PREVALENCEOF MALARIA INFECTION AND ITS ASSOCIATED FACTORS AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT KIRYANDONGO GENERAL HOSPITAL

BY

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A RESEARCH REPORT SUBMITTED TO THE FACULTY OF CLINICAL MEDICINE AND DENTISTRY IN PARTIAL FULFILMENT OF REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF MEDICINE AND SURGERY OF KAMPALA INTERNATIONAL UNIVERSITY

APRIL, 2019

DECLARATION

I declare that this research report is my own work and that all the sources that I used or quoted were indicated and acknowledged by means of complete references and that this work has never been submitted before for any other degree at any other institution.

Signature……

IFRAH ABDI OMAR

(Research student)

APPROVAL

This is to certify that this student did her research entitled ‘Prevalence of malaria infection and its associated factors among pregnant women attending antenatal clinic at Kiryandongo hospital’ under my supervision and do recommend her for submission.

……..

DR. OKELLO BOSCO OTUU (MMED OBs/GYN, MB.Ch.B)

Supervisor.

ACKNOWLEDGEMENT

My sincere appreciation is to my supervisor who tirelessly guided me in reaching this far. I wish to also acknowledge the support of the hospital staffs and the participants. Credit goes to the team. I thank you sincerely.

DEDICATION

This research is dedicated to my beloved parents who have worked tireless to see me reach this far.

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LIST OF ABBREVIATIONS

IPTp	Intermittent preventive treatment in pregnancy
LLINs	Long-lasting insecticidal nets
SP	Sulfadoxine-pyrimethamine),
UDHS	Uganda demographic and health survey
WHO	World health organization
KGH	Kiryandongo general hospital
ISO	International organization for standardizations

ABSTRACT

Background: Malaria in pregnancy increases the risk of anemia, stillbirths, spontaneous abortion, premature delivery and low birth weight. Despite preventive measures put in place, rates of malaria in pregnancy and poor birth outcomes remain persistently high in many parts of Africa. This study was aimed at determining the prevalence of malaria and identifying associated factors in pregnant women attending ANC in Kiryandongo general Hospital.

Methods: A total of 185 pregnant women who had attended ANC within 1 year prior to the study who were tested for malaria were enrolled using simple random sampling. Demographic information, obstetric characteristics and malaria prevention practices were obtained using a structured questionnaire. Chi square test and logistic regression analysis using IBM SPSS version 25 were used to compare factors associated with malaria in the pregnant women.

Results: The prevalence of malaria from the 185 pregnant women in this study was 5.4%. Participants who did not take IPT were 4 times more likely to have malaria than those who had taken IPT (OR=3.69; 95%CI= 1.062-12.872) and this was significantly associated with malaria infection (p=0.040). Participants who were living in rural areas were five times at risk of having malaria than those in urban areas (OR=4.62; 95%CI=0.577-37.007). Similarly, women who were house wives were 5 times more likely to have malaria (OR=5.18; 95%CI=0.630-42.541) compared to those were employed. Primigravida women had a 2-fold risk of having malaria compared to multigravida women (OR=2.01; 95%CI= 0.587-6.882).

Conclusion: Malaria prevalence was low among the pregnant women studied. IPT-sp use was the only factor significantly associated with malaria infection. The use of intermittent preventive treatment and ITNs should be strengthened among all pregnant women. Future research should be conducted in different transmission settings to provide current data on the national prevalence of malaria and risk factors in the context of scaled-up malaria control efforts.

CHAPTER ONE: INTRODUCTION

1.0 Background

Malaria according to world health organization (WHO) is a life-threatening disease caused by parasites that are transmitted to people through the bites of infected female Anopheles mosquitoes (WHO, 2015).In 2016, there were an estimated 216 million cases of malaria in 91 countries, an increase of 5 million cases over 2015(WHO, 2017). The same report shows that, WHO African Region carries a disproportionately high share of the global malaria burden. For instance, in 2016, the region was home to 90% of malaria cases and 91% of malaria deaths(WHO, 2017).

Malaria infection during pregnancy is a significant public health problem with substantial risks for the pregnant woman, her fetus, and the newborn child. Malaria-associated maternal illness and low birth weight is mostly the result of *Plasmodium falciparum* infection and occurs predominantly in Africa(WHO, 2016).Most cases of malaria in pregnancy in areas of stable malaria transmission are asymptomatic (Pehrson et al., 2016). Depending on the endemicity of malaria in an area, it can be expected that 1–50% of pregnant women may carry malaria parasitemia, especially in the placenta, without noticing it (Ashley, Pyae Phyo, & Woodrow, 2018). This is attributed to immunity acquired during previous exposure that protects against clinical malaria (Srinivasan et al., 2014). Pregnant women are three times more likely to suffer from severe diseases as a result of malarial infection compared with their non-pregnant counterparts, and have a mortality rate that approaches 50% (Uganada Clinical Guidelines, 2016, P. 659). The principal impact of malaria infection is due to the presence of parasites in the placenta, which causes maternal anaemia and low birth weight (Lalloo et al., 2016). Beyond the post-partum period, the long- term consequences of malaria during pregnancy on the infant include poor development, behavioral problems, short stature and neurological deficits (Nkumama, O'Meara, & Osier, 2017).

Protection of pregnant women living in malaria endemic countries has been of particular interest to many malaria control programs because of this group's higher susceptibility and reduced immunity. WHO recommends the following package of interventions for the prevention and treatment of malaria during pregnancy: use of long-lasting insecticidal nets (LLINs);in all areas

with moderate to high malaria transmission in Africa, intermittent preventive treatment in pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP), as part of antenatal care services; and lastly, prompt diagnosis and effective treatment of malaria infections(WHO, 2018).

In Uganda, the overall burden of malaria is high and its adverse outcomes to the infected mother and the unborn child are widespread. The malaria day report 2018 show that Uganda contributes 4% of the global malaria burden and currently, the national malaria prevalence is 19% (Ministry of Health, 2018). Although Uganda is regarded as being a malaria-endemic region, the transmission level varies considerably across the country (UDHS, 2017). Therefore, this study was conducted to assess the prevalence of malaria infection and its associated factors among pregnant women attending antenatal clinic at Kiryandongo general Hospital (KGH).

1.1 Problem statement

According to the latest World Malaria Report, released in November 2017, there were 216 million cases of malaria in 2016, up from 211 million cases in 2015. The estimated number of malaria deaths stood at 446 000 in 2016(WHO, 2018).The African region continues to carry a disproportionately high share of the global malaria burden. In 2016, the region was home to 90% of malaria cases and 91% of malaria deaths. Some 15 countries – all in sub-Saharan Africa, except India – accounted for 80% of the global malaria burden(WHO, 2017).

In sub-Saharan Africa, over 30 million pregnancies occurred annually in areas where malaria is endemic, and each year malaria in pregnancy is estimated to cause nearly one million low birth weight (LBW) deliveries and up to 100,000 infant deaths (WHO, 2016). Given this high burden of disease, the World Health Organization (WHO) recommends the implementation of malaria preventive measures in all African countries where *Plasmodium falciparum* remains endemic, including the use of long lasting, insecticide-treated nets (LLINs) and intermittent preventive treatment during pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP) (Centers for Disease Control and Prevention, 2016).

Despite these measures, rates of placental malaria and poor birth outcomes remain persistently high in many parts of Africa. In a recent in Mulago Hospital, Kampala Uganda, the prevalence of malaria in pregnancy was 12% in women who had received ≥two doses of IPTp-SP, and48 % of who had not received at least two doses of IPTp (Odongo, Odida, Wabinga, Obua, &

Byamugisha, 2016). Although no study has been done in KGH concerning malaria in pregnancy, a surveillance report from Kiryandongo district showed that among febrile women who reported to hospital, 60.3% were found to have malaria (Agwu, 2015).To understand the burden of malaria in pregnancy in KGH, this study was done.

1.2 Objectives of the study

1.2.1 General objective

To assess the prevalence of malaria infection and its associated factors among pregnant women attending antenatal clinic at KGH.

1.2.2 Specific objective

1. To find out the prevalence among pregnant women attending antenatal clinic at KGH.
2. To determine factors associated with malaria among pregnant women attending antenatal clinic at KGH.

1.3 Research questions

1. What is the prevalence among pregnant women attending antenatal clinic at KGH?
2. What are the factors associated with malaria among pregnant women attending antenatal clinic at KGH?

1.4Justification of the study

Malaria in pregnancy is a serious health risk for the pregnant woman, the fetus and ultimately the newborn and infant(Ashley et al., 2018).

Even in highly endemic areas where adults have some level of acquired immunity, pregnant women (especially primigravidae) are at risk because placental tissue has never been exposed to the malaria parasites. In fact, a pregnant woman may be an asymptomatic carrier of placental malaria parasites which are none-the-less harming the fetus resulting in inter-uterine growth retardation, low birth weight, miscarriage, still birth, greater susceptibility to malaria during infancy and higher neonatal and infant mortality. Pregnant mothers themselves are also at risk for malaria associated anemia. Anemia, in turn, can adversely affect a mother’s ability to survive complications related to postpartum hemorrhage and is therefore a serious concern.

A recent study in Mulago hospital (Odongo et al., 2016) revealed a prevalence rate of malaria in pregnancy to be 12% and factors associated with malaria in pregnancy to be parity, use of ITN, doses of IPTp taken and presence of placental infection. However, no study has been done in Kiryandongo to assess the prevalence of malaria infection and associated factors among pregnant women. The study findings will help to establish prevalence of malaria and its associated morbidity and mortality, inform of policy makers and redirect resources for malaria case management and prevention.

1.5: Study scope

1.5.1: Geographical scope

The study took place in KGH, Kiryandongo district.

1.5.2: Content scope

This study assessed the prevalence of malaria in pregnancy among pregnant mothers attending antenatal clinic.

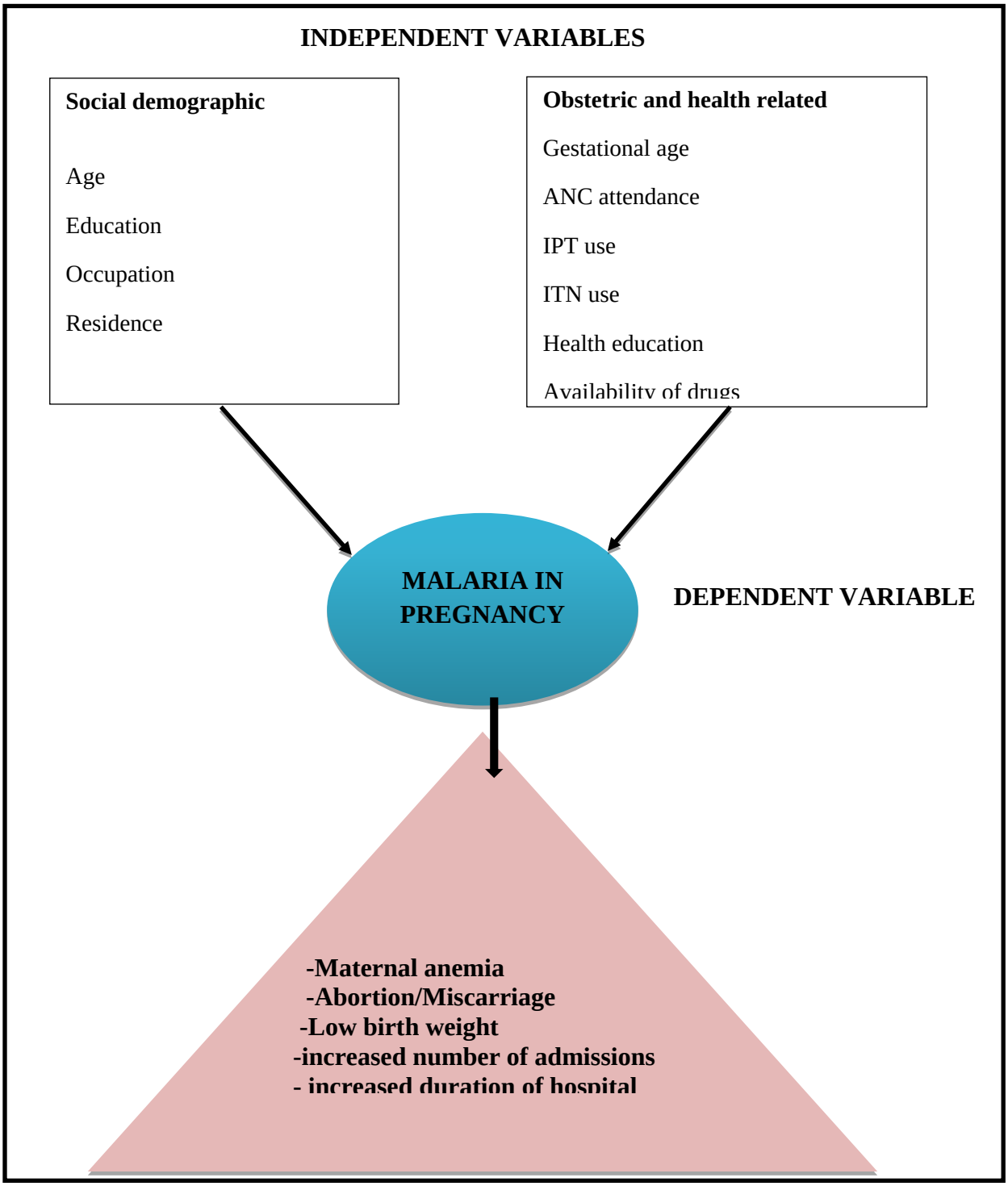
1.5.3: Time scope

The study took place between August 2018 and February 2019.

1.6 Conceptual frame work for malaria in pregnancy

Figure 1 below illustrates relationship of malaria in pregnancy and associated risk factors

Figure 1: Conceptual frame work for malaria in pregnancy



Source: designed by the researcher, 2018

CHAPTER TWO
LITERATURE REVIEW

2.1Burden of Malaria

In 2016, an estimated 216 million cases of malaria occurred worldwide compared with 237 million cases in 2010. Most of the cases in 2016 were in the WHO African Region (90%), followed by the WHO South-East Asia Region (7%) and the WHO Eastern Mediterranean Region (2%). About 4% of estimated cases globally were caused by *P. vivax,* but outside the African continent this proportion was36%. *P. vivax* is the predominant parasite in the Americas (64%) and above 30% in South-East Asia and 40% in the Eastern Mediterranean regions.

In Africa, Nigeria accounted for the highest proportion of cases globally (27%), followed by the Democratic Republic of the Congo (10%) while Uganda contributed (4%)(WHO, 2018). In Kiryandongo district, the district health report 2017 shows that 2% of all patients who were tested for malaria were found positive (District health report, 217).

In 2016, it was estimated that 445 000 deaths due to malaria had occurred globally; of which407 000 deaths (approximately 91%) were in the WHO African Region. This represents broadly similar levels of deaths to 2015, when446 000 deaths were estimated to have occurred globally. Approximately 80% of all deaths in 2016occurred in 15 countries, all of which are in the WHO African Region, except for India. Nigeria, Democratic Republic of the Congo, Burkina Faso and India accounted for 47% of all malaria deaths globally(WHO, 2017).

Each year, approximately 50 million women living in malaria endemic countries throughout the world become pregnant. Around 10 000 of these women and 200 000 of their infants die as a result of malaria infection (WHO report 2015). In Sub Saharan Africa, 25 million pregnant women estimated every year are at risk of *P. falciparum* infection (Mbonye, Mohamud, & Bagonza, 2016). In areas of stable transmission, the prevalence of malaria in pregnancy at the time of delivery was estimated as 25 % for peripheral or placental infection. These were evaluated as underestimate, since the data it's based on, are prevalence data at one time-point and determined by light microscopy. Thus, infections outside the particular time-point haven't been considered, and low-grade parasitemia, which are not detectable by light microscopy, are

not included. For detection of those submicroscopic infections, polymerase chain reaction (PCR) or placental histology would be needed (Pehrson et al., 2016).

Recently, studies from high transmission areas have shown prevalence of malaria among pregnant women with microscopy from 2.3 % in Malawi (Roman et al., 2014) to as high as 99 % in South-Eastern region of Nigeria (Onyebuchi, Lawani, Iyoke, Onoh, & Okeke, 2014). It seems that the prevalence of malaria in pregnancy has declined along with the overall incidence of malaria. Even prevalence determined by PCR and thus including submicroscopic infections, is not as high as before. These suggest that the utilization of malaria control measures in both general population and among pregnant women has been successful.

In high transmission areas malaria in adults is often asymptomatic. That is due to acquired immunity as a result of constant exposure and prior infections in childhood(World Health Organization, 2016). This immunity does not cover from infection but reduces the risk of severe disease. The acquired immunity protects pregnant women too and the malaria infections are often asymptomatic. But pregnant women are still predisposed to malaria and the risk for severe symptomatic disease is higher than among non-pregnant women. Additional immunocompromising state besides pregnancy, e.g. HIV, further increase the risk of severe disease. Also in areas of seasonal or low transmission, the probability of symptomatic malaria is higher(Roman et al., 2014). In a study reported by Oakley et al., the clinical complaints suggestive to malaria were not associated with prevalence of malaria, indicating that traditional signs and symptoms of malaria doesn't predict malaria infection in pregnant women (Oakley, Gerald, McCutchan, Aravind, & Kumar, 2011).

In pregnant women, the infected red blood cells sequester to placenta causing placental infection. As a consequence, the rate of parasitemia in peripheral blood is low, and will most likely be undetected by light microscopy. Immunity also results as low-grade parasitemia in peripheral blood. To detect these submicroscopic infections, more sensitive methods like PCR and placental histology are needed (Namusoke, Rasti, Kironde, Wahlgren, & Mirembe, 2010).

Although malaria in pregnancy is mostly asymptomatic and severe disease is rare, malaria infection during pregnancy has remarkable negative consequences which not only affect maternal health but also birth outcomes. Most significant maternal outcome is anaemia. Of all

severe anaemia among pregnant women in Africa, it is estimated that 25 % is caused by malaria (De Beaudrap et al., 2013). Moreover, a study by Braun et al. found that submicroscopic infection was associated with increased risk of maternal anaemia(Braun et al., 2015). Thus, asymptomatic and submicroscopic malaria also cause anaemia.

The maternal mortality is also one of the negative outcomes caused by malaria and it remains to be poorly estimated. The mortality rates caused directly or indirectly by malaria range from 0.5 % to 23 % in hospital studies and from 2.9 % to 17.6 % in community-based studies (Holmberg et al., 2012).

For birth outcome, the most commonly reported adverse effect is an increased risk of low birthweight (LBW, defined as birthweight < 2500 g). LBW is highly associated with increase in infant mortality. The cause for LBW is thought to be intrauterine growth retardation (IUGR) or preterm births which are partly caused by malaria in pregnancy. Also, association between placental malaria and stillbirth has been shown(De Beaudrap et al., 2013).

In South western Uganda (Rakai), by Kiggundu and colleagues found low prevalence of malaria (0.07 %) among pregnant women and no association to anaemia or LBW (Kiggundu et al., 2013). The diagnosis was made by rapid diagnostic tests (RDT). There was great loss in study population during the study period, and less than half of the enrolled was in follow up at the time of delivery. Malaria tests were planned to be taken at least three times during the study period until delivery, but there is no information on how this was fulfilled. Authors recognize that the numbers are too low to show evidence of association.

In conclusion, the evidence of the association between submicroscopic malaria infections and LBW is somewhat contradictory. On the other hand, microscopic malaria, either peripheral of placental, increases the risk of LBW unequivocally (Rashidi & Roullet, 2013).

In addition, the risk of all-cause anaemia is higher among infants born to mothers with placental malaria. Placental infections reduce the transfer of maternal antibodies to the fetus causing increasing risk to many other infectious diseases besides malaria. Earlier studies suggest that malaria during pregnancy creates increasing overall morbidity and developmental problems for the child later in life. These conclusions are still uncertain and require more research(van Eijk, Hill, Noor, Snow, & ter Kuile, 2015).

2.2 Risk factors and prevention of malaria in pregnancy

The known risk factors for microscopic malaria in pregnancy on high transmission areas are primigravity, younger maternal age and second trimester (Beaudrap et al., 2013). On low transmission and seasonal malaria areas the gravidity hasn't been so strongly associated to risk of malaria. These suggest that in high and stable transmission areas immunity acquired is associated to both age and parity (Wanzira et al., 2017).

For the prevention of malaria in pregnancy WHO recommends the use of long-lasting insecticidal nets (LLINs), intermittent preventive treatment in pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP) in areas of moderate to high transmission and prompt diagnosis and effective treatment of malaria (World Health Organization, 2016).

Maternal characteristics as risk factors are quite commonly investigated but environmental factors affecting malaria prevalence hasn't been much studied, with the exception of bed net availability and usage (Mbonye et al., 2016). Obliviously, a lot of studies about the benefits of IPTp has been done, but they are not referred here.

In many countries, Malaria Indicator Survey (MIS) has been conducted regularly to determine the availability and usage of malaria control measures including insecticide treated bed nets (ITN) and determining the prevalence of malaria in risk groups and/or general population. In Eritrea at MIS 2015 the coverage of bed nets was high, at least one bed net was owned by 90 % of households and 87 % had at least one ITN. Of pregnant women, 60 % had slept under an ITN the previous night. The malaria prevalence in general population was 1.1 % (95 % CI 0.9–1.3)(Anonymous. & Anonymous, 2016).

In South Sudan, MIS 2012 showed that the prevalence of malaria was 24.5 % (95 % CI 23.0–26.1) among general population and among pregnant women 9.9 % (95 % CI 7.4–13.1) (Pasquale et al., 2013). The proportion of households with at least one bed net was 59.3 % (95 % CI 57.5–61.6), and 35.9 % (95 % CI 31.9–40 .2) of pregnant women had slept under the net the previous night. The malaria prevalence was high, and the reasons suggested were low coverage and utilization of interventions, and low knowledge levels. In these reports no analyses of the association between owning or using ITNs and the prevalence of malaria were made. It seems

that in Eritrea where ITN coverage is high, the prevalence of malaria is essentially lower than in South Sudan where ITN coverage was lower, at least in 2009.

For environmental factors affecting malaria prevalence among pregnant women, not many studies were available. In six studies the association between malaria prevalence in pregnancy and ITN coverage or usage was analyzed. The effect of season in the prevalence of malaria among pregnant women was analyzed in three studies with inconsistent findings(Keating et al., 2011). High-risk season was associated with higher malaria prevalence in one study (Kibret, Wilson, Tekie, & Petros, 2014), but two studies found no association between dry or rainy season and prevalence of malaria. The effect of housing conditions and materials of walls, roofs, floors and windows on the prevalence of malaria was investigated in general population. The poor wall materials were found to be associated with prevalence of malaria. Another study found association between household size and malaria prevalence in pregnant women. Only two of the studies above included submicroscopic infections to the analysis.

The need for malaria control strategies specifically targeted to pregnant women was evaluated in two studies. In the South African study of the prevalence of malaria was low (0.07 %) (Maharaj et al., 2013). They suggest that malaria control measures for entire population benefit also during pregnancy, and there is no need for measures specifically aimed for pregnant women.

Another study investigated if a universal bed net campaign would reduce the burden of malaria among pregnant women in Malawi (Centres for Disease Control and Prevention, 2013). Following the bed net campaign, the use of bed nets increased from 50.3 % to 66.2 %. At the same time the prevalence of malaria decreased from 28.4 % to 15.0 %. However, there was no association between malaria infection and bed net use in individual level. Contradictory to the study by Lowe, Chirombo, & Tompkins, (2013), this study suggests that besides universal anti-malarial measures, specific strategies targeting pregnant women are still needed. All women had their first or second pregnancy, being in higher risk of malaria, which may explain the high prevalence (Lindblade et al., 2015). And in the end, the bed net coverage in Malawi is still quite low, and as a universal method it cannot be compared with the yearly IRS of every household.

CHAPTER THREE

METHODS

3.1 Study design

The study utilized descriptive cross-sectional design.

3.2 Study area

This study was conducted in Antenatal Clinic of KGH in Kiryandongo district. Kiryandongo district, is in Bunyoro Kitara region of western Uganda. It is bordered by districts of Nwoya in the north, Nakasongora in the South, Masindi in the West and Apac in the East. The district has one Town council and It covers a 1399 M^2 area (National Population and Housing Census, 2014).

The 2014 national census estimated the population of the district to be 266, 197 (133701 males and 132496 females). The economy of the area is predominantly agricultural with the majority of the population dependent on subsistence farming and light agro-based industries. Hence most of people earn their livelihoods in the agricultural sector in particular crop farming. Kiryandongo Hospital is government aided and is located 225Km along the Kampala - Gulu highway. The hospital is in Kikube parish, Kiryandongo sub-country, Kibanda Country in Kiryandongo district. It is a 109-bed hospital serving a population of over 400,000 people from areas of Kiryandongo, Masindi, Nakasongola, Oyam, Apac, Amuru and Nwoya districts.

The hospital offers a number of services including; OPD, inpatient, Ophthalmology, X-ray, ultra sound, Orthopedics, health promotion and education, occupational therapy, HIV care and treatment, Maternal and child health, environmental health, special clinics among others.

3.3 Study population

Study population included all women attending ANC at KGH.

3.3.1. Inclusion criteria

Records of pregnant women who attended ANC at KGH from June 2018-November 2018 and tested for malaria were reviewed.

3.3.2. Exclusion criteria

Pregnant women who did not test for malaria.

Women who attended ANC before August or after November 2018

3.4 Sample size determination

The sample size required for the study was calculated based on the formula by Kish to estimate a single population proportions (Gwet, 2010).

$$N = \frac{Z^2\, p(1-p)}{\delta^2}$$

Where,

N = estimated sample size

P = anticipated proportion of pregnant women with malaria. Similar study at Mulago hospital found only prevalence of 14%, so P was taken to be 0.14

Z = standard normal variation ant 95% confidence (1.96)

δ = margin of error (5%)

the calculated sample size was, $\frac{1.96^2\, x\, 0.14(1-0.14)}{0.05^2}$ **= 185 sample was considered.**

3.5 Sampling procedure and techniques

Convenient sampling was employed to get list of women who attended ANC and tested for malaria from the register. Then systematic sampling was used to get the sample required. The list was created and numbered from number '1' up wards. Only names with even numbers were selected for the study until the required number 185 was reached.

3.6 Data collection methods

Data was collected by reviewing records from antenatal register, using structured pretested checklist.

3.7 Data processing and analysis

The checklist was checked for completeness, missed values and then manually cleaned up on such indications before living the study area. Data was coded and entered in to IBM SPSS version 25. Data was then cross checked for consistency and accuracy, after data cleaning, data was analyzed and Chi square test was done to find the associated risk factors of malaria in pregnancy. Results were presented in tables and charts.

3.8 Ethical Consideration

Ethical clearance was obtained from faculty of clinical medicine and dentistry in form of introduction letter. The copy of introduction letter was taken to the hospital administrator to seek permission to collect the data.

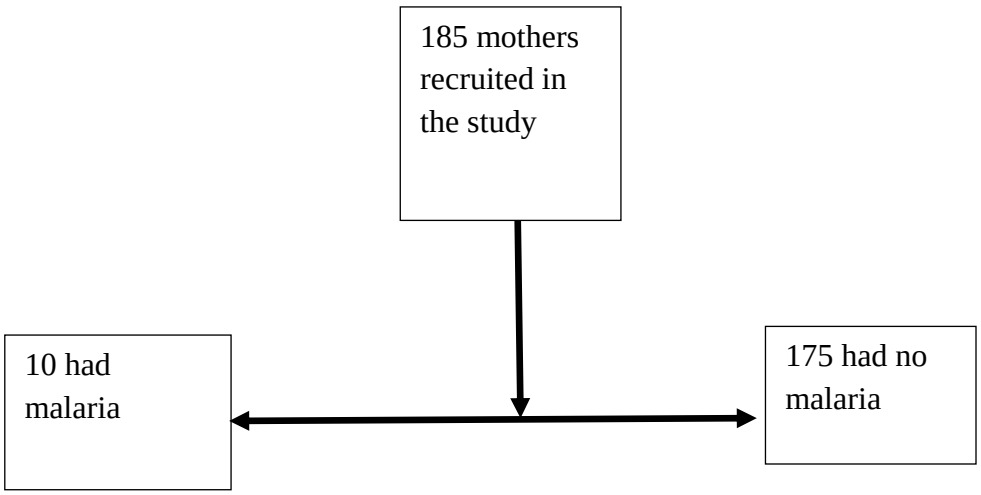
3.9 Study Limitations

The use of microscopy instead of the more sensitive PCR to determine the prevalence of malaria could have underestimated the real prevalence. The study findings may have been compromised by the study design (i.e. cross-sectional study) which allows for only temporality and point assessment, as well as the choice of study site (regional hospital) may have.

CHAPTER FOUR

RESULTS

4.0 Summary of results



4.1 Demographic characteristics of the study population

A total of 185 pregnant women who visited the antenatal clinic at KGH between June 2018 and November 2018 participated in the study. The demographic characteristics of the pregnant women that participated in this study are summarized in Table 1. The mean age of respondents was 25.2±5.9 SD years. There was equal number of the women were in the age groups of ≤20 and 21-25 (29.2%) while the least number were those of the age group of ≥31 with 19.5%. More than half of the pregnant women (70.3%) had education of primary or below while only (9.7%) had tertiary education. Most of the study participants were house wives (50.3%) and most of women (69.7%) were from rural setting.

Table 1: Demographic characteristics of the study participants

Variables		Frequency	Percent
Age group (years)	≤20	54	29.2
	21-25	54	29.2
	26-30	41	22.2
	≥31	36	19.5
	Total	**185**	**100.0**
Education level	≤ primary	130	70.3
	Secondary	37	20.0
	Tertiary	18	9.7
	Total	**185**	**100.0**
Occupation level	house wife	93	50.3
	Employed	36	19.5
	Business	56	30.3
	Total	185	100.0
Area of residence	Rural	129	69.7
	Urban	56	30.3
	Total	**185**	**100.0**

4.2 Obstetric and malaria prevention characteristics of the pregnant women

The obstetric characteristics of the pregnant women that participated in this study are summarized in Table2.Multigravida constituted over half of the study participants 129(69.7%) while only 56 (30.3%) were primigravidae. Most of participants 167 (90.3%) had attended ANC for ≤3 times, and majority had taken IPT (80%) and were using ITN (80%).

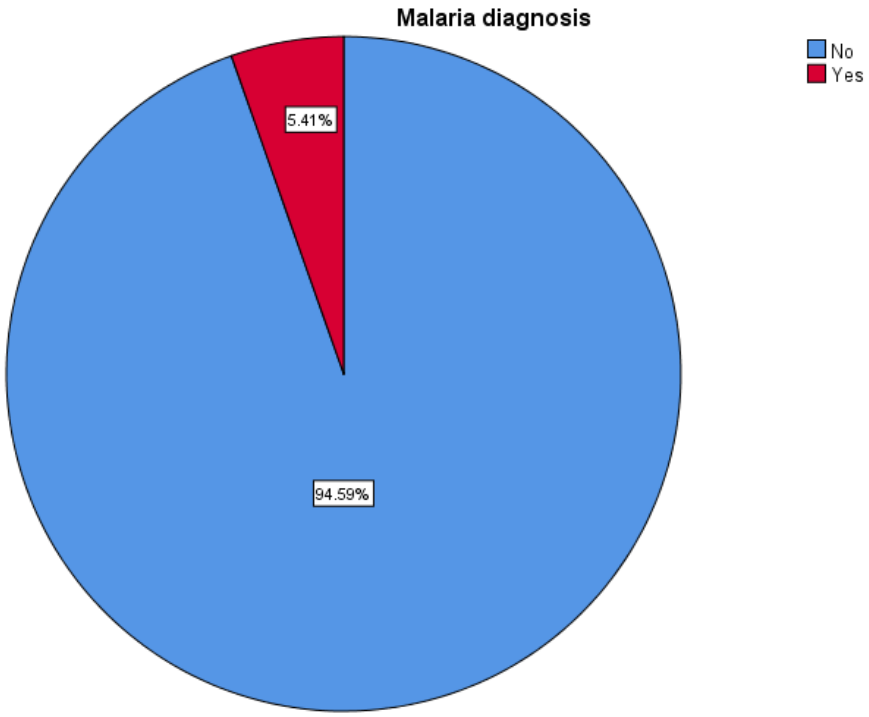
Table 2: Obstetric and malaria prevention characteristics of the study participants

Variables		Frequency	Percent
Gravidity	Prime	56	30.3
	Multi	129	69.7
	Total	**185**	**100.0**
Number of ANC Attendance	≤3	167	90.3
	≥4	18	9.7
	Total	**185**	**100.0**
IPT taken	No	37	20.0
	Yes	148	80.0
	Total	**185**	**100.0**
ITN use	No	37	20.0
	Yes	148	80.0
	Total	**185**	**100.0**

4.3 Malaria prevalence among pregnant women attending ANC in KGH

The prevalence of malaria in this study was 5.4% with the majority of the study participants (94.6%) having no malaria infection as shown in figure 2 below.

Figure 2: Malaria prevalence among pregnant women attending ANC in KGH N=185



4.4 Chi square test of Socio demographic factors associated with malaria prevalence

The socio demographic characteristics associated with malaria prevalence are reported in table 3 below. The study participants in the age group ≤20 had the highest number of malaria cases (7.4%) compared to other age groups. There was no difference in malaria prevalence between different education levels. Women who were housewives had the highest percentage of malaria cases (7.5%) compared to the5.6% who were employed. Participants who were doing business had the least percentage of malaria (1.8%). In terms of residence, women residing in rural area had a higher malaria prevalence (7.0%) compared to those residing in urban setting (1.8%). The chi square test showed that the prevalence of malaria among participants had no significant relationship (p≥0.05) with the demographic characteristics of the participants.

Table 3: Chi square test of Socio demographic factors associated with malaria prevalence

Variables	Malaria diagnosis		Total	X^2	P value
	No	Yes			
Age in years				0.934	0.817
≤20	50 (92.6%)	4 (7.4%)	54 (100%)		
21-25	51 (94.4%)	3 (5.5%)	54 (100%)		
26-30	39 (95.1%)	2 (4.9%)	41 (100%)		
≥31	35 (97.2%)	1 (2.2%)	36 (100%)		
Total	175 (94.6%)	10 (5.4%)	185 (100%)		
Education level				0.001	1.000
≤ primary	123 (94.6%)	7 (5.4%)	130 (100%)		
Secondary	35 (94.6%)	2 (5.4%)	37 (100%)		
Tertiary	17 (94.4%)	1 (5.6%)	18 (100%)		
Total	175 (94.6%)	10 (5.4%)	185 (100%)		
Occupation				2.255	0.324
house wife	86 (92.5%)	7 (7.5%)	93 (100%)		
Employed	34 (94.4%)	2 (5.6%)	36 (100%)		
Business	55 (98.2%)	1 (1.8%)	56 (100%)		
Total	175 (94.6%)	10 (5.4%)	185 (100%)		
Residence				2.058	0.151
Rural	120 (93.0%)	9 (7.0%)	129 (100%)		
Urban	55 (98.2%)	1 (1.8%)	56 (100%)		
Total	175 (94.6%)	10 (5.4%)	185 (100%)		

4.5 Chi square test of obstetric characteristics and preventive methods associated with malaria prevalence of malaria in pregnancy

Prevalence of malaria among primigravidae in this study was (8.9%) while multigravidae had the least percentage (3.9%). Among those who had not used IPT,13.5% had malaria while only 3.4% of those who had take nIPT had malaria infection. The chi square test showed that only IPT was significant associated with malaria (X^2 = 5.946, P=0.015).

Table 4: Chi square test of obstetric characteristics and preventive methods associated with malaria prevalence of malaria in pregnancy

Variables	Malaria diagnosis		Total	X^2	P value
	No	Yes			
Gravidity				1.95	0.163
Prime	51 (91.1%)	5 (8.9%)	56 (100%)		
Multi	124 (96.1%)	5 (3.9%)	129 (100%)		
Total	175 (94.6%)	10 (5.4%)	185 (100%)		
IPT taken				5.946	**0.015***
No	32 (86.5%)	5 (13.5%)	37 (100%)		
Yes	143 (96.6%)	5 (3.4%)	148 (100%)		
Total	175 (94.6%)	10 (5.4%)	185 (100%)		
ITN use				0.661	0.416
No	36 (97.3%)	1 (2.75)	37 (100%)		
Yes	139 (93.9%)	9 (6.1%)	148 (100%)		
Total	175 (94.6%)	10 (5.4%)	185 (100%)		
HIV status				0.311	0.577
Negative	165 (94.3%)	10 (5.7%)	175 (100%)		
Positive	9 (90%)	1 (10%)	10 (100%)		
Total	175 (94.1%)	10 (5.9%)	185 (100%)		

***=Significant.**

4.6 Logistic regression analysis of malaria prevalence and socio demographic characteristics of participants.

The logistic regression analysis results show that participants who were living in rural areas had almost five times risk of getting malaria than those in urban areas (OR=4.62;95%CI=0.577-37.007). Similarly, women who were house wives were 5 times more likely to have malaria (OR=5.18; 95%CI=0.630-42.541) compared to those were employed who had a 3 times risk of having malaria (OR=3.24; 95%CI=0.282-37.053).There was no observed difference in risk of having malaria across all age groups and there were also similar risks of having malaria in different education levels as illustrated in the table 5 below. All the factors were not significantly associated with malaria ($p \geq 0.05$).

Table 5: Socio demographic characteristics of participants from logistic regression analysis

Variables		[A]OR (95%CI)	P value
Age group (years)	≤20	0.74 (0.157-3.454)	0.697
	21-25	0.64 (0.112-3.682)	0.618
	26-30	0.74 (0.127-4.421	0.731
	≥31	1	
Education level	≤primary	1.12 (0.131-9.474)	0.921
	Secondary	0.97 (0.082-11.478)	0.982
	Tertiary	1	
Occupation level	house wife	5.18 (0.630-42.541)	0.126
	Employed	3.24 (0.282-37.053)	0.345
	Business	1	
Area of residence	Rural	4.62 (0.577-37.007)	0.149
	Urban	1	

4.7 Logistic regression analysis of obstetric characteristics and preventive methods used associated with malaria

The logistic regression analysis results are presented in table 6 below. Primigravida women had a 2-fold risk of having malaria compared to multigravida women (OR=2.01; 95%CI= 0.587-6.882). There was no observed difference in risk of malaria between those who had attended ANC ≤3 or ≥4 times (OR=1.08; 95%CI= 0.131-8.982).Women who did not use ITN had similar chance of getting malaria (OR=0.38;95%CI=0.048-3.093).Participants who did take IPT were 4 times more likely to have malaria than those who had taken IPT (OR=3.69; 95%CI= 1.062-12.872). There was difference in risks of having malaria between women who were using ITN and those that were not (OR=0.38; 95%CI= 0.048-3.093). Women who were HIV negative had equal risk of having malaria like those were HIV positive (OR=0.55; 95%CI= 0.063-4.741). Of all the above factors, only IPT was significantly associated with having malaria (p=0.040).

Table 6: Logistic regression analysis of obstetric characteristics and preventive methods used associated with malaria

Variables		[A]OR (95%CI)	P value
Gravidity	primigravida	2.01 (0.587-6.882)	0.266
	multigravida	1	
Number of ANC attendance	≤3	1.08 (0.131-8.982)	0.941
	≥4	1	
IPT taken	No	3.69 (1.062-12.872)	**0.040***
	Yes	1	
ITN use	No	0.38 (0.048-3.093)	0.368
	Yes	1	
HIV status	Negative	0.55 (0.063-4.741)	0.583
	Positive	1	

***=Significant.**

CHAPTER FIVE
DISCUSSION

5.1 Introduction

This study examined prevalence of malaria and associated factors among pregnant women attending antenatal clinic in KGH, Kiryandongo District, Uganda.This chapter therefore discusses the findings of the study.

5.2 Prevalence of malaria among pregnant women

In this study the prevalence of malaria was 5.4%. The prevalence of 5.4% is higher than that reported by findings of a survey conducted in Kabale municipality south-western Uganda from April-June, 2015 which found a prevalence of 25%(Mbonye et al., 2016). The difference in prevalence could have resulted from different methods of malaria diagnosis adapted. In this study, both RDT and microscopy methods were used together which have less sensitivity compared to PCR while the former study considered results from both microscopy and PCR which could have led to the higher prevalence in that study. The prevalence in this study is comparable to findings by a study in countries of Malawi, Senegal and Zambia by Roman et al., (2014)which reported a prevalence of 2.3% and that of a study in Mulago hospital by Namusoke et al., (2010) which reported a prevalence of 9%.

There is, therefore, a wide variation in reported prevalence of malaria. The low prevalence of malaria in this study could be explained by the improved education on malaria during pregnancy in Uganda ministry of health and KGH ANC staff. Indeed, in 2017, Kiryandongo district health department report 2017 shows that malaria prevalence in the district was 2% (District Health Report, 217). The large differences in the reported prevalence rates of malaria may also be attributed to skill and experience of laboratory personnel involved in blood film preparation, staining and reading of the slides. KGH laboratory has been accredited in accordance with the recognized international standards ISO 15189:2012 and one of their test is malaria test especially Microscopy which can be accepted anywhere in the world.

5.3 Risk factors associated with malaria among pregnant women

Studies have shown that age, gravidity, gestation, use of ITN, education level and the use of IPT are associated with malaria in pregnancy(WHO, 2017;Agwu, 2015;WHO, 2018). These studies have shown that pregnant women of young maternal age are at the greatest risk of malaria

infection. Multigravidas have been noted to have lower effects of malaria in pregnancy than in other gravidities. This is as a result of acquisition of specific immunity to placental malaria due to previous exposure(Muhindo et al., 2016). Acquired specific immunity accumulates with subsequent infection and subsequent pregnancies (Eijk et al., 2015). In this study, older women (≥31 years) had least cases of malaria (2.2%) and multigravidas had reduced chance of getting malaria 3.9% compared to younger (7.4%) and primigravida(8.9%) women. However, this reduced chance was not significant. This could be because in a malaria endemic area such as Uganda, it is possible that the women could have had a number of encounters with malaria infection prior to visiting the antenatal clinic used in this study. There could also have been no difference in the level of specific immunity of the study participants based on gravidity.

Education of the women was not significantly associated with malaria infection. This lack of significant association could be explained by the fact that majority of the study participants could have had very good knowledge of malaria preventive methods from campaigns on radio stations or ANC its self and availability of good malaria prevention strategies and appropriate treatment options available in Uganda. Moreover, pregnant women attending antenatal clinic at KGH are usually given a health talk on malaria and other conditions affecting them before being attended to. These campaigns have bridged the gap between those who have formal education and those who do not have.

In terms of residence, women residing in rural area had a higher malaria prevalence (7.0%) compared to those residing in urban setting (1.8%). However, this finding was not significant (X^2=2.058; P= 0.151). A study in malaria-endemic areas of Al Hudaydah in the Tihama region, west of Yemen by Aderibigbe et al., (2015) reported that area of residence was significantly associated with malaria prevalence and respondents in urban areas had a reduced risk of malaria. Although residence was not significant in this study, participants who were living in rural areas had almost five times risk of getting malaria than those in urban areas (OR=4.62;95%CI=0.577-37.007). Similar findings were reported by Kibret et al., (2014) in Ethiopia.

Reports(UBOS, 2016 and Ssempiira et al., 2017)indicate that the use of ITN substantially reduces the risk of malaria in pregnancy. Indeed, WHO has advocated for a three pronged approach to tackling malaria and part of the strategy is the use of ITN (WHO, 2018). In this study,

Women who did not use ITN had similar chance of getting malaria (OR=0.38;95%CI=0.048-3.093) like those who were using ITN and this was not significant (p=0.368). Lindblade et al., (2015) also reported a non-significant impact of ITN on malaria in pregnancy in Malawi.

The use of IPT has been shown to reduce malaria prevalence in pregnancy significantly (CDC, 2013).In this study, the use of IPT was significantly associated with malaria infection in pregnancy (p=0.040).Participants who had not taken IPT were 4 times more likely to have malaria than those who had taken IPT (OR=3.69; 95%CI= 1.062-12.872).Similar finding was also observed in a study in Kabale municipality, Uganda(Mbonye et al., 2016) and in a secondary data analysis of the 2014 Malaria Indicator Survey dataset(Wanzira et al., 2017).

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

The prevalence of malaria among pregnant women attending ANC in KGH was low. This is as a result KGH laboratory was accredited by ISO group with ISO 15189:2012 and malaria test done here meet the world standards of laboratory diagnosis.

6.2Recommendations

Based on the findings, there is need to:

- Upgrading laboratory to meet ISO standard as already done by KGH Laboratory, would improve the diagnosis with no false results.
- Future research should be conducted in different transmission settings to provide current data on the national prevalence of malaria and risk factors in the context of scaled-up malaria control efforts.

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Annexes

Annex i: Checklist

1. Age of respondents (in years) …….

2. Education level

- Primary and below ☐
- Secondary ☐
- Tertiary ☐

3. Occupation

- Housewife ☐
- Peasant ☐
- Employed ☐
- Business ☐

4. Area of residence

- Rural ☐
- Urban ☐

5. Gravidity

- Prime ☐
- Multi ☐

6. Number of ANC attendances ……

7. Have you ever been tested for

HIV ☐

Syphilis ☐

Malaria ☐

Urinalysis ☐

8. IPT taken

Yes ☐

No ☐

9. ITN use

Yes ☐

No ☐

10. Diagnosed with malaria in this pregnancy

Yes ☐

No ☐

11. If yes in 10, how many times?.....

12. If admitted for management, how many days did you spend in hospital?.....

13. Have you had any abortion in previous pregnancies?

Yes ☐

No ☐

Annexii: Map of Uganda showing location of Kiryandongo district