UNIVERSITY OF CAPE COAST

PREVALENCE OF MALARIA DURING PREGNACY AND EFFECTIVENESS OF SULPHADOXINE-PYRIMETHAMINE.

OSEI-MENSA JAMES

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BY

OSEI-MENSA JAMES

DISSERTATION SUBMITTED TO THE DEPARTMENT OF BIOMEDICAL SCIENCES OF THE SCHOOL OF ALLIED HEALTH SCIENCES, COLLEGE OF HEALTH AND ALLIED SCIENCE, UNIVERSITY OF CAPE COAST IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A BACHELOR OF SCIENCE(HONOURS) DEGREE IN BIOMEDICAL SCIENCE.

JUNE 2018

DECLARATION

CANDIDATE'S DECLARATION

I, JAMES OSEI-MENSA hereby declare that except for the references made to the works of others of which acknowledgement has been duly made, this project work submitted to the Department of Biomedical Sciences is my own original research and that this thesis has not been presented for any degree elsewhere.

SIGNATURE..... DATE.....

SUPERVISOR'S DECLARATION

I hereby declare the preparation and presentation of this dissertation was supervised in accordance to the guidelines on supervision of dissertation laid down by the University of Cape Coast.

DR PAULINA AMPOMAH

SIGNATURE..... DATE.....

DR DESMOND OMANE ACHEAMPONG (HEAD OF DEPARTMENT)

SIGNATURE..... DATE.....

ABSTRACT

Malaria during pregnancy could result in prematurity, foetal anaemia, intrauterine growth, retardation, low birth weight, stillbirth, congenital malaria, increased perinatal mortality. Taking malaria prophylaxis and parity are factors that affect malaria status during pregnancy. The study sought to determine the prevalence of malaria during pregnancy, and effectiveness of Sulphadoxine-Pyrimethamine in treating malaria during pregnancy, and to find factors that influence malaria status during pregnancy. A descriptive cross-sectional study was carried out in Assin Fosu in the Assin North District at the St. Francis Xavier Hospital. Data was obtained from Ante-natal care and laboratory record books, and questionnaires. The data was analysed with STATA version 16 to find frequencies, percentages, and association for categorical variables. A total 202 pregnant women at various stages of gestation participated in the study. Analysis of the data showed that a little percentage (4.95%) of pregnant women presented with malaria during pregnancy. There was association between malaria status and Sulphadoxine-Pyrimethamine use (0.000), parity (0.007) and sickle cell trait (0.022). Exactly, 97.52% of participants were on Sulphadoxine-Pyrimethamine. Sulphadoxine-Pyrimethamine showed an adjusted odds ratio (AOR = 0.00, 95% CI = 0.00 – 0.11), p-value = 0.00). Prevalence of malaria during pregnancy in women visiting St. Francis Xavier Hospital is low. Taking Sulphadoxine-Pyrimethamine reduces the chances of being infected with malaria during pregnancy.

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My sincere gratitude goes to my supervisor, Dr Paulina Ampomah of the Department of Biomedical Sciences for her patience and supervision. I would also like to acknowledge all the staff at the Ante-natal Care Clinic of St. Francis Xavier Hospital at Assin Fosu.

DEDICATION

I dedicate this work to my family especially my siblings Mr Benedict Osei-Mensa, Mrs Benedicta Osei-Mensa, Mr Damian Osei-Mensa, and Ms Anastasia Osei-Mensa.

TABLE OF CONTENTS

LIST OF TABLES

TITLE **PAGE**

CHAPTER ONE

INTRODUCTION

1.1 Background

Malaria is a parasitic disease caused by the *Plasmodium* parasite borne by the female Anopheles mosquito. Malaria affects a majority of the world being mainly devastating in Sub-Saharan Africa where 90% of deaths resulting from an estimated 214 million cases reported globally in 2015 (WHO, 2016). Among the four types of parasites responsible for malaria in humans, *Plasmodium falciparum* is mainly responsible for morbidity and mortality in Ghana. Among pregnant women, malaria accounts for 28.1% of OPD attendance, 13.7% of admissions and 9.0% of maternal deaths (Ministry of Health, 2005). In areas such as Ghana where malaria transmission is high most malaria infections in pregnant women are asymptomatic. These asymptomatic infections contribute invariably to the development of severe anaemia in the mother, resulting in an increased risk of maternal mortality. Malaria during pregnancy could result in prematurity, foetal anaemia, intrauterine growth, retardation, low birth weight, stillbirth, congenital malaria, increased perinatal mortality.

The World Health Organisation (WHO) recommends the use of Insecticide-treated nets (ITNs), the use of Intermittent Preventive Treatment (IPT) and case management of malaria illness. In 2004, Ghana adopted the Intermittent Preventive Treatment (IPT) using Sulphadoxine-Pyrimethamine for the prevention of malaria during pregnancy(Ministry of Health, 2005). IPT involves the administration of full, curative treatment doses of Sulphadoxine-Pyrimethamine in at least monthly intervals during pregnancy. Other protective measures put in place included the use of ITNs, Indoor Residual Spraying (IRS)

and use of mosquito repellents. A significant reduction in the incidence of malaria was reported in areas or districts where IRS was implemented.

1.2 Problem Statement

Malaria has always been a major restriction to development in third-world countries and especially so in Sub-Saharan Africa. Malaria is particularly more dangerous in pregnant women as it poses substantial risk not only to the mother but also to the foetus. A reduction in immunity during pregnancy makes women susceptible to multiple malaria episodes and development of severe forms of malaria. It is therefore imperative to determine how measures put in place to combat malaria in pregnancy are holding up.

1.3 Justification

According to the Ghana Health Services maternal mortality ratio is still as high as 319 per 100,000 live births. Among pregnant women, malaria accounts for 28.1% of OPD attendance, 13.7% of admissions and 9.0% of maternal deaths (Ministry of Health, 2005). This has a debilitating effect on the entire population and the economy as this pushes the country further away from achieving its Millennium Development Agenda.

1.4 Hypothesis

Sulphadoxine-Pyrimethamine use as Intermittent Preventive Treatment is effective in reducing malaria prevalence during pregnancy.

1.5 General Objective

To evaluate the prevalence of malaria in pregnancy at the St. Francis Xavier Hospital.

1.6 Specific Objectives

- To determine factors that contribute to malaria in pregnancy.
- To determine the effectiveness of malaria prophylaxis provided to pregnant women.

CHAPTER TWO

LITERATURE REVIEW

Malaria is a life-threatening parasitic disease transmitted by female Anopheles mosquitoes. Malaria is arguably the most highly prevalent tropical disease, with high morbidity and mortality and high economic and social impact (WHO, 2001). The severity of malaria cases depends on the status of the infected person's immune system. Ironically repeated infection grants partial immunity to malaria, this, however, can be short-lived if there is a break in repeated infection. Infection with Plasmodium does not mean a person has malaria as many infected persons in endemic regions are asymptomatic (Adefioye, Adeyeba, Hassan, & Oyeniran, 2007). These persons harbour the Plasmodium parasites but show no signs and symptoms of deterioration in health and body function. Persons asymptomatic to malaria, however, act as reservoirs for the parasites.

In Ghana, malaria among pregnant women accounts for about 14% of Out Patient Department (OPD) attendance, 11% of admissions and 9% of deaths (Ministry of Health). Malaria in pregnancy may occur depending on a woman's exposure to mosquitoes, her level of immunity and possible co-infections such as other malaria species, HIV or helminths as well as the efficacy of treatment and preventive interventions available to her (De Beaudrap et al, 2013.). Even though adult women in malaria-endemic areas have a high level of immunity, this generally is impaired during pregnancy particularly in the first pregnancy, thereby increasing their risk of infection (Ibrahim et al., 2017). This increased risk has been attributed to the immunological, hormonal, and physiological changes in pregnancy (Takem, D'Alessandro 2013). The reduced immunity

may result in the risk of acute and severe clinical disease as well as more frequent episodes (WHO, 2016). *P. falciparum* infected red cells sequester in the placenta, disrupting nutritional exchange between mother and foetus and causing intrauterine growth retardation. Pregnant women and foetuses are vulnerable to malaria which is a major cause of prematurity, foetal and maternal anaemia, intrauterine growth, retardation, low birth weight, stillbirth, congenital malaria, increased perinatal mortality (Rogerson et al., 2018; WHO, 2016). Although malaria in pregnancy may sometimes be asymptomatic, it can still affect the health of a woman and that of her unborn child. Malaria during pregnancy has been most widely evaluated in sub-Saharan Africa where 90% of the global malaria burden occurs.

In pregnancy, there is a transient depression of cell-mediated immunity that allows foetal allograft retention but also interferes with resistance to various infectious diseases (Brabin, 1983). Cellular immune responses to P. falciparum antigens are depressed in pregnant women in comparison with non-pregnant control women (Riley, Schneider, Sambou, 1989; Fivet et al, 1995). Anti-adhesion antibodies against chondroitin sulphate A-binding parasites are associated with protection from maternal malaria, but these antibodies develop only over successive pregnancies, accounting for the susceptibility of primigravidae to infection (Duffy, Fried, 1999) Indeed, women in first and second pregnancies are the most affected, with both gravidity and premunition influencing susceptibility to malaria infection (Bouvier et al, 1997; Cot et al 1995; Mutabingwa et al, 1993).

In line with World Health Organisation (WHO) recommendations, Ghana moved from the use of mono-therapy to combination therapy using Artemisinin-Based Combination Therapy (National Malaria Control Programme, 2013). This change included the move from use of weekly Chloroquine Chemoprophylaxis to Sulphadoxine-Pyrimethamine (SP) as Intermittent Preventive Treatment (IPT) for malaria prevention during pregnancy (Ministry of Health, 2005). The policy change was based on growing concerns of resistance to Chloroquine Chemoprophylaxis and the fact that only 11.6% were adhering to the policy of using Chloroquine as IPT (Ministry of Health, 2005).

In order to combat the problem of adherence that plagued the Chloroquine program, A clinic-based prevention approach was adopted as over 90% of the pregnant women attend the antenatal clinic at least once during pregnancy (Ministry of Health, 2005). Intermittent preventive treatment of malaria in pregnancy is based on the assumption that every pregnant woman living in areas of high malaria transmission has malaria parasites in her blood or placenta, whether she has symptoms of malaria or not. The coverage of Sulphadoxine-Pyrimethamine as IPT however, remains generally low (Orish et al, 2015).

Factors linked to malaria prevalence have been studied and published in a lot of studies globally. Nearness to mosquito breeding grounds, staying late outdoors, poor hygiene, malnutrition, alcoholism, excessive heat are common factors thought to cause malaria (Asenso-Okyere, 1994). These factors have been observed in tropical areas where poverty is most severe.

A study in Gabon found that pregnant teenagers were more likely to be parasitaemic than young and old adults. The same study found that the sickle

cell trait had no influence on malaria prevalence during pregnancy. Also, pregnant women with anaemia are likely to be more infected with Plasmodium than those who are not. (Bouyou-akotet et al., 2003).

CHAPTER THREE

METHOD

3.1 Study Site

The study was based in the town of Assin Foso in the Central Region. The hospital selected for this study from which data was obtained was the St. Francis Xavier Hospital. The St. Francis Xavier Hospital provides health services to a wide area, serving clients within the Assin North District. Residents in this area are involved in outdoor occupations.

3.2 Study Population and Design

The study conducted was a non-experimental descriptive cross-sectional study. The study involved 202 pregnant women in various gestational periods. All participants answered questionnaires

3.2.1 Inclusion Criteria

Only pregnant women who had visited the St. Francis Xavier Hospital at least once and were willing to participate in the study were recruited.

3.2.2 Exclusion Criteria

Pregnant women who were visiting the antenatal care clinic of the St. Francis Xavier Hospital for the first time due to a referral from another hospital or was their first visit since being pregnant were excluded.

3.3 Data Collection

Permission was sought from hospital authorities before the study begun. All data was collected between November 2017 and January 2018. Data was collected from each participant's antenatal care records book. The parameters of interest were age, weight, blood pressure, blood group, sickling status, trimester, parity, malaria infection status and other infections which they visited the hospital with within their pregnancy.

Data on the haematological profile was obtained from the hospital laboratory. The parameters of interest included white blood count, haemoglobin levels, platelet count, neutrophil and leukocyte cell counts. In addition, data on glycosuria was obtained from laboratory record book.

Participants were guided to answer questionnaires, as most of them were not conversant with the English language. The questionnaires provided data on participant's nutrition, alcohol intake while pregnant, how active their pregnancy had left them and their knowledge of foods that were good against anaemia. The malaria status of the participants was recorded and the prevalence of malaria determined from this. The use of Sulphadoxine-Pyrimethamine among participants was recorded.

Verbal consent was sought from all participants before any data was taken.

3.4 Data Analysis

Data was analysed using STATA version 16.0. Descriptive frequency analyses were performed statistically to determine the frequency of the various factors. Bivariate and multivariate analysis and chi-squared were performed to examine

the significance and association of specific variables. The effectiveness of Sulphadoxine-Pyrimethamine use was determined through odds ratio obtained through multivariate analysis against malaria and other confounders. The statistical significance was defined as $p < 0.05$.

CHAPTER FOUR

RESULTS

The study involved 202 participants. Most of the participants were within the 25-29 years age group, 33.66%. The mean age of participants was 29.2 ± 5.8 with a range of 15 - 42years. Most of the participants were multiparous, 48.02%. Most of the participants were in their third trimester, (56.3%). Only 4.95% of the participants were positive for malaria parasites. Most of the participants, 97.52% had taken Sulphadoxine-Pyrimethamine. Table 2 shows the Bivariate model. This model provides results of association between participants' characteristics and the binary outcome (positive malaria status or negative malaria status) using chi-square test. It showed parity, sickle cell carrier and Sulphadoxine-Pyrimethamine use were associated with malaria infection status. Age, trimester, haemoglobin level, weight, infection during pregnancy, consumption of alcohol during pregnancy and meals eating in a day, however, were not statistically significant. Table 4 shows the multivariate model. It showed that only Sulphadoxine-Pyrimethamine use was positively associated with malaria infection status, parity and sickle cell status were not statistically significant.

Table 1: Frequency Distribution of Malaria Status and Sulphadoxine-Pyrimethamine Use

	Frequency	Per cent (%)
Malaria Status		
Positive	10	4.95
Negative	192	95.05
Sulphadoxine-Pyrimethamine Use		
Yes	197	97.52
No	5	2.48

Table 2: Bivariate analysis of factors affecting malaria status

	Malaria Status		P value
	Positive	Negative	
Sulphadoxine-Pyrimethamine Use			0.000
Yes	6 (2.97%)	4 (1.98%)	
No	191 (94.55%)	1 (0.50%)	
Parity			0.007
Nulliparous	6 (2.97%)	54 (26.73%)	
Primiparous	4 (1.98%)	41 (20.30%)	
Multiparous	0 (0.00%)	97 (48.02%)	
Sickle Cell			0.022
Yes	1 (0.50%)	2 (0.99%)	
No	9 (4.50%)	190 (94.06%)	

Continuation of Table 2

	Malaria Status		p value
	Positive	Negative	
Infection during pregnancy			0.389
Yes	1 (0.50%)	8 (4.00%)	
No	9 (4.50%)	182 (91.00%)	
Haemoglobin			0.672
≤6	0 (0.00%)	21 (10.66%)	
9 – 11.9	8 (4.06%)	146 (74.11%)	
≥ 12	2 (1.02%)	20 (10.15%)	
Alcohol Consumption			0.690
Yes	0 (0.00%)	3 (1.49%)	
No	10 (4.95%)	189 (93.56%)	
Meals per day			0.672
1	1(0.50)	8 (3.96%)	
2	2 (0.99%)	36 (17.82%)	
≥3	7 (3.47%)	148 (73.27%)	
Age			0.203
15 – 19	2(0.99)	10(4.95)	
20 – 24	3(1.49%)	25(12.38%)	
25 – 29	3(1.49%)	1(0.50%)	
30 – 34	1(0.50%)	53(26.24%)	
35 – 39	1(0.50%)	32(15.84%)	
≥ 40	0(0.00%)	7(3.47)	

Table 3: Multivariate analysis of SP use with Sickle cell and Parity as Confounder

Sulphadoxine-Pyrimethamine Use	Malaria Status		Unadjusted Odds Ratio		Adjusted Odds Ratio	
	Positive	Negative	(95% CI)	p value	(95% CI)	p value
			0.01(0.00 -0.10)	0.000	0.00(0.00-0.11)	0.00
Yes	6 (2.97%)	4 (1.98%)				
No	191 (94.55%)	1 (0.50%)				

CHAPTER FIVE

DISCUSSION

This study was conducted to determine factors that contributed to malaria in pregnancy and the use of Sulphadoxine-Pyrimethamine (SP) as Intermittent Preventive Treatment (IPT) for malaria prevention during pregnancy.

From the study, it was estimated that majority of participants had not had malaria infection since becoming pregnant with an incidence of 4.95%. Also, majority of the participants had adhered to the use of Sulphadoxine-Pyrimethamine (SP) as Intermittent Preventive Treatment (IPT). Out of those who had not taken Sulphadoxine-Pyrimethamine, 60% were in their second trimester. This could be due to pregnant women not reporting to the hospital early in the pregnancy due to the constraints put on them in travelling miles to reach a facility. The high patronage of Sulphadoxine-Pyrimethamine can be attributed to the insistence of the antenatal care nurses on pregnant women taking their Sulphadoxine-Pyrimethamine at the facility (AOR = 0.00, 95% CI = 0.00 – 0.11), p-value = 0.00)

Nutrition-wise, pregnant women who visit the St. Francis Xavier Hospital have adequate knowledge on which foods to eat during pregnancy, they are given talks daily on the subject. The study found that majority of participants managed to have three meals a day. The study area being a semi-urban area afford the participants the chance of getting fresh and a variety of fruits daily. This is something the participants seem to have taken advantage of as the study shows that most of the participants eat fruits on the daily. Following this diet pattern undoubtedly strengthens their immune system which could be a factor in the low malaria positive numbers. Only 3.96%, that is eight (8) participants suffered

from pica, the craving and eating of non-food substances such as ayilo, chalk and dirt. While pica has no direct relation with malaria infectivity it may interfere with absorption of nutrients and cause deficiencies. The inability of some participants to avoid pica seemed to stem from some cultural beliefs. Some participants held some wild beliefs about certain foods such as eating ripe plantain with groundnut whiles pregnant will make you fall asleep during labour.

About fifty-six per cent (56.93%) of the participants were in their third trimester and only 25% in their first trimester. This difference could be attributed to pregnant women visiting the hospital well late into their term. Most of the participants gave for this was the cost and strain in travelling from their locales to the hospital. The study showed that 40% of participants in their first trimester were nulliparous. Studies have shown that nulliparous and primipara women are the most susceptible to malaria during pregnancy this study confirms the finding as it shows 60% of malaria positive participants to be nulliparous and 40% to be primipara and parity being significantly associated with malaria infection status (AOR = 4.07, 95% CI = 1.15 – 14.39, p-value = 0.029) (Bouvier et al, 1997 Cot et al 1995 Mutabingwa et al, 1993).

The study also found that age was not significantly associated with malaria infection status during pregnancy. This finding was inconsistent with studies done in Gabon that observed that teenage mothers were more likely to be malaria positive (Bouyou-akotet et al., 2003).

The sickle cell trait wasn’t significantly associated with malaria infection status during pregnancy even though it has been found to afford carriers some

immunity as compared with their normal haemoglobin counterparts (AOR = 3.58, 95% CI = 0.00 – 525), p-value = 0.86) (Bouyou-akotet et al., 2003).

CHAPTER SIX

CONCLUSION

Malaria is a serious threat to global and maternal health. The study, however, has shown that malaria prevalence is on the low in pregnant women who visit the St. Francis Xavier Hospital at 4.95%. and that the use of Sulphadoxine-Pyrimethamine (SP) as Intermittent Preventive Treatment (IPT) in malaria prevention in pregnancy is working. This study also confirms that parity is a key factor in relation to malaria in pregnancy. First time and second-time mothers are at higher risk of being infected with malaria. Many Pregnant women do not visit the hospital during their first trimester.

RECOMMENDATION

The Intermittent Preventive Treatment (IPT) should be taken into the communities and households to cater for pregnant women who cannot make it to the hospital in their first trimesters. The teaching of pregnant women who visit antenatal care clinics about nutrition should be adopted nationwide in both small and big clinics.

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APPENDIX

Table 4: Frequency Distribution of Participants' Social Demographic Features

Characteristics	Frequency	Percent (%)
Age		
15 – 19	12	5.94
20 – 24	28	13.86
25 – 29	68	33.66
30 – 34	54	26.73
35 – 39	33	16.34
≥ 40	7	3.47
Parity		
Nullipara	60	29.7
Primipara	45	22.28
Multipara	97	48.02
Trimester		
First	25	12.38
Second	62	30.69
Third	115	56.93
Alcohol Consumption		
Yes	3	1.49
No	199	98.51
Meals/day		
1	9	4.46
2	38	18.81
3	155	76.74

Table 5: Frequency Distribution of Participants Health Status

Characteristics	Frequency	Percent (%)
Haemoglobin		
≤6	21	10.66
9 – 11.9	154	78.17
≥ 12	22	11.17
Infection during pregnancy		
Yes	9	4.5
No	191	95.5
Sickle Cell		
Yes	3	1.49
No	199	98.51

SAMPLE QUESTIONNAIRE

TITLE: EVALUATION OF TOTAL HEALTH OF PREGNANCY IN PREGNANT WOMEN WHO VISITS SAINT FRANCIS XAVIER HOSPITAL, ASSIN FOSU.

This questionnaire is part of the project work of a final year B.Sc. Human Biology student of the University of Cape Coast by name James Osei-Mensa. The research wishes to find out the risk of low birth weight among first time mothers in the Greater Accra region. This information shall be helpful in finding out preventive measure for this risk population. This is aimed at reducing the incidence of low birth weight to improve the health and save the lives of our babies.

Participants may voluntarily enrol on this project.

Name: ……

Age: ……

Occupation: ……

GESTATIONAL PERIOD AND PARITY

1. How old is your pregnancy?

   1-3 months [ ] 4-6 months [ ] 7-9 months [ ]
2. Have you given birth before?

   Yes [ ] or No [ ]

   If yes, then how many times?

   Once [ ] twice [ ] thrice [ ] more than thrice [ ]

NUTRITIONAL STATUS

3. How many times do you eat daily?

   Once [ ] twice [ ] thrice [ ] more than thrice [ ]
4. Which food do you eat most?

   ……
5. How often do you take it?

   Daily [ ] twice a week [ ] thrice a week [ ] more than thrice a week [ ]

6. Do you take in fruits?

   Yes [ ] or No [ ]

   If yes, which fruit(s) do you take most?

   ……

7. How often do you take it?

   Daily [ ] once a week [ ] twice a week [ ] thrice a week [ ] more than thrice a week [ ]

8. Do you crave for other non- dietary materials (sand, ayilo and chalk etc)?

   Yes [ ] or No [ ]

   If yes, which non-dietary material do you take most?

   ……

9. How often do you take it?

   Daily [ ] once a week [ ] twice a week [ ] thrice a week [ ] more than thrice

   a week [ ]

10. Do you consume alcohol?

    Yes [ ] or No [ ]

    If yes, how often do u take it?

    Daily [ ] once a week [ ] twice a week [ ] thrice a week [ ] more than thrice a week [ ]

ACTIVENESS

11. Do you exercise?

    Yes [ ] or No [ ]

    If yes, how often do you exercise?

    1 hour daily [ ] 2 hours daily [ ] three hours daily [ ] more than three hours daily.

PROPHYLAXIS

12. Have you taken Sulphadoxine-Pyrimethamine (SP) since you became pregnant?

    Yes [ ] or No [ ]