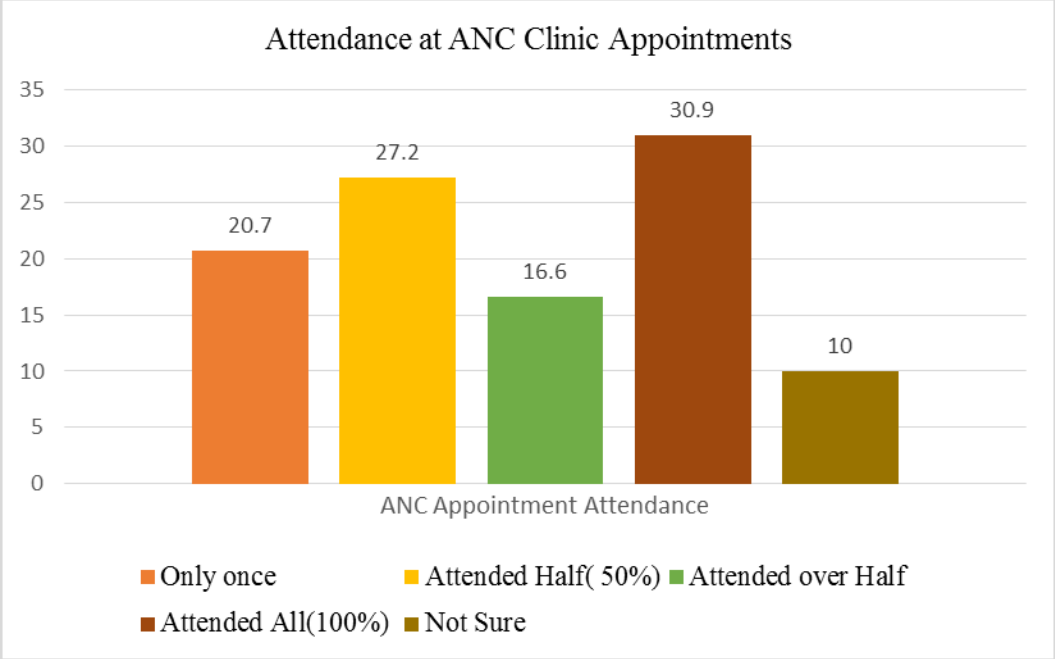


*Figure 7*: Attendance at antenatal clinic (ANC) by pregnant women, Abuja, August, 2016

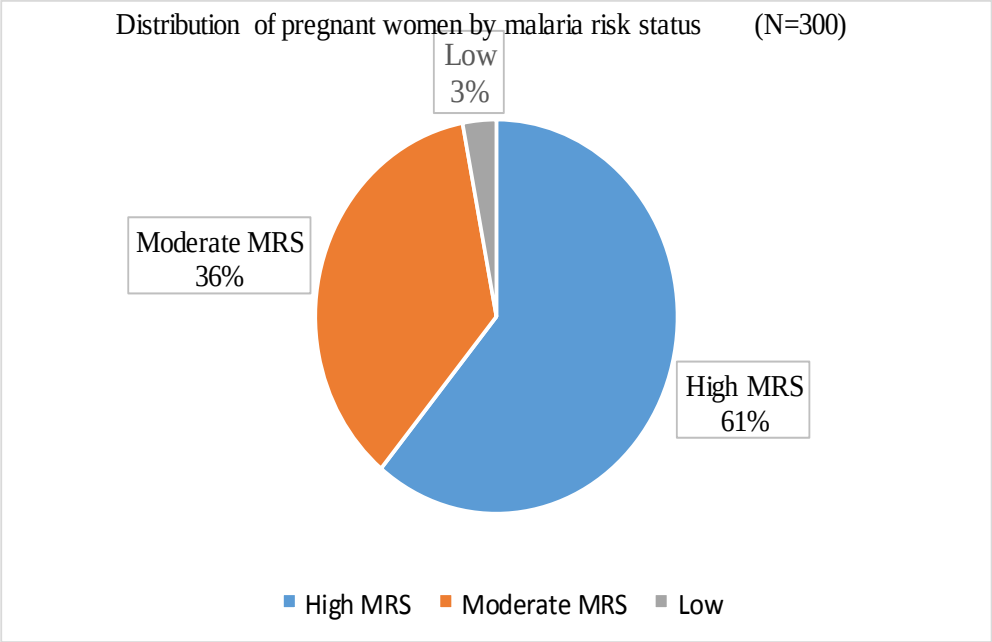


*Figure 8*. Distribution of the pregnant women by malaria risk status (MRS), Abuja, August, 2016.

## Analysis of Results in Relation to RQ 1

RQ 1 reflected the independent variables of perception and attitude to malaria and the recommended measures for prevention of MiP, with MRS as the dependent variable.

**Perception and Attitude of Pregnant Women Regarding Malaria and MiP.**

Participants' perception and attitude regarding malaria, and MiP were measured by 14 Likert-type scale items; 7 on malaria, and the other 7 were on MiP. For meaningful analysis, the range of responses on the Likert-type scale were merged. The strongly agreed and agree responses were merged as 'agreed', just as the strongly disagree and disagreed options were merged as 'disagreed'. For each item, the analysis focused on the merged options of "agreed', 'not sure' and 'disagreed'.

As shown in Table 8, positive perception and attitude were shown by 50.0% to 70% ($N$ = 300) of respondents by their agreement or disagreement with four out of seven items on malaria as follows:

- "I don't worry about malaria because I am healthy……." with 56.0% disagreement,
- "I don't worry about malaria because it's an ordinary problem..…" with 57% disagreement,
- "I think it is important to sleep under the net to prevent malaria" with 56.4% agreement,
- "I always sleep under a mosquito net because I think it helps ……" with 56.0% agreement.

Negative perception and attitude were shown by 50.0% to 70% ($N$ = 300) of respondents by their agreement or disagreement with three out of seven items on malaria (Table 8). One item that showed highly negative perception was "Sleeping inside the mosquito net can be suffocating, causes heat and rashes, so I don't use it, every night", with 71% agreement.

Seven items were used to measure perception and attitude to MiP (Table 8). Positive perception and attitude were shown by 50.0% to 70% ($N$ = 300) of respondents by their agreement or disagreement with three out of seven items as follows:

- "I think malaria is a serious problem for a pregnant woman…….", with a majority 96% (N=300) in agreement

- "Many people believe regular attendance at ANC provides opportunity for…. prevention of malaria", with over four-fifth 84.3% (*N*=300) in agreement.
- "I think the medicine given for prevention of MIP (SP) works…… " , with 61.3% agreement

The two items that showed highly negative perception for MIP were as follows:

- "I believe many people are not sleeping under the net regularly ……..." with over four-fifth 80.3% (*N*=300) agreement.
- "Many people believe malaria in pregnancy can be prevented and treated with the use of good native medicine (concoction)"; with nearly half of the respondents 48.7 % (*N*=300) in agreement.

Overall, positive perception and attitude were shown by at least 50.0% (*N* = 300) of respondents by their agreement or disagreement with seven out of 14 items on malaria and MiP. Similarly, negative perception and attitude were shown by at least 50.0% (*N* = 300) of respondents by their agreement or disagreement with the other 7 items (Table 8).

Six items on perception were analyzed regarding malaria risk behavior. The analyses are presented under hypotheses in relation to research RQ 1.

**Table 8.**
*Perception and Attitude to Malaria and Malaria in Pregnancy Among Pregnant Women, Abuja, August, 2016*

| | Responses (%) | | |
|---|---|---|---|
| Perception and Attitude to Malaria | Agree | Not Sure | Disagree |
| I don't worry about malaria because I am healthy, I don't do too much work, and I don't work in the sun | 22.4 | 21.7 | 56.0 |
| I don't worry about malaria because an ordinary problem that can be easily treated | 33.0 | 10.0 | 57.0 |
| My chances of getting malaria is the same, whether or not I sleep inside the net? | 46.7 | 19 | 34.3 |
| Sleeping inside the mosquito net can be suffocating, causes heat and rashes, so I don't use it every night | 71.0 | 12.0 | 17.0 |
| I think it is important to sleep under the net to prevent malaria but I often forget/ or I am lazy to hang the net every night | 56.4 | 15.3 | 28.3 |
| I always sleep under mosquito net because I think it helps in prevention of malaria | 56.0 | 7.3 | 36.6 |
| I think the net is effective for malaria prevention, but it is expensive to buy. | 45.0 | 12.3 | 42.7 |
| Perception and Attitude to MIP | | | |
| I think my chances as a pregnant woman in having malaria is not higher than any other member of the community | 46.0 | 23.7 | 30.4 |
| I think malaria is a serious problem for a pregnant woman and her baby in the womb | 96.0 | 3.0 | 1.0 |
| I think the medicine given for prevention of malaria in pregnancy (SP) really works to keep mother and baby healthy | 61.3 | 36.7 | 2.0 |
| Many people say pregnant women are at risk of malaria, even if they use medicine for prevention of malaria in pregnancy. | 50.0 | 28.3 | 21.7 |
| Many people belief regular attendance at ANC provides opportunity for care, including prevention of malaria | 84.3 | 13.7 | 2 |
| Many people belief malaria in pregnancy can be prevented and treated with the use of good native medicine (concoction) | 48.7 | 24 | 27.3 |
| I belief many people are not sleeping under the net regularly because of the associated inconveniences or discomfort | 80.3 | 10.7 | 9 |

**Hypotheses in Relation to RQ 1.**

RQ1; Do perception and attitude of pregnant women to malaria, and measures for prevention of MiP influence their MRS?

Hypothesis 1

$H_0$1a Pregnant women who perceive MiP as a serious and severe problem will be of low MRS while those who perceive MiP as ordinary will be of high MRS.

$H_1$1a: There is no difference in the MRS of pregnant women who perceive malaria as a serious and severe problem and those who perceive malaria as ordinary.

The data on seriousness and severity of malaria were analyzed separately for meaningful analysis and presented in Table 9. Regarding seriousness of MiP, a majority of participants 96.0% (N = 297) agreed with the statement "I think malaria is a serious problem for a pregnant woman and her baby in the womb." Within this category, many participants 59.7 % (n = 288) were of high MRS, compared to 100.0% of those that disagreed with the statement (see Table 9). The relationship between seriousness of malaria and MRS was not significant by Fisher exact test (p= 0.284)

Concerning severity of MiP, many respondents 57.0% ($N$ = 300) disagreed with the statement that 'I don't worry about malaria because it is an ordinary problem that can be easily treated.' Within this category, nearly two third 63.7% (n=171) were of high MRS (Table 9). Chi-square analysis indicates that the relationship between perceived severity of malaria and MRS was not significant ($\chi 2$= 1.28, p=0.262).

As shown in Table 9, the relationship between perceived seriousness of malaria and MRS, and the relationship between perceived severity of MiP and MRS were not

significant. H01a was accepted that there was no significant difference in the MRS of pregnant women who perceive malaria as a serious and severe problem, and those that perceive malaria as ordinary.

Hypothesis 2

$H_1$1b: Pregnant women who believe that recommended measures for prevention of MiP are effective and comfortable to use will be of low MRS, while those who believe the recommended measures as ineffective or uncomfortable to use will be of high MRS.

$H_0$1b: There is no difference in the MRS of pregnant women who believe that recommended measures for prevention of MiP are comfortable to use and those who believe the recommended measures as uncomfortable.

The data on effectiveness and comfort regarding the measures for prevention of MiP were analyzed separately for meaningful analysis. The two questionnaire items for this measurement were (a) 'sleeping inside the mosquito net can be suffocating, causes heat and rashes, so I don't use it every night', and (b) 'I think the net is effective for malaria prevention. A majority of the respondents 83.0 % (N=300) agreed with the statement that sleeping inside the mosquito net causes discomfort such as feelings of suffocating, heat, and rashes. Within this category, nearly two third 65.9% (n=249) were of high MRS, compared to 37.3 % (n= 51) of those that disagreed. As shown in Table 9, a significant relationship was found between the discomfort of sleeping inside mosquito nets and MRS ($\chi 2 = 14.56$, $p=0.000$).

Nearly three-fifth 57.3% (N=300) agreed with the statement on the effectiveness of mosquito nets for the prevention of MiP. Among respondents that agreed, 51.7%

(n=172) were of high MRS, compared to 73.4% (n=128) of those that disagreed with the statement. As shown in Table 6, the relationship between the effectiveness of measure for prevention of MiP (ITN) and MRS was significant ($\chi 2$= 14.52, p=0.000).

As indicated in Table 8, there was a significant difference in the MRS of pregnant women who perceived that recommended measures for prevention of MiP are effective, and comfortable to use, and those who perceive the recommended measures as ineffective, and uncomfortable to use, hence $H_0$1b was rejected.

Hypothesis 3

$H_1$1c: Pregnant women who believe that recommended measures for prevention of MiP are beneficial to use will be of low MRS, while those who perceive the recommended measures as not beneficial to use will be of high MRS.

$H_0$1c: There is no difference in the MRS of pregnant women who believe that recommended measures for prevention of MiP are beneficial to use and those who perceive the recommended measures as beneficial.

The benefit of measures for the prevention of MiP was measured by two questions a) 'I think the medicine given for prevention of malaria in pregnancy (SP) works to keep mother and baby healthy'; and b) "I always sleep under mosquito net because I think it helps in prevention of malaria". Slightly over three fifth 61.3% (*N*=300) agreed that the medicine is given for prevention of MiP, (SP for IPTp) works. Many of the respondents 51.08% (*n*=184) that agreed that MiP medicine works were of high MRS, compared to 76.72 % (*n*=116) of those that disagreed (Table 9). A significant relationship was found between the effectiveness of SP for IPTp and MRS ($\chi 2$= 14.52, p=0.000).

Similarly, slightly over half of the respondents, 56.0%% (*N* =300) agreed with the statement that mosquito net helps in prevention of malaria. Among respondents that agreed with the statement that ITN is beneficial, 42.26% (*n*=168) were of high MRS, compared to 84.85% (*n*= 132) of those that disagreed with the statement. As shown in Table 9, a significant relationship was found between the discomfort of sleeping inside mosquito nets and MRS ($\chi 2$= 14.56, p=0.000).

As shown in Table 9 there was a significant difference in the MRS of pregnant women who perceive that recommended measures for prevention (ITN and SP) as beneficial and those who perceive the recommended measures as not beneficial use, hence $H_0$1c was false and rejected.

**Table 9.**
*Bivariate Analysis of Perception and Malaria Risk Status of Pregnant Women, Abuja, August 2016.*

| Perception regarding malaria and its prevention | Malaria Risk Status | | Chi Square $\chi 2^*$ or Fisher's | p value |
|---|---|---|---|---|
| | High | Low | | |
| Seriousness of malaria and MiP (N=300) ** | | | | |
| Perceived malaria as serious. (n=297) | 60.6 | 39.4 | Fisher's | 0.284 |
| Perceived malaria as not serious or not sure(n=3) | 100.0 | 0.0 | | |
| Severity of malaria and MiP (N=300) * | | | | |
| Perceived malaria as severe) (n= 171) | 109(63.7 | 62(36.3) | 1.28* | 0.262 |
| Perceived malaria as not severe or not sure(n=129) | 74(57.4) | 55(42.6) | | |
| Barrier against preventive measures (ITN Discomfort) (N=300) | | | | |
| Perceived use of ITN as comfortable(n=51) | 19 (37.3) | 32(62.7) | | |
| Perceived use of ITN as uncomfortable or not sure(n=249) | 164 (65.9) | 85(34.1) | 14.52* | 0.000 |
| Barrier against preventive measures (ITN Effectiveness) (N=300) * | | | | |
| Perceived use of ITN as effective (n=172) | 89(51.7) | 83(48.3) | | |
| Perceived use of ITN as not effective or not sure(n=128) | 94(73.4) | 34(26.6) | 14.56* | 0.000 |
| Benefit of preventive measures (SP for IPTp) (N=300) | | | | |
| Perceived SP for IPTp as beneficial (n=184) | 94(51.08) | 90(48.91) | 19.66 | 0.000 |
| Perceived SP for IPTp as not beneficial or not sure (n=116) | 89(76.72) | 27(23.3) | | |
| Benefit of Preventive measures (ITN)(N=300) | | | | |
| Perceived use of ITN as beneficial (n=168) | 71(42.26) | 97(57.74) | | |
| Perceived use of ITN as not beneficial or not sure (n=132) | 112(84.85) | 20(15.15) | 56.35 | 0.000 |

*Note.* SP= Sulfadoxine Pyrimethamine; IPTp= Intermittent Preventive Treatment in pregnancy

**Regression Analysis on RQ 1.**

A regression model analysis in which the co-variables on perception was conducted, regardless of whether the association of the variables with MRS was significant or not when subjected to Chi-square analysis. The overall percentage of correct classification of intercept only model is 61.1 % while step 0 model, which indicates 87.9% correct classification. The Hosmer-Lemeshow test was not significant ($\chi^2$=6.844; df =8; *p* =0.554), meaning the model fits the data. The reported Nagelkerke R2 is .705.

Table 10 shows the result of multiple logistic regression analysis, adjusting for all independent variables on perception that were significant or not significant in association with MRS, in the Chi-square and Fishers exact tests of association. The relationship between perceived seriousness of malaria in relation to MRS was not significant on regression analysis *(OR* = 7.419; 95% C*I* = 0.945, 58.242; p = 0.284). Similarly, the relationship between perceived severity of malaria in relation to MRS was also not significant on regression analysis (*OR* = 7 1.307; 95% C*I* = 0.818, 2.086; p = 0.262).

Regression analysis shows that there was a significant association between perceived barrier regarding effectiveness of ITN, as a recommended measure for prevention of MiP and MRS. Pregnant women who perceived ITN as effective had lower odds (*OR* = 2.578; 95% CI = 1.574, 4.222; p = < 0.05) of high MRS than those who perceived ITN as ineffective or were not sure of its effectiveness (see Table 10). Similarly, there was significant association between perceived barrier regarding comfort in the use of ITN, as a recommended measure for prevention of MIP, and MRS. Pregnant

women that perceived ITN as comfortable to use had lower odds (*OR* = 0.308; 95% *CI* = 0.165, 0.575; *p* = < 0.05) of high MRS than those who perceived ITN as uncomfortable to use or were not sure.

Multiple logistic regression analysis also indicated that the association between perceived benefits of ITN as a recommended measure for prevention of MiP and MRS was significant. Pregnant women that perceived ITN beneficial had lower odds (*OR* = 7.651; 95% *CI* = 4.345, 13.471; *p* = < 0.05) of high MRS than those who perceived ITN as not beneficial to use or were not sure of it benefits. The relationship between perceived benefits of the use of SP for IPTp for prevention of malaria in pregnancy and MRS was also significant. Pregnant women that perceived use of SP as beneficial for prevention of MiP had lower odds (*OR* = 3.156; 95% *CI* = 1.879, 5.301; p = < 0.05) of high MRS than those that perceived SP as not beneficial or were not sure (see Table 10).

**Table 10.**
*Multiple Regression Analysis of Perception and Malaria Risk Status Among Pregnant Women in Abuja, August, 2016.*

| Perception regarding malaria and its prevention | Malaria Risk Status | | Odds Ratio | 95 % Confidence Interval | *p value* |
|---|---|---|---|---|---|
| | High | Low | | | |
| Seriousness of malaria and MiP (*N*=300) | | | | | |
| Perceived malaria as serious. | 180(60.6) | 117(39.4) | 7.419 | 0.945, 58.242 | 0.284 |
| Perceived malaria as not serious. | 3(100.0) | 0(0.0) | | | |
| Severity of malaria and MiP (*N*=300) | | | | | |
| Perceived malaria as severe) (*n*= 171) | 109(63.7 | 62(36.3) | 1.307 | 0.818, 2.086 | 0.262 |
| Perceived malaria as not severe or not sure(*n*=129) | 74(57.4) | 55(42.6) | | | |
| Barrier against Preventive measures (ITN Effectiveness) (*N*=300) | | | | | |
| Perceived use of ITN as effective (*n*=172) | 89(51.7) | 83(48.3) | 2.578 | 1.574, 4.222 | 0.000 |
| Perceived use of ITN as not effective or not sure(*n*=128) | 94(73.4) | 34(26.6) | | | |
| Barrier against preventive measures ITN Discomfort) (N=300) | | | | | |
| Perceived use of ITN as comfortable(n=51) | 19 (37.3) | 32(62.7) | 0.308 | 0.165, 0.575 | 0.000 |
| Perceived use of ITN as uncomfortable or not sure(n=249) | 164 (65.9) | 85(34.1) | | | |
| Benefit of preventive measures (ITN)(*N*=300) | | | | | |
| Perceived use of ITN as beneficial (n=168) | 71(42.26) | 97(57.74) | 7.651 | 4.345, 13.471 | 0.000 |
| Perceived use of ITN as not beneficial or not sure(n=132) | 112(84.85) | 20(15.15) | | | |
| Benefit of preventive measures (SP for IPTp *(N*=300) | | | | | |
| Perceived SP for IPTp as beneficial (n=184) | 94(51.08) | 90(48.91) | 3.156 | 1.879, 5.301 | 0.000 |
| Perceived SP for IPTp as not beneficial or not sure (n=116) | 89(76.72) | 27(23.3) | | | |

## Analysis of Results in Relation to RQ 2

RQ 2 reflected the independent variables of cognition, socioeconomic and demographic variables as the independent variable, with MRS as the dependent variable. RQ 2 had five hypotheses, starting from hypotheses.

### Knowledge of Malaria and Malaria in Pregnancy

Participants' knowledge of malaria and prevention of MiP was measured by nine multiple choice knowledge items, five items on malaria and the other four on MiP (see Table 11). A majority of respondents 96.3% (*N* = 300), knew the cause of malaria; many 52 % (*N* = 300) knew how malaria is transmitted, but only some 35% (*N*=300) knew the most effective medicine for treatment of malaria. Most participants 80.7 (*N* = 300) knew that it is possible to prevent malaria in pregnancy, just as majority 74% (*N*=300) knew the benefits or registration at ANC. Only few 24.0 % (*N* =300) knew how many times a pregnant woman is expected to take the medicine SP for prevention of malaria.

Five of the nine knowledge items: questions 24, 25, 26A, 28, and 29 had a score of one mark each for the correct option, while each of the other four items had a score of more than one mark because of multiple correct options. The knowledge items had a maximum score of 14: knowledge of malaria, had 7 marks, and knowledge of MiP, also had 7 marks. Participants responses to knowledge items were either correct, incorrect, or don't know. For meaningful analysis, the incorrect and don't know responses were merged as incorrect. The mean scores for the items on malaria knowledge and MiP knowledge were 5.1, and 3.2 respectively. The mean score, taken as composite knowledge of malaria and MiP was 8.3 (see Table 11)

**Table 11.**
*Knowledge of Malaria and Malaria in Pregnancy Among Pregnant women, Abuja, August 2016*

| Knowledge of Malaria (*N*=300) | Correct Frequency (%) | Incorrect and Don't know Frequency (%) | Total Score | Mean Score and Standard Deviation (*SD*) |
|---|---|---|---|---|
| What is the cause or are the causes of malaria? | 289(96.3) | 11(3.7) | | |
| How is malaria transmitted? | 156(52.0) | 144(48.0) | | |
| What signs or symptoms would make you to think that a person has malaria? | 221(73.7) | 79(26.3) | 7 | 5.09 (1.35) |
| What is the most effective medication for the treatment of malaria? | 105(35.0) | 195(65.0) | | |
| When somebody feels feverish or has any other sign or symptoms of malaria, what should the person do first? | 201(67.0) | 99(33.0) | | |
| Knowledge of malaria in pregnancy(MIP) (*N*=300) | | | | |
| Is it possible to prevent malaria among pregnant women? | 242(80.7) | 112(37.3) | | |
| How can pregnant women protect themselves from malaria? | 225 (75.5) | 75(25.5) | | |
| What are the benefits of early registration and regular attendance at antenatal clinic, to a pregnant woman? | 224(74.7) | 76(25.3) | 7.0 | 3.2(1.8) |
| How many times is a pregnant woman expected to take the medicine for prevention of malaria (SP) during pregnancy? | 72(24.0) | 228(76.0) | | |
| | | | *14 | 8.28(2.56) |

*Note.* *Maximum score=14; Mean Score = 8.28; SD= Standard Deviation

**Knowledge of Malaria and Selected Sociodemographic Variables**

Respondents' knowledge of malaria and MiP was compared to some socio-demographic variables namely age, level of education and geographical location (see Tables 12, and 13). These variables were identified in some previous studies as relevant to aspects of malaria risk behavior (Akoma et al. 2012; Mbah et al., 2013; Mwandama et al. (2015). The five knowledge items correctly answered by a majority, 70.0 % and above ($N$ = 300) were on a) the cause, b) the signs or symptoms, c) possibility of prevention of MIP, d) means for prevention of MIP, and e) the benefits of antenatal clinic attendance (see Table 12). However, a majority of the participants 76.0% ($N$=300) either did not know or responded wrongly to the question on how many times a pregnant woman is expected to take the medicine SP for prevention of malaria. Across the sociodemographic factors compared, the proportion of participants, that answered correctly each of the five knowledge items (70% and above), was higher among the teenagers, among those with secondary education, and urban residents (see Table 13).

The overall mean score for all knowledge items was 8.28, which I compared to three selected variables of age, education, and geographical location. The three subsets of pregnant women that had the mean knowledge scores above the overall mean were the teenagers (8.92), those with secondary education (8.97), and urban residents (8.36) (see Table 14).

**Table 12.**
*Knowledge of Malaria Among Pregnant Women and Selected Sociodemographic Factors, Abuja, August, 2016*

| Knowledge Items | Response Options | *N*= 300 | Age (in years) | | | Level of Education* | | | Geographical Location | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 15-19 | 20-34 | 35> | Pry | Sec | Post Sec | Urban | Rural |
| | | | *n*=12 | *n*=234 | *n*=54 | *n*=67 | *n*=105 | *n*=82 | *n*=189 | n=111 |
| How can pregnant women protect themselves from malaria? | Correct | 70.7 | 91.7 | 80.3 | 79.6 | 79.1 | 90.5 | 82.9 | 80.4 | 81.1 |
| | Incorrect & Don't Know | 29.3 | 8.3 | 19.7 | 20.4 | 20.9 | 9.5 | 17.1 | 19.6 | 18.9 |
| Is it possible to prevent malaria among pregnant women? | Correct | 80.7 | 91.7 | 68.8 | 74.1 | 68.7 | 88.6 | 63.4 | 69.8 | 72.1 |
| | Incorrect & Don't Know | 19.3 | 8.3 | 31.2 | 25.9 | 31.3 | 11.4 | 36.6 | 30.2 | 27.9 |
| What are the benefits of early registration and regular attendance at antenatal clinic, ANC to a pregnant woman? | Correct | 74.7 | 100 | 74.8 | 68.5 | 82.1 | 84.8 | 75.6 | 78.3 | 68.5 |
| | Incorrect & Don't Know | 25.3 | 0 | 25.2 | 31.5 | 17.9 | 15.2 | 24.4 | 21.7 | 31.5 |
| How many times is a pregnant woman expected to take the medicine for prevention of malaria (SP) during pregnancy? | Correct | 24.0 | 25.0 | 22.6 | 29.6 | 25.4 | 25.7 | 30.5 | 26.5 | 19.8 |
| | Incorrect & Don't Know | 76.0 | 75 | 77.4 | 70.4 | 74.6 | 74.3 | 69.5 | 73.5 | 80.2 |

**Table 13.**
*Knowledge of Malaria and Malaria in Pregnancy and Selected Sociodemographic Factors, Abuja, August, 2016*

| Knowledge Items | Options | *N* = 300 | Age (in years) | | | Level of Education* | | | Geographical Location | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 15-19 | 20-34 | 35> | Pry | Sec | Post Sec | Urban | Rural |
| | | | *n* =12 | *n*=234 | n=54 | *n*=67 | *n*=105 | *n*=82 | n=189 | *n*=111 |
| What is the cause or are the causes of malaria? | Correct. | 96.3 | 100 | 97.4 | 90.7 | 98.5 | 98.1 | 98.8 | 95.8 | 97.3 |
| | Incorrect & Don't Know. | 3.7 | 0 | 2.6 | 9.3 | 1.5 | 1.9 | 1.2 | 4.2 | 2.7 |
| How is malaria transmitted? | Correct. | 52.0 | 16.7 | 53.4 | 53.7 | 43.3 | 56.2 | 61 | 50.8 | 54.1 |
| | Incorrect & Don't Know. | 48.0 | 83.3 | 46.6 | 46.3 | 56.7 | 43.8 | 39 | 49.2 | 45.9 |
| What signs or symptoms would make you to think that a person has malaria? | Correct. | 73.7 | 100.0 | 98.3 | 90.7 | 97 | 99 | 98.8 | 95.2 | 100 |
| | Incorrect & Don't Know | 26.3 | 0 | 1.7 | 9.3 | 3 | 1 | 1.2 | 4.8 | 0 |
| What is the most effective medication for treatment of malaria? | Correct. | 35.0 | 50.0 | 34.2 | 35.2 | 40.3 | 47.6 | 20.7 | 34.9 | 35.1 |
| | Incorrect & Don't Know | 65.0 | 50.0 | 65.8 | 64.8 | 59.7 | 52.4 | 79.3 | 65.1 | 64.9 |
| When somebody feels feverish or has any other sign or symptoms of malaria, what should the person do first? | Correct | 67.0 | 58.3 | 69.2 | 59.3 | 62.7 | 62.9 | 90.2 | 72.5 | 57.7 |
| | Incorrect & Don't Know | 33.0 | 41.7 | 30.8 | 40.7 | 37.3 | 37.1 | 9.8 | 27.5 | 42.3 |

**Table 14.**
*Composite Knowledge of Malaria and MIP by Selected Sociodemographic Factors, Abuja, August, 2016*

| Total | All Respondents | Age (in years) | | | Level of Education* | | | Geographical Location | |
|---|---|---|---|---|---|---|---|---|---|
| | *N* =300 | 15-19 | 20-34 | 35> | Pry | Sec | Post Sec | Urban | Rural |
| | | *n*=12 | *n*=234 | *n*=54 | *n*=67 | *n*=105 | *n*=82 | *n*=189 | *n*=111 |
| Mean Score (SD) | 8.28 (2.56) | 8.92 (2.40) | 8.31 (2.35) | 6.91 (2.89) | 8.20 (2.54) | 8.97 (2.17) | 8.68 (1.87) | 8.36 (2.63) | 8.13 (2.45) |
| | | *F*-val.=0.777; *p* val.= 0.461 | | | *F*-val.= 2.542; *p* val.=0.081 | | | *t*-val.=0.771; *p*-val. = 0.441 | |

Level of Education*
Pry: Primary Education
Sec: Secondary Education
Post Sec: Postsecondary Education

**Cognitive, Sociodemographic Factors and Malaria Risk Status.**

I conducted analysis of the data on knowledge and sociodemographic and economic factors with the application of Chi-square ($\chi 2$) test, to compare malaria risk behavior with all other social and demographic factors measured in the study. The significance level was set at $p \leq 0.05$. The findings of the Chi-square test of association are presented on Table 15 below**.**

**Level of education, employment status and MRS.** As shown on Table 15 most of the respondents that had primary education 73.1% (*n*= 67) were of high MRS compared to some 37.1(*n*=105) of those that had secondary education, that were of high MRS (Table 15). The relationship between level of education and MRS was significant ($\chi 2$= 31.575, p=0.000)

A significant relationship was also found between employment status of the pregnant women and their MRS ($\chi 2$= 11.99, p=0.001). Among the unemployed participants, most 68. 9% (*n*=177) were of high MRS, compared to 48.7% (n=115) of those who were employed, that were of high MRS.

**Distance to health facility, ANC clinic attendance and MRS.** Nearly half of the respondents 48.7% (*n*=115) whose residence was less than 30 minutes walking distance to the nearest health facility were of high MRS. Similarly, most of the respondents 68.9% (*n*=177) whose residence was more than 30minues walking distance to the nearest health were also of high MRS. As shown in Table 15, the relationship between the distance of the residence of the pregnant women to health facility and their MRS was not significant ($\chi 2$= 0.001, p=0.978)

The relationship between attendance at an ANC clinic and MRS was significant ($\chi 2$= 5.439, p=0.020). The pregnant women were initially categorized into four by the regularity of their attendance at ANC. For meaningful analysis, the four categories were merged as appropriate into two. Many 54.0% (*N*=300) of the pregnant women attended two or more out of four ANC appointments. Among those that attended two or more out of four ANC clinic appointment, many 56.9 (n=162) were of high MRS, compared to higher proportion 68.1 (n=138) among those that attended less than two out of four ANC appointments, that were of high MRS (see Table 15)

**Stages of pregnancy, number of pregnancy and MRS.** The relationship between stage of pregnancy and MRS of the pregnant women was significant ($\chi 2$= 16.709, p=0.001). Most of the respondents 75.0% (*n*=72) in the first 3 months of pregnancy (first trimester) were of high MRS, compared to 44.6% (*n*=92) of those in the third trimester (see Table 15). The percentage of pregnant women that were of high MRS decreased as the stage of pregnancy increased.

The pregnant women were categorized by the number of pregnancy and their number of children. The seven initial categories were merged as appropriate into three and analyzed concerning their MRS. Over two-fifth of the participants, 42.7% (*N*=300) have had three or more pregnancies, with one child or more alive, while some 29.0%(*N*=300) were pregnant for the first time. Most of the participants 73. 6% (*n*=87) that were pregnant for the first time were of high MRS, compared to 51.6% (*n*=128) of those that have had three or more pregnancies, that were of high MRS (Table 14). The relationship between the number of pregnancy and MRS was significant ($\chi 2$= 10.630,

p=0.005). An inverse relationship was observed between number of pregnancy and MRS. The percentage of pregnant women that were of high MRS decreased as the number of pregnancy increased.

**Type of marriage and MRS. A** significant relationship was found between type of marriage of the pregnant women and their MRS ($\chi 2$= 7.283, $p$=0.007). Most of the pregnant women 76.3% ($N$=300) were into monogamous marriage. The proportion of participants who were of high MRS among those in monogamy 56.8% ($n$=229) was lower than the proportion that was in polygyny 74.6% ($n$=71), who were of high MRS (see Table 15).

**Religion, marital status and MRS.** Most of the pregnant women 71.7% (N=300) were Christians. Among the Christians, many 59.1($n$=215) were of high MRS, compared to a higher percentage 65.9% ($n$=85) of those of Islamic faith, that were of high MRS (see Table 15). The relationship between religion of the pregnant women and their MRS was not significant ($\chi 2$= 1.19, $p$=0.276).

The participants were initially categorized into four by their marital status. For meaningful analysis, the four categories were merged as appropriate into two, either married or unmarried. A majority 89.0% ($N$=300) of the pregnant women were married. Many 56.9% *(*$n$=267) of the married participants were of high MRS, compared to majority 93.9% ($n$=33) of the unmarried participants that were of high MRS (see Table 15). The relationship between marital status and MRS was significant ($\chi 2$= 16.9, $p$=0.000).

**Exposure to malaria prevention messages and MRS.** The relationship between exposure to malaria messages among the pregnant women and their MRS was significant ($\chi 2$= 13.807, p=0.000). A majority of the pregnant women 82.0% (*N*=300) has been exposed to malaria prevention messages. Among participants that were either not exposed or were not sure of their exposure to malaria prevention messages, majority 83.3% (n=54) were of high MRS, compared to a much lesser percentage 56.1% (*n*=246), of those exposed to malaria prevention messages, who were of high MRS (see Table15).

**Table 15**

*Bivariate Analysis of Sociodemographic Factors and Malaria Risk Status Among Pregnant Women, Abuja, August, 2016*

| Sociodemographic Factors | Malaria Risk Status | | Chi Square ($\chi 2$) | p value |
|---|---|---|---|---|
| | High | Moderate | | |
| Level of Education(*N*=254) | | | | |
| Primary | 49(73.1) | 18(26.9) | | |
| Secondary | 39(37.1) | 66(62.9) | 31.575, | 0.000 |
| Post-Secondary | 59(72.0) | 23(28.0) | | |
| Distance of residence to health facility (*N*=292) | | | | |
| Less than 30 minutes | 56(48.7) | 59(51.3) | 0.001 | 0.978 |
| More than 30 minutes | 122(68.9) | 55(31.1) | | |
| Stage of pregnancy (*N*=296) | | | | |
| Months 1-3 (1st Trimester) | 54(75.0) | 18(25.0) | | |
| Months 4-6 (2nd Trimester) | 78(63.9) | 44(36.1) | 16.709 | 0.001 |
| Months 7-9(3rd Trimester) | 41(44.6) | 51(55.4) | | |
| Not sure | 6(60.0) | 4(40.0) | | |
| Employment status (*N*=292) | | | | |
| Employed | 56(48.7) | 59(51.3) | 11.99 | 0.001 |
| Not Employed | 122(68.9) | 55(31.1) | | |
| Number of pregnancy, and number of children (*N*=300) | | | | |
| First pregnancy | 64(73.6) | 23(26.4) | | |
| Second pregnancy (child alive or dead) | 53(62.4) | 32(37.6) | 10.63 | 0.005 |
| Third and 4th pregnancy (1 or more children alive or dead) | 66(51.6) | 62(48.4) | | |
| Type of Marriage (*N*=300) | | | | |
| Monogamous | 130(56.8) | 99(43.2) | 7.283 | 0.007 |
| Polygynous | 53(74.6) | 18(25.4) | | |

*table continues*

| Socioeconomic, demographic Factors | Malaria Risk Status | | Chi Square ($\chi 2$) | p value |
|---|---|---|---|---|
| | High | Low | | |
| Religion (*N*=300) | | | | |
| Christianity | 127(59.1) | 88(40.9) | 1.19 | 0.276 |
| Islam | 56(65.9) | 29(34.1) | | |
| Marital Status (*N*=300) | | | | |
| Married | 152 (56.9) | 115(43.1) | 16.92 | 0.000 |
| Not married | 31(93.1) | 2(6.9) | | |
| Attendance at antenatal clinic (*N*=300) | | | | |
| Attended one or none out of 4 appointments | 94(68.1) | 44(31.9) | 5.439 | 0.020 |
| Attended 2 to 4 out of 4 appointments | 89(54.9) | 73(45.1) | | |
| Exposure to malaria messages (*N*=300) | | | | |
| Exposed to malaria messages | 138(56.1) | 108(43.9) | 13.807 | 0.000 |
| Not exposed to malaria messages | 45(83.3) | 9(16.7) | | |

**Results on Hypotheses in Relation to RQ2**

RQ2 (Quantitative). To what extent are cognitive, socio-demographic and economic factors associated with the MRS of pregnant women? RQ2 had five hypotheses Hypothesis 2a

$H_1$2a: Pregnant women, with adequate knowledge of malaria and MiP, will be of low MRS while those with poor knowledge of malaria will be of high MRS.

$H_0$2a: There is no difference in the MRS of pregnant women who have adequate knowledge of malaria and MiP and those with inadequate knowledge

The bivariate analysis of cognitive, sociodemographic and economic factors in relations to MRS of pregnant women is presented on Table 15. Few respondents 14.0 % (*N*= 300) had adequate knowledge of malaria and MiP. Among participants with adequate knowledge, nearly half 47.6% (*n* =20) were of high MRS, compared to 56.9 %

(*n*=218) of those with inadequate knowledge, and nearly all 97.5 % (*n*=39) of those with poor knowledge. The relationship between knowledge of malaria and MiP, and MRS of pregnant women was significant ($\chi$2= 27.116, *p*=0.000). Hence $H_0$2a was false and rejected (Table 16)

Hypothesis 2b

$H_1$2b: Pregnant women who are of high socioeconomic status will be of low MRS while those who are of low socioeconomic status was be of high MRS.

$H_0$2b: There is no difference in the MRS of pregnant women who are of high socioeconomic status and those who are of low socioeconomic status.

Wealth index was calculated as a measure of SES. For meaningful analysis, the five initial categories of participants by wealth index (WI) were collapsed into three, denoted as poor, average, and rich. Two-fifth 40.0 % (*N*=300) of the participants were of average WI, while nearly two-fifth 38.7% (*N*=300) were of rich WI. Among participants that were of average WI, 65.0% (*n*=120) were of high MRS, just as most participants who were of poor WI 64.1% (*n*=61) were also of high MRS. As shown in Table 16, the relationship between SES and MRS was not significant ($\chi$2= 2.715, *p*=0.257). Hence $H_0$2b was true and accepted.

Hypothesis 2c

$H_1$2c: Pregnant women who live in urban and semi-urban areas will be of low MRS while those who live in the rural areas was be of high MRS.

$H_0$2c: There is no difference in the MRS of pregnant women who live in rural areas and those who live in semi-urban and urban areas.

About two-third of the participants 63.0 % (*N*=300) lived in urban areas. Among participants that lived in urban areas, 65.1% (*n*=189) were of high MRS compared to 54.1% (n=111) of those that lived in rural areas that were of high MRS. The relationship between geographical location and MRS was nearly significant ($\chi$2= 3.573, *p*=0.059). Hence $H_0$2c was true and accepted (Table 16).

Hypothesis 2d

$H_1$2d: Pregnant women whose living situations are supportive of prevention of MiP will be of low MRS, while those whose living situations are unsupportive of prevention of MiP was be of high MRS.

$H_0$2d: There is no difference in the MRS of pregnant women who are supportive living situation and those who living in unsupportive living situation.

The five initial categories of the living arrangement of the pregnant women were merged into two categories: living arrangement (with husband, spouse or extended family) is supportive of prevention of MiP and living arrangement (with husband, spouse or extended family) is unsupportive. The living arrangement of majority of the pregnant women 97.0% (*N*=269) was supportive of prevention of MiP. Among respondents that had supportive living arrangement for prevention of MiP, 57.9% (*n*=250) were of high MRS, compared to a majority 87.5% (*n*=8) of those that had unsupportive living arrangement that was of high MRS (see Table 16). The relationship between living

arrangement regarding prevention of MiP and MRS was not significant (Fishers exact, $p$=0.146). Hence $H_0$2d was true and accepted.

Hypothesis 2e

$H_1$2e: Pregnant women who are adolescents (15-19years) and young adults (20-34 years) will be of low or moderate MRS while those who are of middle age (35years and older) was be of high MRS

$H_0$2e: There is no difference in the MRS of pregnant women who are adolescents (15-19years), those who are young adults (20-34 years); and those of middle age (35years and older).

The seven initial age categories of pregnant women were merged into three; adolescents aged 15 to19 years, young adults aged 18 to 34 years, and middle age adults aged 35 years and older. A majority of the pregnant women 78.0 ($N$ = 300) were young adults. Among the young adults, 62.0% ($n$ =234) were of high MRS, compared to 59.3% (n=54) of those who were of middle age (Table 16). The relationship between age and MRS was not significant ($\chi$2= 0.77, $p$=0.680), therefore, $H_0$2e was true and accepted.

**Table 16.**
*Bivariate Analysis of Cognitive, Sociodemographic Factors; and Malaria Risk Status Among Pregnant Women, Abuja, August 2016.*

| Cognitive socio-economic and demographic factors | Malaria Risk Status High (%) | Low (%) | Chi Square $\chi 2$ | P value |
|---|---|---|---|---|
| Knowledge of Malaria *(N*=300) | | | | |
| Adequate Knowledge | 20(47.6) | 22(52.4) | 27.116 | 0.000 |
| Inadequate Knowledge | 124(56.9) | 94(43.1) | | |
| Poor Knowledge | 39(97.5) | 1(2.5) | | |
| Wealth Index (*N*=300) | | | | |
| Rich | 35(57.4) | 26(42.6) | 2.715 | 0.257 |
| Average | 107(61.14) | 68(38.86) | | |
| Poor | 41(64.06) | 23(35.93) | | |
| Geographical Location (*N*=300) | | | | |
| Urban | 123(65.1) | 66(34.9) | 3.573 | 0.059 |
| Rural | 60(54.1) | 51(45.9) | | |
| Living Arrangement (N=269) | | | | |
| Living with husband/spouse / extended family is supportive of preventing of MIP | 151(57.9) | 110(42.1) | Fischer's Exact | 0.146 |
| Living with husband/spouse / extended family is not supportive of preventing of MIP | 7(87.5) | 1(12.5) | | |
| Age(*N*=300) | | | | |
| Adolescents | 6(50.0) | 6(50.0) | 0.771 | 0.680 |
| Young adults | 151(61.4.) | 95(38.0) | | |
| Middle Age (ref) | 32 (59.3) | 22(40.7) | | |

**Regression analysis on RQ 2.**

Another multiple regression model analysis was conducted on cognitive, socioeconomic and demographic factors in which 12 independent variables and seven co-variables were analyzed. The regression analysis was conducted regardless of whether the association of the variables with MRS was significant or not when subjected to Chi-square analysis. The overall percentage of cases for which the dependent variables were correctly predicted in the model is 61.1% in step 0 which increases to 87.9% in the full model (step 1) indicating correct classification of the dependent variables. The reported Nagelkerke *R*2 is 0.705. The Hosmer-Lemeshow test was not significant ($\chi 2$ =6.844; df =8; $p$ =0.554), meaning the model fits the data.

Table 17 shows the result of multiple logistic regression analysis, adjusting for all independent cognitive, socioeconomic and demographic variable that were significant or not significant with MRS in the Chi-square and Fishers exact tests of association. There was significant association between level of education and MRS. Respondents who had secondary education had lower odds (*OR* =0.050; 95% *CI* = 0.013, 0.197; $p$ = < 0.000) of high MRS than those with primary education ($p$= 0.077, and those with post-secondary education (reference group).

The relationship between the number of pregnancy and MRS was significant on regression analysis. Women who were pregnant for the first time had significantly higher odds (*OR* =5.589; 95% *CI* = 1.465, 21.316 $p$ = 0.012), of high MRS than those who were pregnant for the second time ($p$=0.020), and third or more times (reference group). The relationship between the frequency of attendance at ANC and MRS was significant.

Pregnant women that attended less than half of all ANC appointments had higher of odds (*OR* =3.777; 95% *CI* = 1.119 -12.746 *p* = 0. 0.032) of high MRS than those who attended half or more than half clinic appointments (see Table 17)

The odds of the other co-variables were not statistically significant: Marital status (*p*= 0.061 for the married), employment status (p= 0.060 for the employed), type of marriage (p=0.070 for monogamous marriage), and living situation (p=0.981 for lived alone). The odds of stage of pregnancy (*p*= 0.680 for the first trimester), and exposure to malaria messages (*p*=0.385 for not exposed) were also not significant (see Table 17).

**Table 17.**
*Logistics Regression Analysis of Cognitive, Sociodemographic Variables and Malaria Risk Status Among Pregnant Women, August, 2016*

| Variables | Odd Ratio | 95 % Confidence Interval | *p* value |
|---|---|---|---|
| Education | | | |
| Primary | 0.263 | 0.060, 1.155 | 0.077 |
| Secondary | 0.050 | 0.013, 0.197 | 0.000* |
| Post-Secondary (Reference) | 1.00 | | |
| Marital Status | | | |
| Married | 0.07 | 0.004, 1.138 | 0.061 |
| Not Married (Reference) | 1.00 | | - |
| Employment status | | | |
| Employed | 0.358 | 0.123, 1.044 | 0.060 |
| Not Employed (Reference) | 1.00 | | - |
| Type of Marriage | | | |
| Polygynous | 1.00 | | - |
| Monogamous | 0.332 | 0.101, 1.093 | 0.070 |
| Living Situation | | | |
| Lives alone | 0.960 | 0.035, 26.484 | 0.981 |
| Lives with spouse/husband | 1.670 | 0.211, 13.207 | 0.627 |
| Lives with extended family/other (Reference) | 1.00 | | - |
| Stage of Pregnancy | | | |
| Months 1-3 (First trimester) | 0.757 | 0.202, 2.836 | 0.680 |
| Months 4-6 (Second trimester) | 1.781 | 0.584, 5.433 | 0.311 |
| Months 6-9 (Third trimester) (Reference) | 1.00 | | - |
| Number of Pregnancy | | | |
| First pregnancy | 5.589 | 1.465, 21.316 | 0.012* |
| Second pregnancy | 4.610 | 1.273, 16.693 | 0.020* |
| Third or more pregnancy (Reference) | 1.00 | | - |

*table continues*

| Variables | Odd Ratio | 95% Confidence Interval | P value |
|---|---|---|---|
| Knowledge of Malaria and Malaria in Pregnancy | | | |
| Inadequate knowledge | 3.282 | 1.091, 9.873 | 0.034* |
| Adequate knowledge(Reference) | 1 | | - |
| Exposure to malaria messages | | | |
| Exposed to malaria messages(Reference) | 1.00 | | - |
| Not exposed to malaria messages | 3.022 | 0.249, 36.675 | 0.385 |
| Took SP for IPTp during Pregnancy | | | - |
| Yes (Reference) | 1.00 | | - |
| No | 0.843 | 0.264, 2.694 | 0.774 |
| Attendance at antenatal clinic (ANC) appointments | | | |
| Attends at least half of 4 appointments (Reference) | 1.00 | | - |
| Attends less than half of 4 appointments | 3.777 | 1.119, 12.746 | 0.032* |

## Summary of Findings

The study examined composite risk behaviors of pregnant women that enhance the transmission of MiP. The participants were mostly young adults, in monogamous marriages, and resided mainly in urban location. Many had secondary education, and just as many were unemployed. Many of the pregnant women were of high MRS.

Bivariate ($\chi 2$) analysis conducted showed that eight socio-economic and demographic variables were significantly associated with MRS. The variables were the level of education, stage (trimester) of pregnancy, employment status, number of pregnancy, and number of children. Other variables significantly associated with MRS were the type of marriage, the living arrangement, the marital status, attendance at ANC and exposure to malaria messages.

Results on RQ1 showed that four variables on perception regarding barriers and benefits of measures for the prevention of MIP were significantly associated with MRS, both on $\chi 2$ and logistics regression model analyses. Regarding RQ2, $\chi 2$ analysis of the five independent variables showed that only knowledge of malaria and MiP was significantly associated with MRS.

Regression analysis of all cognitive, socioeconomic, and demographic variables, regardless of whether their association with MRS was significant and not significant on bivariate analysis, revealed only four predictors of MRS. The predictors of MRS were the level of education, knowledge of malaria and MiP, the number of pregnancy, and attendance at ANC clinics. Pregnant women who had primary or post-secondary education had significantly higher odds of high MRS than those who had secondary

education. Participants whose knowledge of malaria and MiP was inadequate or poor, had significantly higher odds of high MRS than those who had adequate knowledge of malaria respectively. Also, women who were pregnant for the first or second time; and those that kept less than half of ANC appointments, had significantly higher odds of high MRS than those who were pregnant for the third or fourth time, and those who those kept half or more ANC appointments, respectively.

Based on above analysis I concluded that perceived barriers and benefits of the recommended measures for prevention of MiP were significantly associated with, and predictive of MRS. Similarly, the four variables of knowledge of malaria and MiP, level of education, the number of pregnancy, and attendance at ANC clinics were significantly associated with, and predictive of MRS.

In Chapter 5, I present interpretation and discussion of findings, social change implications of this study and the recommendations for policy and programmatic decisions, and for future studies.

# Chapter 5: Discussion, Conclusions, and Recommendations

## Overview

This cross-sectional survey was conducted to measure the composite risk behavior for MiP, as indicative of the MRS of pregnant women in Abuja, Nigeria. The survey enabled the assessment of the MRS of selected pregnant women at the time of the study, such that the attribute of the study sample can be projected to the larger population (Frankfort-Nachmias & Nachmias, 2008). I assessed the level of compliance of the pregnant women with the three recommended measures for prevention of MiP (WHO 2004) to determine the MRS of pregnant women and to enable classification of their MRS. The classification of the pregnant in women into high, moderate, and low MRS was conducted to gauge their adoption of the three recommended measures for the prevention of MiP. I also identified and analyzed the socioeconomic, cognitive, and demographic factors related to MRS. The findings could contribute evidence for the review of policy, programs, and service delivery to increase the adoption of the recommended measures for prevention of MiP.

## Summary of Key Findings

In this study, I examined the composite risk behaviors of pregnant women that enhance the transmission of MiP. I found that perceived barriers, and benefits of the recommended measures for prevention of MIP, were significantly associated with and predictive of MRS. In addition, knowledge of malaria and MiP, level of education, number of pregnancy, and attendance at ANC clinics were significantly associated with and predictive of MRS.

Some other factors including marital status, stage (trimester) of pregnancy, employment status, type of marriage, living arrangement, and exposure to malaria messages were significantly associated with MRS on bivariate analysis, but were not predictive of it. The association between geographical location and MRS was nearly significant. However, there was no significant association between the factors of age, religion, distance to health facilities, and MRS.

## Interpretation of the Findings

### Sociodemographic Characteristics

Most of the pregnant women were young adults, between 20 and 34 years of age (78.0%); a majority (97.0%) were married, mostly in a monogamous marriage (77.3%). A majority (92.0%) lived with their husbands or partners, and many (41.3%) had secondary education (41.3%). These sociodemographic characteristics were typical of pregnant women in Nigeria and many other countries where marriage is seen as a form of social, emotional, and economic security, especially for women (Lerman & Wilcox, 2014; Mokomane, 2012; NPC, 2014). The NDHS (2013) for Nigeria showed that majority of WCBA were married, mostly below 30 years of age, and many had secondary education or below (NPC, 2014).

Many respondents were Christians (71.7 %); many lived in urban areas (63.0%), while the residence of most participants (75.1%) was less than 30 minutes walking distance from the nearest health facility. A majority of the respondents lived in urban areas, which is reflected in the geographical distribution of the population of the FCT, the study location. The FCT is the capital city of Nigeria, where about 55.2% of the

population lives in one highly urbanized area council, AMAC, and its suburbs (NPC 2008). It was not surprising that the residence of most respondents (75%) was more than 30 minutes walking distance from the nearest health facility because most of the primary health care facilities in Nigeria are located at quite a distance from the population they serve (Ademiluyi & Aluko-Arowolo, 2009).

The SES of participants, as measured by WI, showed that nearly two-fifth (39.9 %), and one-fifth (20.3%) of the participants were of the fourth and fifth (the highest) WI respectively. This finding on WI is at a variance with that of the 2013 NDHS, which indicated that in the north-central region, where FCT is located, the proportion of the population in the fourth and fifth (highest) WI was 20.5% and 14.8% respectively. The variance can be explained by ownership and access to housing and household assets, which were key variables in the WI calculation. In the FCT, ownership and access to housing and household assets are relatively better, compared to cities and towns in other states in the north central region. Despite what appears to be better WI in the FCT, as found in this study, many of the participants were poor because 60.6% were unemployed, and nearly three-fifth (57.3%) earned N40, 000 (USD 130) or below per month. Poverty is a risk factor in many health problems and diseases (Blakely, Hales, & Woodward 2004).

**Knowledge of Malaria and MiP**

I found that many (59.1%) participants had good knowledge of malaria and MiP, with overall mean score 8.28 out of total score of 14. However, the overall *m* malaria knowledge score masks the discrepancy in the two aspects of the knowledge assessed.

Although knowledge of malaria was high at a *m* score of 5.08 out of 7 for most (72.6%) participants, knowledge of MiP and its prevention was low, at a *m* score of 3.2 out of 7 for some participants (45.7%). The discrepancy in knowledge created doubts on the adequacy, frequency, and relevance of the messages on MiP, given that most of the participants were exposed to such messages.

The *m* knowledge score of malaria and MiP for three categories of pregnant women: the teenagers, those with secondary education, and urban resident was above the overall *m* score. Most teenagers are known to be inquisitive, and their curiosity may have accounted for their above average knowledge of malaria. Oladepo and Fayemi (2011) reported that adolescent had high knowledge of HIV transmission and prevention. Although participants in urban areas had higher *m* knowledge score than those in rural areas, the difference is marginal because rural participants had higher correct scores in five out of the nine knowledge items. This finding mirrors that of another study which showed that difference in knowledge of malaria between urban and rural residents appeared insignificant (Aung, Lwin, Sudhinaraset, & Wei, 2016).

**Composite Malaria Risk Behavior and Malaria Risk Status**

The composite risk behavior was taken to be indicative of MRS of the pregnant women. The findings of the study on access and use of ITN, use of SP for IPTp, and attendance at ANC are similar to that of other studies in Nigeria, at the national level, and the FCT, the study location.

A little over half (57.0%) of the respondent owned an ITN, of which 68.4% slept under (used) the net the night before the survey. This finding approximates that of the

2015 Malaria Indicator Survey (MIS) in Nigeria. In the north central region, including FCT, the 2015 MIS indicated that 55.4% of HHs owned at least one ITN, while its use was 61.8% among pregnant women in such HHs (NPC, 2016). Trends in Nigeria indicate that ownership of at least one ITN increased among the general population, from 44% in the 2010 MIS, to 48.0% in the 2013 NDHS, and to 69% in 2015 MIS (NPC, 2012, 2014, 2016). The use of ITN the night before survey among pregnant women who owned ITN, or in HH with at least one ITN, has also increased in the last 4 years. This increase in the use of ITN was from 25.7% in 2008 (Ankoma et al., 2012) to 62.3% in 2015 (NPC, 2016) and to 68.4% found in this study.

The finding of this study that majority of owners of ITN among the participants used the net, which confirms the findings of other studies that use of ITN is enhanced by having access to it. Kilian, et al. (2013) reported that 81% of people with access to ITN use it. Although a majority of owners of ITN among the participants used the net, the proportion of owners and users of ITN is far less than the national target. The national malaria strategic plan (2014-2020) for Nigeria stipulates 100% ownership of ITN among pregnant women, and at least 80.0 % use it use every night (NMEP, 2014)

The finding of this study that 37.7% of pregnant women had taken at least one dose of SP for IPTp approximates the figure (36.7%) reported in the 2015 MIS (NPC, 2016). Trends in Nigeria indicate a substantial increase in the use of at least one dose of SP for IPTp, from 7.1% in 2010 (NPC, 2012), to 36.7% in 2015 (NPC, 2016), and the 37.7% found in this study. However, the increase in the use of SP for IPTp found in this

study is very far from the national target for the use of 2 doses of SP for IPTp by of least 80% of pregnant women in Nigeria (NMEP, 2014).

Regarding the attendance at ANC clinic, the finding of this study that 30.9% of the participants attended all (four out of four) clinic appointments approximates the national data. The 2013 NDHS indicated that 29.9% of pregnant women attended at least four ANC appointments (NPC, 2014), but analysis of the data showed that the attendance was 29.0 % in the north central region where FCT is located (Umar, 2016). The marginal increase in pregnant women's attendance of at least four ANC appointments from to 29.9% in 2013 (NPC, 2014), to 30.9% in this study, is far from the national target. The WHO (2016) recommends attendance of at least four ANC visit by all pregnant women.

Based on the parameters for the measurement of MRS of the pregnant women, many (61.0%) were at high risk of malaria, either because they did not use of ITN, or had a combination of the other two elements of the risk behaviors: Nonuse of SP for IPTp, or irregular ANC clinic attendance. Although this study relied on reported risk behavior at the community level, the finding is comparable with other clinic level studies that measured malaria parasites in pregnant women through microscopy or rapid diagnostic test. Many pregnant women (61.1%) were of high MRS, which mirrors the finding of an ANC study in Nigeria that reported 60.06% and 55.56% parasitemia among pregnant women at two secondary health facilities respectively (Mbah, et al., 2013). Similarly, Dako-Gyeke, & Kofie (2015) reported 57.4% and 42.6% malaria parasitemia among pregnant women attending ANC at two urban slum areas in Ghana. However, lower levels of malaria parasitaemia in pregnancy have been reported by other authors of

studies in Nigeria, estimated at between 38% and 62% in a population survey in Enugu State; and 41.6% in an ANC study in Kebbi state (Gunn et al., 2015; Fana et al., 2015). The nature of the studies and the seasonality of malaria probably accounted for the difference in proportion of pregnant women that were of high MRS, and the level of malaria parasitemia. Where malaria studies were conducted during period of low transmission of the infection, low level of parasitemia is expected, and vice versa. Also, measured reported risk behavior related to a disease can only be reasonable estimates of actual cases of the disease.

**Perception, Attitude and Malaria Risk Status**

It was mixed finding regarding issues of perception and attitudes to malaria and MiP. Many participant's (50.0% to 70.0%) indicated positive response regarding many of the items, just as many indicated negative response to some of the items. Both bivariate and multivariate analysis indicated that four items on perceived benefits and perceived barriers of ITN, and SP for IPTp were significantly associated with, and predictive of MRS. However, many women still perceive malaria to be neither a serious nor severe disease, because the relationship of perceived seriousness, and severity of malaria was not significantly related to MRS of the pregnant women.

The study findings on the influence of perception on MRS are in agreement with other studies on elements of behavior for MiP. Researchers have reported that the use of ITN is enhanced by positive attitude of appreciation of its social and economic benefits, and it is predicted by not holding misconceptions about prevention of malaria (Ankoma et al., 2012; Strachan, et al., 2016; Watanabe et al., 2014). The nonuse of ITN has been

attributed to negative attitudinal factors such as discomfort, primarily due to heat; not being able to hang a net, and the inconvenience of hanging ITN (Pulford, et al, 2011; Aluko & Olowatosin, 2012; Watanabe et al 2014). Other attitudinal factors associated with use SP for IPTp as reported in other studies include reluctance to use of medicine when there are no signs or symptoms of disease; and concerns about side effects of IPTp (Rassi, et al, 2016).

Although many pregnant women perceived ITN and SP for IPTp as effective, and as comfortable, and beneficial to use, the findings that some perceive malaria to be neither serious nor severe, have negative implications for prevention of MiP. Some pregnant women may be less motivated to comply with all measures to prevent MiP, either because of poor perception of the effectiveness, benefits and or comfort related to adoption of the measures for the prevention of MiP.

**Socioeconomic and Cognitive Factors Regarding Malaria Risk Status**

The dearth of studies on composite risk behavior for MiP implies that the findings of this study on factors associated with MRS was be compared to findings of studies on the elements of risk behavior for MiP: the use of ITN, the use of SP for IPTp, and ANC attendance.

**Knowledge and MRS.** Both bivariate and multivariate analysis showed that knowledge of malaria and MiP was significantly associated with MRS of the pregnant women. Nearly all participants (97.5%) with poor knowledge of malaria and MiP were of high MRS, compared to only a few (14.0 %) of those with adequate knowledge. This finding is in agreement with findings of some studies that analyzed the relationship

between knowledge and any of the components of MRS. Ankoma et al. (2012) reported that knowledge that ITNs helps to prevent malaria was a key predictor of ITN use among pregnant women. Onyeneho et al. (2013, 2014) noted a significant association between knowledge of malaria and compliance with two doses of SP for IPTp. Perumal, et al. (2013) reported that higher number of ANC clinic visits were significantly associated with maternal health knowledge.

The finding of this study that knowledge was associated with use of ITN is not surprising. Proponents of many health behavior theories including HBM, ecological model (EM) and social cognitive theory SCT) have identified knowledge as one of the determinants of health behavior (Champion & Skinner, 2008; McAlister, Perry, & Parcel, 2008). Although adequate knowledge is a precursor to the adoption of desirable behavior, it is important to recognize other determinants of behaviour are equally important. Kinkaid et al. (2000), noted that knowledge works along with other ideation factors in the adoption of desired behavior.

**Socioeconomic status and MRS**. Bivariate analysis indicated that employment status was significantly associated with MRS, but multivariate analysis showed that neither employment status nor wealth quintile was significantly associated with nor predictive of MRS. This finding is at variance with that of other studies that measured WI in relation to different elements of MRS. The 2013 NDHS, and the 2015 MIS for Nigeria, showed that partial or full compliance with recommended doses of SP for IPTp increased from the lowest to the highest wealth quintile (NPC 2014, NPC 2016). Onyeneho, et al. (2013), reported a significant relationship between wealth quintile and use of SP for

IPTp, and that compliance with doses of SP for IPTp was higher among pregnant women in paid employment, and those in higher wealth quintile. Regarding the use of ITN, the 2015 MIS indicated sharp difference in ITN use for the lowest and highest quintile estimated at 69.5% and 45.2% respectively (NPC 2016). Other studies indicated significant association between household wealth and attendance at ANC clinic (Mustafa & Mukhtar 2015; Umar, 2015).

The variance in the findings of this study and others on the relationship between WI and the element of MRS can be explained by ownership and access to housing and household assets, which were the variables in the WI calculation. In the FCT, the nation's capital, ownership and access to housing and household assets are relatively better, compared to cities and towns in other states in the north central region and Nigeria. Many of the household items assessed for WI were found in most homes, in the urban and rural locations in FCT.

**Geographic location and MRS**. The relationship between geographical location and MRS, was a nearly significant ($p$= 0.059) on bivariate analysis, with the proportion of pregnant women with low MRS, estimated at 34.9% and 45.9% respectively in rural and urban locations. This finding closely mirrors that of studies on the different elements of MRS. Ankoma et al. (2012), reported that pregnant women who live in urban areas were nearly twice more likely to use bed nets. The 2013 NDHS indicated that a higher proportion of pregnant women in urban location, compared to those in rural location slept under the bed net in households with at least one net. Similarly, Umar (2015), reported a significant association between place of domicile (urban or rural), and ANC attendance,

with higher odds of ANC visits among pregnant women in urban areas. Onoka et al. 2012) noted that coverage of IPTp was higher in the urban areas compared to rural areas.

Urban location usually enhances access to mass media, and to ANC services, which are sources of exposure to messages on prevention of malaria and MIP. As such, it was not surprising that this study and others indicated better compliance with recommended measures for prevention of MIP among pregnant women in urban locations, compared to those in rural locations.

**Living arrangement and MRS**. Although the living arrangement of a majority of the participants (97.0%) was supportive of prevention of MiP, the relationship between living arrangement and MRS was not significant. A majority (87.5%) of participants whose living arrangement was not supportive of prevention of MiP were of high MRS, compared to 57.9% of those whose living arrangement was supportive, that were of high MRS. This finding corroborates other studies on the components of risk behavior for malaria and MIP. Onyeneho et al., (2013) reported that currently living with a partner is one of the factors that predicts compliance IPTp-SP as recommended. Iloh, et al. (2013) reported that in eastern Nigeria, certain family biosocial variables including monogamy and inter-spousal communication significantly influenced the use of ITN.

Although a majority of participants were into monogamy unions, the relationship between living arrangement and MRS was not significant probably because the factors that accounted for non-adoption of recommended measures for prevention of MiP were not bio-social in nature. Rather, the non-adoption of measures for prevention of MiP were related to supply and environmental factors, including lack of access to ITN, and heat

associated with its use; and the supply factors associated with low adoption of IPTp–SP (Onoka, Onwujekwe, Hanson, & Uzochukwu, 2012; Stanley & Nsabagasani, 2014).

**Age and MRS.** A majority (78.0%) of the pregnant women were young adults, most of whom were of high MRS, compared to half of those who were of adolescents. Age is a key variable in MiP because adolescents and women who were pregnant for the first time are known to be at higher risk of MiP and its consequences than older women, and those who had more than one child (Mbah et al., 2013; Oladehinde et al., 2012). Although this study indicated that the relationship between age and MRS was not significant, the finding that the adolescents were of lower MRS compared to other age groups can be attributed to factor of knowledge. I found that knowledge of malaria and MiP was significantly related and predictive of MRS, and the pregnant adolescents were more knowledgeable about malaria and MiP than older pregnant women.

**Other Socioeconomic variables and MRS**

The flowing discussion focus on other socioeconomic and demographic variables which I analysed in relation to MRS of the pregnant women.

**Level of education and MRS**. The relationship between the level of education and MRS was significant, only by bivariate analysis. Most participants (73.1%) that had primary education were of high MRS, compared to some (37.1%) of those that had secondary education that were of high MRS. The relationship between the level of education of a population and a health-related behavior appears to be controversial, with significant relationship reported in some studies (Osuala, 2015; Umar, 2016), and non-significant relationship reported in others (Ankoma, 2012). While the finding of this

study closely approximates that of some studies that focused ITN and MiP as a component of MRS, it differs from other similar studies. Ankoma et al. (2012), reported that level of education was not significantly associated with ownership and use of ITN among pregnant women. However, Russell et al. (2015), reported that the odds of ITN use decreased with increasing education level among the general population after ITN distribution campaign.

Just as it was for ITN, some studies reported significant association between level of education and use of SP for IPTp. Mwandama et al. (2015) noted that educated pregnant women in Malawi were more likely to have received IPTp compared to women with no education. Similarly, according to the 2013 NDHS, and the 2015 MIS for Nigeria, the proportion of pregnant women that received at least one dose of SP for IPTp increased by the level of education (NPC, 2014; NPC, 2016). Since this study indicated that education was associated with MRS, on bivariate analysis, then it is appropriate to tailor the content and method of learning experiences on malaria and MIP to suit the educational level of pregnant women.

**Distance to health facility and MRS**. The relationship between the distance of the residence of the pregnant women to a health facility and their MRS was not significant, a finding that differs from other studies on use ITN, SP for IPTp, attendance at ANC; as elements of MRS. Registration at ANC enhance ownership of ITN, which in turn, has a positive effect on its use, because most owners of ITN actually use it (Ankoma et al. 2012; Koenker & Kilian, 2014). Similarly, registration and attendance at ANC enhance partial use (one dose) or optimal use (2+doses) of SP for IPTp (Exavery, et al.

2015; Kibusi, et al. 2015). Ordinarily, living close to a health facility with ANC services should enhance ownership of ITN, the use SP for IPTp, which are distributed free to ANC attendees. A majority of participants lived in areas that were distant to a health facility, many were registered at ANC, yet many (61%) are of high MRS. This implies that being registered at ANC clinic and living close to it may not have enhanced full compliance with all the three measures for prevention of MIP as recommended.

**Employment status and MRS.** The relationship between employment and MRS was significant only by bivariate analysis. Several authors' studies have reported a significant relationship between employment status and the elements of MRS. Onyeneho, et al. (2013), reported a significant relationship between employment status and use of SP for IPTp, as compliance with SP for IPTp was higher among pregnant women in paid employment. Aluko and Oluwatosin (2012) reported that dependent (unemployed) pregnant women were more likely to sleep under ITNs than those who were employed. Regarding attendance at ANC clinic, Mustafa & Mukhtar (2015), reported that higher household wealth is one of the factors associated with attendance at ANC clinic. It was not surprising that employment status was related to MRS on bivariate analysis because employment helps to overcome poverty, a known factor that discourages healthy behavior.

**Number of pregnancy, number of children and MRS**. A significant relationship was found between the number of pregnancy, number of children and MRS; both on bivariate and multivariate analysis. Most of the participants (73. 6%) that were pregnant for the first time, were of high MRS, compared to just about half (51.6%) of

those that had one or more previous pregnancies. The relationship between the number of pregnancy and MRS was inverse because as the number of pregnancy and number of children increased, the proportion of pregnant women that were of high MRS decreased.

The relationship between the number of pregnancy, and the component of MRS appears controversial. While the findings of this study reflects that of other studies, it was in contrast with others that analyzed the relationship between number of pregnancy and any of the elements of MRS. Sangare et al. (2012), reported non-significant relationship between pregnancy history and use of ITN for prevention of MiP, while other researchers reported significant relationship between pregnancy history, parity and use of SP for IPTp (Kibusi et al., 2015; Mustafa & Mukhtar, 2015). Kibusi et al. (2015) noted that women that were pregnant for the first or second time had higher odds of completing the recommended IPTp dosage, compared to those who had two or more children. Umar (2015), reported that pregnant women who had 2 or more children were less likely to have 4 or more ANC visits than those who had one child, and the association between number of children and number of ANC visits was significant on bivariate analysis.

The inverse relationship between number of pregnancy, and MRS can be explained. Women with pregnancy experience and with children may have interacted with other pregnant women and service providers, to the extent that they appreciate the effectiveness of measure for the prevention of MiP, and the benefits of adoption of such measures, with a positive effect on their MRS.

**Marital status, type of marriage and MRS. T**he proportion of pregnant women in monogamy in this study and that of the FCT in the 2013 NDHS was close, at 76.4%

and 81.6% respectively (NPC, 2014). Among the pregnant women, the relationship between marital status and MRS; and between the type of marriage and MRS were significant, but only on bivariate analysis.

The proportion of unmarried pregnant women that were of high MRS, was far higher than the married, just as the proportion of those who were in polygyny who were of high MRS, was far higher than that of those in monogamy. This finding was in agreement with some studies that analyzed the relationship between the number of pregnancy, the number of children; and elements of the components of MRS. The regression analysis by Kibusi, Kimunai, and Hines (2015) showed that being married or living with partner was associated with high uptake of IPTp compared to those who were never married, divorced or separated. Similarly, other authors reported that pregnant women who were married, and lived with a partner were more likely to have the required number of ANC visits than those who were never married (Anchang-Kimbi, et al., 2014; Umar, 2015).

The finding of this study that the proportion of married, pregnant women who were in monogamous union and were of low MRS was lower than those who were unmarried or in polygyny was not surprising. Being married and living in monogamous union probably enhanced emotional, financial and other support from the spouse, which in turn may have enhanced adoption of healthy practices related to prevention of MiP.

**Religion and MRS.** A higher proportion of pregnant women of Islamic faith were of high MRS (65.9%), compared to the Christians, of were of high MRS, but the relationship between religion and MRS was not significant. This finding tends to agree

with findings of some studies that analyzed the relationship between religion and any of the components of MRS. Dako-Gyeke, & Kofie (2015), reported that there was no significant relationship between religious beliefs of pregnant women and their malaria prevention and control practices. Umar (2015) reported a significant association between religion and the number of ANC visits, with Christians being more likely to have more ANC visits than Muslim. Similarly, Sangaré, et al 2012, noted that Muslim pregnant women were more at risk of malaria because they were less likely always to use ITN, compared to Christians**.**

**Attendance at ANC clinic and MRS.** Both bivariate and multivariate analysis indicated a significant relationship between attendance at ANC clinic and MRS. The proportion of pregnant women that attended less than half of four ANC appointments that were of high MRS (68.1%) was higher than those that attended half or more of such appointments that were of high MRS (56.9%). These findings reflect some other studies on elements of risk behavior for MiP. Ankoma et al. (2012) reported that pregnant women who registered at ANC were 1.3 times more likely to own bed nets compared to those who did not. Perumal, et al. (2013) reported that higher number of ANC clinic visits were significantly associated with maternal health knowledge. Onyeneho, et al (2014) noted that pregnant women with good knowledge of the causes, effects and prevention of malaria during pregnancy complied more with the use of SP for IPTp than those with poor knowledge. Since higher number of ANC attendance enhances maternal health knowledge, and this study and others showed that knowledge was a predictor of MRS, then ANC attendance appears to be a key determinant of MRS of pregnant women.

**Exposure to malaria prevention messages and MRS**. I found a significant relationship between exposure to malaria messages and MRS of the pregnant women. Most pregnant women that were either not exposed or were not sure of their exposure to malaria prevention messages, were of high MRS, compared to a much lesser percentage of those exposed to such messages. This finding corroborates some other studies on elements of risk behavior for MIP. Dilaram et al. (2014) reported that mothers of children under one year who were exposed to mass media while pregnant, were more likely to have attended ANC than their non-exposed counterparts. Ankomah, et al (2014) reported that pregnant women who listened to radio, and those who heard a specific radio campaign on ITN were more likely to use ITN than those who did not. The HBM which is one of the models applied for this study indicated that exposure to media messages is a key variable for cue-to-action, for pregnant women to comply with recommended behavior for prevention of MIP (Champion & Skinner, 2008).

## Interpretation of Findings in Relation to Theories.

The HBM and the TPB (Champion & Skinner 2008; Montanoo, & Kasprzyk, 2008), informed the conceptual framework for this study. Based on the HBM, a pregnant woman will adopt a recommended behavior if she appreciates the benefits of the recommended behavior; have the required means (money, knowledge, and skill), and can overcome any barrier against the behavior. Also, desired behavior will be adopted if a pregnant woman is positively influenced by significant other such as media, service provider and spouse (cues to action). As expected, the findings of this study, to a large extent reflects the postulation of the HBM. The study showed that the element of

perception there were predictive of MRS were perceived effectiveness, perceived benefits and comfort regarding preventive measures for MiP. Also, four of the cognitive and socioeconomic variables predictive of MRS were level of education, knowledge of malaria and MiP, number of pregnancy, and attendance at ANC clinics. The subjective norms as an element of TPB is also reflected in the perception of the pregnant women regarding the recommended behavior as comfortable, beneficial and effective; all of which were predictive of MRS. However, the finding of this study that perceived seriousness, wealth index, age and geographical location were not associated with not predictive of MRS, were at variance with HBM and TPB.

## Limitations of the Study

The quantitative cross-sectional design used for this study was suitable because the nature of the study does not allow for experimental research design (Frankfort-Nachmias & Nachmias, 2008). For a study on risk behavior for MiP, it's unethical to put some pregnant women in a control group, and ask them not to protect themselves from malaria. Data was collected through participants reported accounts of pregnancy status, use of ITN, SP for IPTp, and attendance at ANC. The accuracy of the data depended on respondents' ability to recollect and report exactly on their pregnancy status and behavior. While pregnancy status is obvious at second and third trimesters, it is not in the first trimester, and behaviors related to prevention of MiP cannot be verified. It was not feasible to verify the use of ITN at night in several homes; neither was it feasible to observe the use of SP for IPTp at ANC clinic, or ANC attendance of several pregnant women.

The non-verifiability of the reported behavior notwithstanding, measures were taken to ensure validity and reliability of the data. Valuable data have been generated in studies on reported human behavior when measure was taken to ensure validity and reliability of the study (Ankoma, et al., 2012; Frankfort-Nachmias & Nachmias, 2008). Although the measurement of MRS was based on oral accounts of compliance with three recommended behaviors by WHO, the comparability of the results with some studies that measured malaria parasitemia in pregnant women in Nigeria, indicated that the findings of this study closely approximated the actual MRS of the participants.

## Recommendation for Further Research

1. Despite the general perception of malaria as ordinary illness, the study showed that perceived seriousness and severity were not related to MRS. There is need for further research to better explain the factors of perceived seriousness and severity of malaria in relation to MRS, since the study finding appeared to be contrary to the expectation.

2. The nature of the significant and inverse relationship between the number of pregnancy and MRS, require further studies. Since teenagers that are pregnant for the first time are biologically more vulnerable to MiP than older women, it is important to explain whether the odd of high MRS found to be lesser for women with multiple births and children, is biological or behavioral or both. Such a study is needed to measure of both parasitamia and malaria risk behaviors, as behavioral and biological phenomena. The findings was help to explain the convergence and divergence of factors of pregnancy history and other variables in relation to MRS of pregnant women.

3. Research is also needed on the involvement of men in prevention and control of risk behavior for MiP, because men as spouses, were identified as the source of information and support for prevention of MiP. Such a research can help to identify and explain the factors that account for men's role for the creation and sustenance of the supportive or unsupportive living situation of pregnant women, in relation to prevention of MiP.

## Implications

The following are the implications of the findings for positive social change, for practice, towards effective prevention of MiP.

### Implication for Positive Social Change

The findings of this study on composite risk behavior for MIP have social change implications at policy, service delivery, individual, family, organizational levels. Since ANC attendance is significantly associated with MRS, the chances of social change for effective prevention of MiP can be enhanced through improvement in access to, and quality of such services. It is important to increase access to ANC, by increasing service delivery points, to make the service readily accessible where people live and work, at urban or rural locations. It is equally important to enhance the quality of ANC service by providing quality assured commodities for prevention of MiP, including ITN, IPTp-SP and malaria diagnostic tests. In addition, social change can be fostered through adequate number of trained health workers, with updated knowledge and skill, to render ANC service for prevention of MiP, at every service delivery point.

Furthermore, since knowledge of malaria and MiP was significantly associated with MRS, social change for prevention of MiP can be achieved by improvement of

knowledge of malaria and MiP at individual, household and community levels. It is important to mobilize public and private sector resources to produce education and communication materials on prevention of MiP, in print and electronic formats. Such materials need to be tailored to the needs of married couples as primary audiences, and all others within the child bearing age.

When every individual, household and community can demonstrate adequate knowledge and skill in prevention of MiP; and when every pregnant woman has easy access to quality ANC services, close to wherever she lives and work, then social change is underway. Such social change is most needed to achieve a positive effect on reduction in maternal mortality, which is one of the sustainable development goals of the United Nations.

**Implication for Practice**

This study has shown that ANC visits was significantly related to MRS, just as other studies showed the significance of ANC attendance in relation to desirable pregnancy outcomes. ANC is a veritable platform to deliver vital information, and equip attendees with relevant knowledge and skills in the use of ITN, SP for IPTp, and importance of diagnosis of malaria before treatment. It is most important to strengthen ANC services by increasing the number of service outlets in both rural and urban locations, and ensure adequate service providers and commodities are available for malaria prevention and treatment

The study showed that level of education and knowledge were predictors of MRS, and that marital status was significantly associated with MRS. There is need for policies

and strategies to improve enrolment and retention of students for basic education, and to include prevention of MiP in the school curriculum. Subjects such as the social studies and family life education can be used as a platform to provide content on knowledge and skills for prevention of MiP, as integral to secondary education. School-based learning experiences on prevention of MiP has additional value because it will extend to both male and female students, which was have combined positive effects when the students become parents.

## Conclusion

Malaria is a disease that is preventable, treatable and curable, yet it remains one of the major causes of mortality and morbidity among the general population, most especially among the vulnerable population, including pregnant women. Most pregnant women in Nigeria and other malaria endemic countries continue to be at risk of malaria because either they did not use of ITN, or nonuse of SP for IPTp, or irregular ANC clinic attendance or combination of more than one of the risk behaviors. In response to a gap in the literature, I conducted this study to measure composite risk behavior that enhance MiP, and analyzed the MRS of pregnant women in relation to perception, socioeconomic and demographic variables.

The findings of this study indicate that personal factors including (a) perceived benefits, and barriers of recommended measures for prevention of MiP, (b) level of education, (c) number of pregnancy, and (d) ANC attendance were significantly related to and predictive of MRS. Six other factors were related to, but not predictive of MRS. It is most important for policy makers and program designers to consider the key findings on

MRS regarding MiP in the design of interventions. Such interventions will enable exposure to information and messages; and access to quality ANC services, to enhance compliance with the recommended measures for prevention of MiP. The design and implementation of comprehensive message and service delivery for prevention of MiP as integral to reproductive health, will contribute immensely for to the achievement of maternal health and sustainable development goals in Nigeria.

Further studies are needed to (a) examine the inverse relationship between the number of pregnancy and MRS, and (b) assess factors that can enhance the involvement of men in creating supportive living situation for prevention of MiP.

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Appendix A: Survey Questionnaire

**COMPOSITE RISK BEHAVIOR/ MALARIA IN PREGNANCY**

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**IDENTIFICATION**

Area Council……
Enumeration Area……
Location Urban [1] ……Semiurban [2] ……. Rural [3] …….
Building Unit…….Household Number……
Name and Phone number of Household Head……
**Interviewers Name……** Date of Interview…….
**Interviewers visit: 1st** visit/ Date……Remarks……
2nd visit /Date ……...Remarks……..

**Remarks Codes**

| | | | |
|---|---|---|---|
| Interview Completed | 1 | Interview Refused | 4 |
| No Eligible Respondent at home | 2 | Others (Specify | 99 |
| Interview Postponed | 3 | | |

Language of Interview……. Native Language of respondent …….....
Eligibility of Respondent.

a) Lives on the selected enumeration area in the last 6months. Yes……. No…….
b) Visibly pregnant OR Confirmed to be pregnant (with evidence). Yes…No……
c) Aged 15 and above Yes…… No……
   If No to any of the 3 eligibility questions, she is NOT eligible to be interviewed.
   **STOP**
   If yes to all the 3 eligibility questions, she is eligible to be interviewed.
   CONTINUE

Supervisor Name……
Field Coordinators Name…….
Field Coordinators Review Yes/Date of review
Supervisor Name……
Supervisors Review Yes/Date of review……

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## INTRODUCTION

**Good Morning/Afternoon/Evening Sir/Madam,**

My name is **…….. I am here o**n behalf of a doctoral student to ask you some questions on a research on prevention of malaria among pregnant women. The research is approved by the Department of Health and Social Services of the federal Capital Territory Authority. Your answer will be used for only for research purposes aimed at promoting the heath of women in the Federal Capital Territory, Nigeria. I assure you that all your answers will be treated as confidential, and was NOT be discussed with any other person. It will be most appreciated if you provide honest and sincere answers to all the questions. This interview was last for about 40 minutes. Your participation is voluntary, and you can decide to stop the interview at any time, if you do not want to continue. Can we proceed with the interview now? Yes No

---

**Section A: Socioeconomic and Demographic Characteristics**

| | Question | Response | Code |
|---|---|---|---|
| 1 | How old are you? | 15- 19 years | 1 |
| | | 20 – 24 years | 2 |
| | | 25 – 29 years | 3 |
| | | 30 – 34 years | 4 |
| | | 35 – 39 years | 5 |
| | | 40 – 44 years | 6 |
| | | 45 – 49 years | 7 |
| | | 50years and above | 8 |
| 2 | What is your marital status? | Married | 1 |
| | | Never married | 2 |
| | | Divorced | 3 |
| | | Separated | 4 |
| | | Widowed | 5 |
| | | Others specify | 99 |
| 3 | What is your religion? | Christian | 1 |
| | | Muslim | 2 |
| | | Traditional Religion | 3 |
| | | Other Specify | 99 |
| 4 | What is your type of marriage? | Polygynous | 1 |
| | | Monogamous | 2 |
| | | Others specify | 99 |
| 5a | What is your living arrangement in the last six months? | Living alone | 1 |
| | | Living with spouse/ husband | 2 |
| | | Living with extended family | 3 |

| | Question | Response | Code |
|---|---|---|---|
| | | members | |
| | | Others Specify | 99 |
| 5b | If you live with your husband, spouse or relation, how did you describe the support for you to use mosquito net and other measures to prevent malaria in pregnancy | Living with spouse/husband with adequate support, help, and care during pregnancy | 1 |
| | | Living with spouse/husband without adequate support, help, and care during pregnancy. | 2 |
| | | Living with extended family member with adequate support help, and care during pregnancy | 3 |
| | | Living with extended family member without adequate support and care during pregnancy. | 4 |
| | | Others Specify | 99 |
| 6 | What is your highest level of educational qaulification? | No formal Education | 1 |
| | | Primary Education | 2 |
| | | Secondary Education | 3 |
| | | Polytechnic: OND | 4 |
| | | University/Polytechnic: BSc/HND | 5 |
| | | Post Graduate (MSc & PhD) | 6 |

| | | | |
|---|---|---|---|
| 7 | Are you currently employed? (self-employment or paid employment with income) | Yes | 1 |
| | | No | 2 |
| 8 | At what stage of pregnancy are you now? | Months 1-3 of the pregnancy (1st Trimester) | 1 |
| | | Months 4-6 of the pregnancy (2nd Trimester) | 2 |
| | | Months 7-9 of the pregnancy (3rd Trimester) | 3 |
| | | Not sure | 4 |
| 9 | What is the distance between where you live and the nearest health center / hospital you can visit for health care | More than thirty minutes of walking distance | 1 |
| | | Thirty minutes or less of walking distance. | 2 |
| | **Household Characteristics and Assets ( Socio Economic Status)** | | |
| 10 | How many rooms are used for sleeping in your household | One | 1 |
| | | Two | 2 |
| | | Three | 3 |
| | | Four and above | 4 |

| | | | | |
|---|---|---|---|---|
| 11 | What material is used for the **floo**r where you live | Earth/Sand | 1 | |
| | | Concrete | 2 | |
| | | Ceramic Tiles | 3 | |
| | | Polished wood | 4 | |
| | | Carpet | 5 | |
| | | Other Specify | 99 | |
| 12 | What materials are used for the **roof** where you live | Thatched/ Palm leave | 1 | |
| | | Wood plank Tarpaulin | 2 | |
| | | Plastics | 3 | |
| | | Zinc Metal | 4 | |
| | | Wood | 5 | |
| | | Ceramic Tiles | 6 | |
| | | Asbestos Sheet /Single | 7 | |
| | | Other Specify | 99 | |
| 13 | What type of **fue**l do you use for cooking? | Gas | 1 | |
| | | Kerosene | 2 | |
| | | Firewood/Charcoal | 3 | |
| | | Agricultural Crop | 4 | |
| | | Animal Dung | 5 | |
| | | No food Used in the household | 6 | |
| | | Other Specify | 99 | |
| 14 | What type of **toilet** do you use in your household? | Flush to Septic tanks | 1 | |
| | | Flush to Pit latrine | 2 | |
| | | Pit Latrine wit Slab | 3 | |
| | | Pit latrine without slab | 4 | |
| | | Open Defecation/Bush | 5 | |
| | | Other Specify | 99 | |
| 15 | What is the main source of **drinking water** for your house hold? | Piped into house | 1 | |
| | | Public piped water | 2 | |
| | | Borehole/Tube | 3 | |
| | | Hand Pump, Protected well | 4 | |
| | | Unprotected well | 5 | |
| | | Rain water | 6 | |
| | | Water Cart vendors | 7 | |
| | | Bottled water | 8 | |
| | | Sprint Water /Stream | 9 | |
| | | Sachet water | 10 | |
| | | Other Specify | 99 | |
| 16 | Which of the mobility items do you own and is/are currently in use in your family? | | Yes | No |
| | | Canoe | 1 | 2 |
| | | Bicycle | 1 | 2 |
| | | Motorcycle | 1 | 2 |
| | | Car | 1 | 2 |
| | | A boat | 1 | 2 |
| | | Others specify | 99 | 99 |
| 17 | Which of the household | | Yes | No |

| | | | | |
|---|---|---|---|---|
| | items do you have and is/are currently in use in your family? (Circle all items mentioned | Electricity | 1 | 2 |
| | | | Yes | No |
| | | Radio | 1 | 2 |
| | | Television | 1 | 2 |
| | | Air Conditioner | 1 | 2 |
| | | Fan | 1 | 2 |
| | | Fridge | 1 | 2 |
| | | Telephone (Mobile/Landline) | 1 | 2 |
| | | Computer (Table/Lap Top) | 1 | 2 |
| | | Electric Iron | 1 | 2 |
| | | Cable TV (DSTV/ GoTV, other | 1 | 2 |
| 18 | (A). What is your total regular average <u>family income</u> in a month? _____ (B). What is your total average personal regular monthly income? | | 18A | 18B |
| | | N19,000 and Below | 1 | 1 |
| | | N20,000- 40,000 | 2 | 2 |
| | | N41,000- 60,000 | 3 | 3 |
| | | N61,000- 80,000 | 4 | 4 |
| | | N81,000- 100,000 | 5 | 5 |
| | | N101,000- 120,000 | 6 | 6 |
| | | N121, 000 – 140,000. | 7 | 7 |
| | | N141,000- and above | 8 | 8 |
| | | Others specify | 99 | 99 |
| 19 | What proportion of your family income do you spend on food? | Less than 40% | 1 | |
| | | More than 40% | 2 | |
| | | Not sure | 3 | |
| | | Others Specify | 99 | |
| 20A | In the past 6 months, have you seen or heard any messages about prevention of malaria? | Yes | 1 | |
| | | No | 2 | |
| | | Not Sure | 3 | |
| | | Other Specify | 99 | |
| | If No to question 20A, go to Q21. | | | |
| 20B | If yes to Q20A, where did you hear or see the messages or information? | Clinic/Hospital | 1 | |
| | | Community Health Worker | 2 | |
| | | Friends/Family | 3 | |
| | | Workplace | 4 | |
| | | Drama Groups | 5 | |
| | | Peer Educators | 6 | |
| | | Poster/Billboards | 7 | |
| | | Television | 8 | |
| | | Radio | 9 | |
| | | Newspaper | 10 | |
| | | Others specify | 99 | |

| | | | |
|---|---|---|---|
| 21 | What message about malaria did you hear or see? | Malaria is dangerous especially in children and pregnant women | 1 |
| | | Malaria can be prevented by sleeping under mosquito net every day | 2 |
| | | Pregnant women can prevent malaria by the use of SP tablets (malaria medicines) | 3 |
| | | Test cases of fever before treatment | 4 |
| | | Pregnant women register at ANC and collect mosquito nets and SP | 5 |
| | | Other Specify | 99 |
| 22 | How often do you listen to radio and/or television programs in a week? | Once or twice a week (or at least 2-4 hours) | 1 |
| | | Three to four days a week (or at least 5-9 hours) | 2 |
| | | Five days a week (or at least 10 - 14 hours) | 3 |
| | | Six days a week (or at least 15 - 19hours) | 4 |
| | | Seven days a week (at least 20-24 hours) | 5 |
| | | More than 24 hours a week | 6 |
| | | Others specify | 99 |
| 23 | How many times have you been pregnant, and how many children do you have alive? | This is 1st pregnancy | 1 |
| | | The 2nd pregnancy; 1st child alive) | 2 |
| | | The 2nd pregnancy; 1st child dead) | 3 |
| | | The 3rd pregnancy; 2 children alive) | 4 |
| | | Thrice (The 3rd pregnancy; 1 child alive) | 5 |
| | | Thrice (The 3rd pregnancy; no child alive) | 6 |
| | | The 4th or more pregnancy; 3 children alive) | 7 |
| | | The 4th or more pregnancy; at least 2 children alive) | 8 |
| | | This is 4th or more pregnancy; no child alive) | 9 |
| | | Other Specify | 99 |

**Section B: Knowledge of Malaria and Malaria in Pregnancy**

| SN | Question | Response | Code |
|---|---|---|---|
| 24 | What is the cause or are the causes of malaria? (Circle all options mentioned) | Mosquito Bites | 1 |
| | | Eating Immature Sugarcane | 2 |
| | | Eating Cold Food | 3 |
| | | Eating Other Dirty Food | 4 |
| | | Drinking Dirty Water | 5 |
| | | Getting Soaked with Rain | 6 |
| | | Cold or Changing Weather | 7 |
| | | Witchcraft | 8 |
| | | Don't Know | 9 |
| | | Other Specify | 99 |
| 25 | How is malaria transmitted? | By staying or working in the sun for long period | 1 |
| | | By eating too much oil in foods | 2 |
| | | By malaria germs transmitted by Mosquito bites | 3 |
| | | By dirty environment | 4 |
| | | Don't know | 5 |
| | | Other Specify | 99 |
| 26A | Is it possible to prevent malaria among pregnant women? | Yes | 1 |
| | | No | 2 |
| | | Don't Know | 7 |
| | | Other Specify | 99 |
| | If No to question 26A go to question 27 | | |
| 26B | If yes to Q26A, how can pregnant women protect themselves from malaria? (Circle each option mentioned) | Sleep Under a Mosquito Net | 1 |
| | | Sleep Under an Insecticide- Treated Mosquito Net(ITN) | 2 |
| | | Use of Mosquito Repellant | 3 |
| | | Avoid Mosquito Bites | 4 |
| | | Take Preventive Medication (SP) as prescribed | 5 |
| | | Spray House with Insecticide | 6 |
| | | Use Mosquito Coils | 7 |
| | | Cut the Grass Around the House | 8 |
| | | Fill in Puddles (Stagnant Water) | 9 |
| | | Keep House Surroundings Clean | 10 |
| | | Don't Drink Dirty Water or bad food | 11 |
| | | Don't Know | 12 |
| | | Other Specify | 99 |
| 27 | What signs or symptoms would make you think that a person has malaria? (Circle all given answers) | Fever | 1 |
| | | Feeling Cold | 2 |
| | | Headache | 3 |
| | | Nausea and Vomiting | 4 |
| | | Diarrhea | 5 |
| | | Dizziness | 6 |

| SN | Question | Response | Code |
|---|---|---|---|
| | | Loss of Appetite | 7 |
| | | Body Ache or Joint Pain | 8 |
| | | Pale Eyes | 9 |
| | | Salty Tasting Palms | 10 |
| | | Feeling Weak | 11 |
| | | Refusing to Eat or Drink | 12 |
| | | Don't Know | 13 |
| 28 | What is the most effective medication for the treatment of malaria? | SP/Fansidar | 1 |
| | | Chloroquine | 2 |
| | | Quinine | 3 |
| | | New Malaria Drug (ACT) | 4 |
| | | Paracetamol, Aspirin, | 5 |
| | | Don't Know | 6 |
| | | Other Specify | 99 |
| 29 | When somebody feels feverish or has any other sign or symptoms of Malaria, what should the person do first? | Go and ask for malaria test in a chemist/medicine shop/ or hospital. | 1 |
| | | Go and ask for treatment in a chemist/medicine shop/ or hospital | 2 |
| | | Take native medicine/concoction for proper treatment | 3 |
| | | Don't Know | 4 |
| | | Others Specify | 99 |
| 30 | What are the benefits of early registration and regular attendance at antenatal clinic, ANC to a pregnant woman? (Circle all given answers) | She was being examined for early detection of any health problem | 1 |
| | | She was being given blood enhancement medicines | 2 |
| | | She was being given free mosquito nets to prevent malaria | 3 |
| | | She was being give medicine (SP) to prevent malaria | 4 |
| | | Don't Know | 5 |
| | | Others Specify | 99 |
| 31 | How many times is a pregnant woman expected to take the medicine for prevention of malaria (SP) during pregnancy? (Show sample of SP) | Once | 1 |
| | | Twice | 2 |
| | | Thrice | 3 |
| | | Four times | 4 |
| | | Don't Know | 5 |
| | | Others specify | 99 |

**SECTION C: Perception and Attitude**

| SN | Question | Responses and Codes | | | | |
|---|---|---|---|---|---|---|
| | | **Strongly Agree** | **Agree** | **Not Sure** | **Disagree** | **Strongly Disagree** |
| | | **1** | **2** | **3** | **4** | **5** |
| **32** | I think my chances as a pregnant woman in having malaria is not higher than any other member of the community | | | | | |
| **33** | I don't worry about malaria because I am healthy, I don't do too much work, and I don't work in the sun | | | | | |
| **34** | I don't worry about malaria because it is an ordinary problem that can be easily treated | | | | | |
| **35** | I think malaria is a serious problem for a pregnant woman and her baby in the womb. | | | | | |
| **36** | My chances of getting malaria is the same, whether I sleep inside the net? | | | | | |
| **37** | Sleeping inside the mosquito net can be suffocating, causes heat and rashes, so I don't use it every night | | | | | |
| **38** | I think it is important to sleep under the net to prevent malaria but I often forget/ or I am lazy to hang the net every night | | | | | |
| **39** | I always sleep under mosquito net because I think it helps in prevention of malaria | | | | | |
| **40** | I think the net is effective for malaria prevention, but it is expensive to buy. | | | | | |
| **41** | I think the medicine given for prevention of malaria in pregnancy (SP) really works to keep mother and baby healthy. | | | | | |
| **42** | Many people say pregnant women are still at risk of malaria, even if they use medicine for prevention of malaria in pregnancy. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **43** | Many people belief regular attendance at ANC provides opportunity for care, including prevention of malaria | | | | | |
| **44** | Many people belief malaria in pregnancy can be prevented and treated with the use of good native medicine (concoction) | | | | | |
| **45** | I belief many people are not sleeping under the net regularly because of the associated inconveniences or discomfort | | | | | |

## Section D: Prevention of Malaria in Pregnancy

| **SN** | Question | Response | Code |
|---|---|---|---|
| 46 | Do you have treated mosquito net (ITN) for your own use? | Yes | 1 |
| | | No | 2 |
| | | Not sure | 3 |
| 47A | Did you sleep under treated mosquito net (ITN) last night? | Yes | 1 |
| | | No | 2 |
| | If Yes to Q47A go to Q48 | | |
| 47B | If no to question 47A, why? | I don't have mosquito net (ITN) | 1 |
| | | ITN causes discomfort to use (discomfort to hang, feeling of heat or suffocations) | 2 |
| | | I forgot to sleep under e Mosquito net (ITN) | 3 |
| | | My husband doesn't like to seep under ITN | 4 |
| | | Don't Know | 5 |
| | | Others Specify | 99 |
| 48 | How confident are you in your ability to hang ITN and sleep inside it every night? | I don't know how to hang the mosquito net | 1 |
| | | I am not sure I can hang mosquito net, and I am not certain if I can sleep inside it every night | 2 |
| | | I am confident I can hang the net and sleep inside it every night | 3 |
| | | Somewhat confident, but may sleep under it regularly if there is help/support. | 4 |
| 49A | Have you registered at the antenatal clinic since you were pregnant? | Yes | 1 |
| | | No | 2 |
| | | Not sure | 3 |
| | If No to Q49A, go to Q50A | | |

| | | | |
|---|---|---|---|
| 49B | If yes to Q49A, how did you describe attendance at ANC clinic appointments? | I attended ANC only once, and was go again when about to deliver. | 1 |
| | | I keep some of the appointments (estimate of 2 out of 4 appointments) | 2 |
| | | I keep most of the appointments (estimate of 3 out of 4 appointments) | 3 |
| | | I keep all appointments (estimates of 4 out of 4 appointments) | 4 |
| | | Not sure | 5 |
| | | Other Specify | 99 |
| 50A | During this pregnancy, did you take any medicine to protect you from getting malaria? | Yes | 1 |
| | | No | 2 |
| | | Not sure | 3 |
| | If No to Q50A, go to Q51 | | |
| 50B | If yes to Q50A, what medicine did you take? (If respondent is not sure, show the typical SP tablets to her to confirm if that is the type taken) | Chloroquine | 1 |
| | | Fansidar (SP) | 2 |
| | | Panadol | 3 |
| | | Native Medicine | 4 |
| | | Not sure | 5 |
| | | Other Specify | 99 |
| 51 | What is the purpose of the malaria medicine(s) you use | Prevention of malaria | 1 |
| | | Treatment of malaria | 2 |
| | | Prevention and treatment of malaria | 3 |
| | | Other Specify | 99 |
| 52 | Have you taken IPTp-SP during the pregnancy? (Show the sample of a dose of SP) | Yes | 1 |
| | | No | 2 |
| | | Not sure | 3 |
| | | Others specify | 99 |
| 53A | Do you be motivated or encouragement from any source to take necessary measures to prevent malaria in pregnancy? | Yes | 1 |
| | | No | 2 |
| | | Not sure | 3 |
| | | Others Specify | 99 |
| 53B | If yes to question Q54A, mention the major source (s) of motivation or encouragement | Self | 1 |
| | | Spouse | 2 |
| | | Friend(s) | 3 |
| | | Colleague(s) | 4 |
| | | Health Worker(s) or neighborhood | 5 |
| | | Mass media (Radio, TV, Newspaper etc) | 6 |
| | | Not sure | 7 |

Appendix B: Inform Consent- Adults

You are invited to take part in a research study about behaviours that can enhance the transmission of malaria in pregnancy. The researcher is inviting pregnant women in rural and urban areas to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part. This study is being conducted by a researcher Mr. John Dada, who is a doctoral student at Walden University.

**Background Information:**
The purpose of this study is to provide evidence on the risk behaviors for malaria among pregnant women. The study will help to classify pregnant women into high, moderate and low malaria risk behaviour, and explain the low uptake of core preventive measures for malaria in pregnany.

**Procedures:**
If you agree to be in this study, you were being asked to provide information about:

- Your social, economic and cultural background in about 15 minutes
- Your knowledge, perception and attitude regarding malaria and prevention malaria in pregnancy in about 15 minutes.
- What you do to prevent malaria while you are pregnant in about 10 minutes

Here are some sample questions:

- Which age group do you belong?
- In the past 6 months, have you seen or heard any message about prevention of malaria?
- Is it possible to prevent malaria among pregnant women?

**Voluntary Nature of the Study:**
This study is voluntary. Everyone was respect your decision of whether or not you choose to be in the study. No one in your community or in the Federal Capital Territory Authority was treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind later. You may stop at any time.

**Risks and Benefits of Being in the Study:**
Being in this type of study involves some minor discomforts that can be encountered in daily life, such as the time to answer the questions, providing estimate of personal income, fatigue or some stress. Being in this study would not pose risk to your safety or wellbeing. The research will generate evidence on malaria risk behaviour and the associated factors among pregnant women. Such evidence can contribute to improvement programme, and services for pregnant women, which in-turn will contribute to reduction in illness and death of women and children in the community.

**Payment:**
There is no payment or gift for participation in the study.

**Privacy:**
Any information you provide was be kept confidential and anonymous. The researcher was not use your personal information for any purposes outside of this research project. Also, the researcher will not include your name or anything else that could identify you in the study reports. Data was be kept secure by ensuring that data are protected through the use of codes in place of names, pass word for the files, and removal of any form of identifiers. Data will be kept for a period of at least 5 years, as required by the university.

**Contacts and Questions:**
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via 0805-569-0014 or john.dada@waldenu.edu.If you want to talk privately about your rights as a participant, you can call Desmond Emereonyeokwe. He is the representative of the Health Research Ethics Committee (HREC) , of the Federal Capital Territory Authority (FCTA), Nigeria, who can discuss this with you. His phone number is 08036011384. The FCTA-HREC approval number for this study is FHREC/2016/01/06/ 29-01-16, and it expires on 28-01-2017

The researcher was give you a copy of this form to keep.

**Obtaining Your Consent**
If you feel you understand the study well enough to make a decision about it, please indicate your consent by signing below

| | |
|---|---|
| Printed Name of Participant | |
| Date of consent | |
| Participant's Signature | |
| Researcher's Signature | |

Appendix C: Parent Consent Form For Research

Your child is invited to take part in a research study of behaviours that enhance the transmission of malaria in pregnancy. The researcher is inviting pregnant women in rural and urban areas of the Federal Capital Territory Nigeria to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to allow your child to take part.
This study is being conducted by a researcher named Mr. John Dada, who is a doctoral student at Walden University.

**Background Information:**
The purpose of this study is to provide evidence on the risk behaviors for malaria among pregnant women.

**Procedures:**
If you agree to allow your child to be in this study, your child was be asked to provide information about:

- Your social, economic and cultural background in about 15 minutes
- Your knowledge, perception and attitude regarding malaria and prevention malaria in pregnancy in about 15 minutes.
- What you do to prevent malaria while you are pregnant in about 10 minutes

Here are some sample questions:

- Which age group do you belong?
- In the past 6 months, have you seen or heard any message about prevention of malaria?
- Is it possible to prevent malaria among pregnant women?

**Voluntary Nature of the Study:**
This study is voluntary. Everyone was respect your decision of whether you want your child to be in the study. Of course, your child's decision is also an important factor. No one in your community or in the Federal Capital Territory Authority was treat you or your child differently if you or your child decides to not be in the study. If you decide to consent now, you or your child can still change your mind later. Any children who feel stressed during the study may stop at any time. The researcher was follow up with all volunteers to let them know whether or not they were selected for the study."

**Risks and Benefits of Being in the Study:**
Being in this type of study involves some risk of the minor discomforts that your child might encounter in daily life, such as the time to answer the questions, providing estimate of personal income, fatigue or some stress. Being in this study would not pose risk to your child's safety or wellbeing. The research will generate evidence on malaria risk behaviour and the associated factors among pregnant women. Such evidence can

contribute to improvement programme, and services for pregnant women, which in-turn will contribute to reduction in illness and death of women and children in the community.

**Payment:**
There is no payment or gift for participation in the study.

**Privacy:**
Any information your child provides was be kept confidential. The researcher was not use your child's information for any purposes outside of this research project. Also, the researcher will not include your child's name or anything else that could identify your child in any reports of the study. The only time the researcher would need to share your child's name or information would be if the researcher learns about possible harm to your child or someone else. Data will be kept secure by ensuring that data are protected through the use of codes in place of names, pass word for the files, and removal of any form of identifiers. Data will be kept for a period of at least 5 years, as required by the university.
Data will be kept for a period of 5 years, as required by the university.

**Contacts and Questions:**
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via 0805-569-0014 or john.dada@waldenu.edu. If you want to talk privately about your child's rights as a participant, you can call Desmond Emereonyeokwe. He is the representative of the Health Research Ethics Committee (HREC) of the Federal Capital Territory Authority (FCTA), Nigeria, who can discuss this with you. His phone number is 08036011384. The FCTA-HREC approval number for this study is FHREC/2016/01/06/ 29-01-16, and it expires on 28-01-2017.

The researcher was give you a copy of this form to keep.
**Obtaining Your Consent**
If you feel you understand the study well enough to make a decision about it, please indicate your consent by signing below

| | |
|---|---|
| Printed Name of Parent | _____ |
| Printed Name of Child | _____ |
| Date of consent | _____ |
| Parent's Signature | _____ |
| Researcher's Signature | _____ |

# Appendix D: Walden IRB Approval

**IRB Approved-John Dada**

5:49 PM (18 minutes ago)

to me, Patrick

Dear Mr. Dada,

This email is to notify you that the Institutional Review Board (IRB) confirms that your study entitled, "Composite Risk Behaviors That Enhance the Transmission of Malaria in Pregnancy," meets Walden University's ethical standards. Our records indicate that the site's IRB agreed to serve as the IRB of record for this data collection. Since this study will serve as a Walden doctoral capstone, the Walden IRB will oversee your capstone data analysis and results reporting. The IRB approval number for this study is **03-16-16-0171139.**

This confirmation is contingent upon your adherence to the exact procedures described in the final version of the documents that have been submitted to IRB@waldenu.edu as of this date. This includes maintaining your current status with the university and the oversight relationship is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, this is suspended.

If you need to make any changes to your research staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 1 week of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB materials, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained at the IRB section of the Walden website: http://academicguides.waldenu.edu/researchcenter/orec

Researchers are expected to keep detailed records of their research activities (i.e., participant log sheets, completed consent forms, etc.) for the same period of time they retain the original data. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

**http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d**

Sincerely,
Libby Munson
Research Ethics Support Specialist
Office of Research Ethics and Compliance
Email: irb@waldenu.edu
Fax: 626-605-0472
Phone: 612-312-1283

Office address for Walden University:
100 Washington Avenue South, Suite 900
Minneapolis, MN 55401

Information about the Walden University Institutional Review Board, including instructions for application, may be found at this link: http://academicguides.waldenu.edu/researchcenter/orec