KIBOGORA POLYTECHNIC

FACULTY OF HEALTH SCIENCE

DEPARTMENT OF BIOMEDICAL LABORATORY SCIENCES

Topic: MALARIA EFFECT ON PREGNANT WOMEN HEALTH:

Cases study: Case of attendees of antenatal care service at hanika health center

PERIOD: 14th august -24th September 2018

Memoire submitted in partial fulfillment of the requirements for the degree of
Bachelor in Sciences in Biomedical Laboratories Sciences

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Kibogora, September, 2018

DECLARATION

DECLARATION BY THE CANDIDATES

We BYIRINGIRO Elie and DUFATANYE Faustin hereby declare that this is our own original work and not a duplication of any similar academic work. It has therefore not been submitted to any other institution of higher learning.

All materials cited in this paper which are not our own have been duly acknowledged.

DUFATANYE FAUSTIN Signed……..

Date…….

BYIRINGIRO ELIE Signed…….

Date……

DECLARATION BY THE SUPERVISOR

I declare that this work has been submitted for examination with my approval as supervisor

SUPERVISOR'S NAME…….

SIGNED……..

DATE……..

ABSTRACT

Malaria is an infectious disease which infects millions of people on the globe annually. The Disease is a global health problem, which affect mainly young children especially those less than Five years of age and pregnant women. Malaria in pregnancy (MIP) is a serious health risk for the pregnant woman, the fetus and ultimately the newborn and infant. The P. falciparum parasite, which causes anemia and hypoglycemia, is also thought to be the only one responsible for placental malaria.

In Rwanda, Malaria remains to be one of the causes of mortality and morbidity, according to the Rwanda 2010 Demographic and Health Survey (DHS) and the Rwanda Health Sector Strategic Plan 2009 - 2012.Children under five and pregnant women are the most affected In 2010, the number of confirmed malaria cases in Rwanda was 8,517, corresponding to a 76% decline Compared to35, 688 confirmed cases during 2000- 2005.

The aim of this thesis is to contribute for determining the effect of malaria parasites and its complication in pregnancy women especially those who live in Macuba sector where HANIKA HEALTH CENTRE is located and its around, Study was a retrospective antenatal record of HHC by comparing outcomes during pregnancy like anemia and hypoglycemia between pregnant women with malaria parasites and pregnant women without malaria parasites by identifying the age and gestation period as risk factors

Among 471 pregnant women who attended antenatal care at HANIKA health center, 26.53% women was diagnosed with malaria positive. Among those who were positive to malaria, 27.20% were more likely to have hypoglycemia, our result also showed that among pregnant with positive malaria, 76% women had anemia. Anemia and hypoglycemia was found to be high in women with positive malaria compared to those with negative to malaria

We recommend that health facilities especially health centers that they should always make a follow up test for hemoglobin and glycemia in all trimesters and record all the observable of the result, all health center also should mobilize all pregnant women to attend the antenatal care in all trimesters

DEDICATION

To our parents

To our brothers and sisters

To our friends and classmates

ACKNOWLEDGEMENT

Our ultimate thanks go to the Almighty God for giving us strength to conduct this research work successfully.

Our profound thanks go to our supervisors, HABUMUREMYI SOSTHENE, PhD for his sacrifice, advice, time and corrections resulted in the completion of this work.

Many thanks go to the members of the Faculty of health Sciences and the member of the department of Biomedical Laboratory Sciences in KIBOGORA POLYTECHNIC who have involved in our studies from level I to the level IV.

We thank the Government of Rwanda through the minister of education for focusing and establishing sciences especially biomedical laboratory in high learning institutions.

Our gratitude to our lovely parents who rise us up and their effort in our education career and the displine we learnt through their guidance. May God richly bless them! I also appreciate our brothers and sisters especially for their encouragement during our studies.

We will always appreciate all HHC staff members for their permission and support in order to conduct our research, may God bless them

Last but not least, we extend our thanks go to all our friends and our colleagues who always are in our side within this project

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ACRONYMS

HIV: Human Immune Deficiency Virus

RDT: Rapid Diagnostic Test

ICT: Immuno Chromatographic Test

NMCP: National Malaria Control Program

IPTp: Intermittent Preventive Treatment

ITNs: Insecticide Treated Nets

NNT Number Needed to Treat

LLIN: Long Lasting Insecticides Treated Nets

LBW: Low Birth Weight

TNF: Tumor Necrosis Factor

AKI: Acute Kidney Injury

WHO: World Health Organization

MiP: Malaria in Pregnancy

ALT: Alanine amino Transferase

UNICEF: United Nation Children's Fund

DHS: Demographic and Health Survey

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CHAPTER ONE: GENERAL INTRODUCTION

1. BACKGROUND OF STUDY

Malaria is an infectious disease which infects millions of people on the globe annually. The Disease is a global health problem, which affect mainly young children especially those less than five years of age and pregnant women. However, everybody especially the non-immune is at risk of getting the disease. Malaria is caused by any of the human malaria parasites including; Plasmodium falciparum, Plasmodium malarae and Plasmodium ovale and Plasmodium vivax (OTCHERE, 2011) It is transmitted to humans by the bite of an infected female mosquito. Thereafter the parasite is able to enter the blood stream, invade the red blood cells and multiply. This form of malaria (the presence of parasites in the blood stream) is called peripheral malaria (Rulisa, 2014).

According to the World Health Organization's World Malaria Report 2005, at the end of 2004, some 3.2 billion people lived in areas at risk of malaria transmission in 107 countries and territories. Also, between 350 and 500 million clinical episodes of malaria occur every year and at least one million deaths occur every year due to malaria. About 60 percent of the cases of malaria worldwide and more than 80 percent of the malaria deaths worldwide occur in Africa, south of the Sahara. The burden of malaria contributes substantially to the poor health situation in Africa and still remains a major global problem (WHO/UNICEF, 2005). It has devastating effects on both health and development, exacting its greatest toll on the world's poorest and most marginalized (WHO/UNICEF, 2005) (Manirakiza, 2017). Again, malaria costs Africa 12 billion dollars lost in GDP every year.

Malaria in pregnancy is a serious health risk for the pregnant woman, the fetus and ultimately the newborn and infant. Even in highly endemic areas where adults have some level of acquired immunity, pregnant women (especially prim gravidae) 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 in low and

unstable malaria transmission areas, where acquired immunity does not develop, are subject to both acute malaria attacks as well as placental infections that harm the fetus and newborn.

The P. falciparum parasite, which causes the most severe disease and the most deaths, is also thought to be the only one responsible for placental malaria and is the focus of this thesis. Placental malaria is the condition when a pregnant woman becomes infected with malaria parasites and these parasites hide in the Placenta. This phenomenon can have severe consequences for both the mother and the fetus (Rulisa, 2014).

2. RESEARCH PROBLEM

Malaria in pregnancy is a major reproductive health problem in sub-Saharan Africa. Each year approximately 50 million women (30 million living in Africa) in malaria endemic countries throughout the world became pregnant. About 10,000 of this women and 200,000 of their infants dies as result of this infection, with severe malaria anemia contributing more than half of this death (WHO/UNICEF, 2005).

According to WHO, malaria account for significant morbidity in pregnant women, it account 2 to 10 percent maternal anemia and 5 to 14 of low birth weight. The disease is thus leading Couse of LBW in tropic country. It is also account for between 3 to 5 percent of all newborn deaths. (ahmed, 2009)

Consequences of malaria among pregnant women include anemia, spontaneous abortion, preterm delivery and low birth weight. Although this serious impact of malaria during pregnancy women have been known since long, the world health organization and nation guideline noted that coverage of pregnancies at risk of malaria infection has been low in most malaria-endemic countries (WHO, 2004).

In Rwanda, Malaria remains to be one of the causes of mortality and morbidity in Rwanda according to the Rwanda 2010 Demographic and Health Survey (DHS) and the Rwanda Health Sector Strategic Plan 2009 - 2012.Children under five and pregnant women are the most affected In 2010, the number of confirmed malaria cases in Rwanda was 8,517, corresponding to a 76% decline Compared to35, 688 confirmed cases during 2000- 2005.

Malaria in pregnancy is a major health problem not only for the pregnant women but also for the unborn baby. There is thus a great need of research on malaria in pregnancy and the aim of this memoire is to contribute to filling this gap by determining the effect of malaria parasites and its complication in pregnancy women especially in those who attended Hanika Health Center (HHC).

3. OBJECTIVES

3.1. Main objective

- To determine the effect of malaria parasites on health of pregnant women

3.2 .specific objectives

- to determine the most common effect of malaria parasites on health of pregnant women
- to assess the risk factors associated with malaria parasites on health of pregnant women

4. RESEARCH QUESTION

I. What is the effect of malaria parasites on health of pregnant women attending antenatal care service of HHC?
II. What are the main risk factors associated with malaria among women attending antenatal care service of HHC?

5. RESEARCH HYPOTHESIS

I. Malaria prevalence is high in pregnant women attending HHC
II. The effect of malaria parasites could be high in pregnant women attending HHC
III. Season, age, and pregnancy term could be determined as major risk factors associated with malaria among pregnant women attending HHC

6. JUSTIFICATION OF STUDY

After reading different books, journals and some reports about malaria parasites among pregnant women around the world especially in sub Saharan where our country is located, and how malaria parasites among pregnancy women remain public health problem which affect many countries in the world and rate of mortality and other effects which is high especially in developing country, and how pregnant women frequented the hospitals, how they spend time and money in health facilities, this had motivated us to do this study on effect of malaria parasites on health of pregnancy women attending Hanika Health Center.

7. Interest of study

This study has three main interests: personal interest, social interest and scientific interest.

7.1. Personal interest

This research will help us to improve our knowledge in our career where more skills and knowledge will strengthen while completing this research with the aim of becoming professional in this domain. It will help us to get the ability to conduct experiments, as well as to analyze and interpret data. In addition this research will help to fulfill the requirements for the award of a Bachelor's Degree in Biomedical Laboratory Sciences.

7.2 Social interest

This research related to the effect of malaria parasites on health of pregnancy women attending HHC, the study intend to contribute to a new direction in the research for reducing the effect of malaria parasites on health of pregnant women especially those who live in Nyamasheke district where HHC located, it's honor to our country and for society in general to have population who are informed about the effect of malaria parasites particularly to the pregnant women and therefore take more effort about it.

7.3Scientific interest

This study will help other researchers who will conduct other related studies on malaria parasites as reference point. Also, this research is related to the Kibogora Polytechnic goal where it allows

shifting from theoretical acquired from biomedical laboratory science to practical in biomedical laboratory diagnosis.

8. Delimitation of the study

The study will have delimitation in domain, in time and in space. In domain, it will be carried out in all laboratory service but more focus on Parasitology unity, in period it will be conducted in a period of around 2 months from July to August 2018 and it will be carried out in HHC in Macuba sector, Nyamasheke district, Western Province.

9. Research Methodology

9.1 Study area

My study was carried out research in the laboratory and antenatal care departments of Hanika health centre which is the tests of malaria parasites and other difference tests and factors was collected. HHC is located in Western province, Nyamasheke District in Macuba sector.

9.2 study population

The population target of the study is all pregnant women that attended antenatal care service of HHC.

9.3 study design

The study was a cross-sectional study and retrospective study. In a cross-section part, filed data will be considered for retrospective part. Archived data and report from the health center it will used as retrospective study but we will focus more on cross-section study

9.4 Statistical analysis

Result was interpreted by using statistical packages as Excel program and Statistical Package for Social Sciences (SPSS) version 22.0.

10. Organization of the Study

This study will cover 5 chapters, namely general introduction, literature review which focusing the general information of the subject, materials and methods used, results and discussion and conclusion and recommendations.

CHAP 2: LITERATURE REVIEW

2.1: INTRODUCTION

Malaria is an infectious disease which infects millions of people on the globe annually. It is a global health problem, which affect mainly young children especially those less than Five years of age and pregnant women. However, everybody especially the non-immune is at risk of getting the disease. Malaria is caused by any of the human malaria parasites including; Plasmodium falciparum, Plasmodium malarae and Plasmodium ovale. The most dangerous, Common and dreaded malaria parasite is the plasmodium falciparum. Infection with p. Falciparum leads to a wide spectrum of clinical disease including life threatening anemia and coma in children and a severe disease syndrome during pregnancy in Primgravida woman (Miller et al 2002).

Malaria infection with plasmodium falciparum during pregnancy results in a wide range of adverse consequences for the pregnant woman, the developing fetus and the neonate. The clinical effects of malaria in pregnancy depend to a large extent on the immune status of the woman, which in turn is determined by her previous exposure to malaria or transmission intensity (Steketee *et al*., 1996). Acquired anti-malarial immunity depends on the intensity of malaria transmission, the number of previous pregnancies and the presence of other conditions such as human immunodeficiency virus (HIV) infection, which may further impair the efficacy of immune responses during pregnancy.

The particular dangers of malaria in pregnancy in these women are hyperpyrexia (very high fever), hypoglycemia, severe hemolytic anemia, cerebral malaria and pulmonary oedema (steketee *et al*., 2001). Women of all parties are affected (Hammerich *et al*., 2002). During the second half of pregnancy, malaria infection, in combination with maternal anemia, can interfere with fetal weight gain and contribute to intrauterine growth retardation or prematurity and thus result in low birth weight (Menendez*et al*., 2000).

2.2 DEFINITION OF KEY TERMS USED IN OUR STUDY

Below are the key terms that will be frequently used in this dissertation:

- **Primgravida:** A woman who is pregnant for the first time

- **Fetus:** In humans, the unborn young from the end of the eighth week after conception to the moment of birth, as distinguished from the earlier embryo.
- **Neonate:** A newborn infant ,especially one less than four weeks old.
- **Immunity:** the ability of an organism to resist disease, either through the activities of specialized blood cells or antibodies produced by them in response to natural exposure or inoculation (**active immunity**) or by the injection of antiserum or the transfer of antibodies from a mother to her baby via the placenta or breast milk (**passive immunity**).
- **Parasitaemia:** the condition of having parasites in the blood
- **Antigenaemia:** A condition in which viral antigen is present in the blood; occurs in viral hepatitis and may occur in smallpox, myxomatosis, and yellow fever.
- **Intermittent preventive treatment (IPT)**: IPTp entails administration of a curative dose of an effective antimalarial drug (currently sulfadoxine-pyrimethamine) to all pregnant women whether or not they are infected with the malaria parasite. IPTp should be given at each routine antenatal care visit, starting in the second trimester.
- **Intermittent screening and treatment:** a rapid diagnostic test for malaria at scheduled ANC visits and treatment of women only if positive
- **Maternal age:** The age of the mother at the period of conception
- **Gravidity:** The number of pregnancies (complete or incomplete) experienced by a woman.
- **Child bearing:** relating to the process of conceiving, being pregnant with, and giving birth to children

- **Hemoglobinopathy**: a blood disorder (such as sickle cell anemia) caused by a genetically determined change in the molecular structure of hemoglobin

- **Gestation:** the period of development of the young in viviparous animals, from the time of fertilization of the oocyte (ovum) to birth

- **Gestation period:** the duration of PREGNANCY

- **Pregnancy**: The period from conception to birth. After the egg is fertilized by a sperm and then implanted in the lining of the uterus, it develops into the placenta and embryo, and later into a fetus .Pregnancy usually lasts 40 weeks, beginning from the first day of the woman's last menstrual period, and is divided into three trimesters, each lasting three month

- **Glomerulonephritis:** is a group of diseases that injure the part of the kidney that filters blood (called glomeruli). Other terms you may hear used are nephritis and nephrotic syndrome.

- **Nephritic Syndrome:** is a collection of symptoms which occur because the tiny blood vessels (the glomeruli) in the kidney become leaky. This allows protein (normally never passed out in the urine) to leave the body in large amounts

- **Hypovolemia:** abnormally decreased volume of circulating blood in the body;

- **Rhabdomyolysis**: a paroxysmal, potentially fatal syndrome caused by the breakdown of skeletal muscle fibers. It is characterized by the presence of myoglobin in the urine. It may result from untreated compartment syndrome. It is also associated with acute renal failure.

- **Jaundice:** Jaundice is a condition in which a person's skin and the whites of the eyes are discolored yellow due to an increased level of bile pigments in the blood resulting from liver disease.
- **Hepatomegaly:** Abnormal enlargement of the liver.

2.4 BACKGROUND ON MALARIA

Malaria is a protozoa disease caused by infection with parasites of the genus plasmodium and transmitted to man by certain species of infected female anopheles mosquito. The clinical features of malaria vary from mild to severe and complicated according to the species of parasite present, the patient’s state of immunity, the intensity of the infection and also the presence of

concomitant conditions such as malnutrition or other diseases, park, (2007) Malaria and mosquitos- this association between insects and human disease is familiar to most of us. Indeed, to many the mere mention of mosquitos is enough to suggest malaria. It is, however, a sobering thought to recollect that it is not so long since medical dictionaries defined "malaria" as a fever contracted from the miasma rising form swamps and prevented by sleeping with the windows closed.

Malaria is one of the oldest recorded diseases in the world. In the 18thcentury Italy, people associated malaria with "bad air"- mal' aria- from which the name malaria is derived. In 1880, Laveran, a French army surgeon discovered the malaria parasite in Algeria, North Africa. Throughout the ages, suspicion fell on the part played by insects, and the mosquito incriminated in to folklore in Africa, Asia and Europe. The main credit goes to Ronald Ross, who discovered the transmission of malaria by anopheles mosquitoes in 1897. Ross found malaria parasite growing ascysts (oocysts) on the stomach wall of an anopheles mosquito *(*anophelesStephensi*)* which had previously fed on malaria patient, John, (1997) in further work write bird, Ross showed that mosquitoes could transmit malaria parasite from bird to bird. For his covers Ross was awarded the noble prize in 1902. (Ahmed, 2009)

Discovery of transmission human parasites plasmodium in 1898-1899.chloroquine (resochin) was discovered by German in 1934. Finally recognized and establish as effective and save anti malaria in 1946 by British and use scientists. (Ahmed, 2009)

Discovery of transmission of human malaria plasmodium(1889-1899) the presence of malaria in the blood of monkey was observed as early as (1893) and one of these parasite found in east African monkey received name plasmodia kochi (later renamed hepatocystis kochi by garnham). ahmed,(2009)

In Rwanda, Malaria remains to be one of the causes of mortality and morbidity in Rwanda according to the Rwanda 2010 Demographic and Health Survey (DHS) and the Rwanda Health Sector Strategic Plan 2009 - 2012.Children under five and pregnant women are the most affected In 2010, the number of confirmed malaria cases in Rwanda was 8,517, corresponding to a 76% decline Compared to35, 688 confirmed cases during 2000- 2005.

2.5 RISK PEOPLE

Most cases and deaths are in sub-Saharan Africa. However, Asia, Latin America, the Middle East and parts of Europe are also affected. In 2006, malaria was present in 109 countries and territories.

2.5.1 SPECIFIC RISKS FOLLOW.

• Travelers from malaria-free regions, with little or no immunity, who go to areas with high disease rates are very vulnerable.

• Non-immune pregnant women are at high risk of malaria. The illness can result in high rates of miscarriage and cause over 10% of maternal deaths (soaring to a 50% death rate in cases of severe disease) annually.

• Semi-immune pregnant women risk severe anemia and impaired fetal growth even if they show no signs of acute disease. An estimated 200 000 of their infants die annually as a result of malaria infection during pregnancy.

• HIV-infected pregnant women are also at increased risk. (WHO, 2005) pregnant women are particularly vulnerable to malaria as pregnancy reduces a woman's immunity to malaria, making her more susceptible to malaria infection and increasing the risk of illness, severe anemia and death

2.6 EPIDEMIOLOGY OF MALARIA IN PREGNANT WOMEN

Pregnant women are most vulnerable of getting infected with malaria, after children below the Age of 5 years. In spite of the possible measures to prevent the disease, the prevalence of malaria During pregnancy remains high. An estimated 54.7 million pregnancies occurred in areas with Stable Falciparum transmission in 2007 and an additional 70.5 million in areas with low malaria Transmission or with P.vivax only .The incidence and thus the risk of getting malaria in the areas of low transmission is much lower than stable transmission areas, so only a small proportion of the 70 million women actually acquired malaria. In Africa approximately 25 million women are at risk of *P. falciparum* infection during pregnancy every year, and one in four women has evidence of placental infection at the time of delivery. In African areas of low or seasonal

Transmission the median prevalence of peripheral and placental Parasitaemia was approximately 14%and7%. (Rulisa, 2014)

2.7 TRANSMISSION OF MALARIA PARASITES

Malaria parasite enter the human body via the bite of malaria carrying mosquito of the genus anopheles. The parasite invade the liver via the blood stream and multiply. During this period, the victim does not feel ill after about nine days or longer, depending on the species, the parasite (called merozoites) enter the blood stream, invade the red blood cells, and again multiply. A few days after the appearance of the first symptoms some merozoites develop into gametocytes, the sexual stage in the life cycle. Anopheles mosquito that feed on a person with gametocytes in the blood become infected and parasites undergo another phase of reproduction in the insects. At the end of this process a new generation of malaria parasites called sporoziotes, migrates to the salivary glands of the mosquito where they remain until the insect bites a person and injects the sporozoites together with its saliva into a new human host. The sporozoites then invade the liver and the cycle is repeated. The cycle in the mosquito usually lasts between 9 and 12 days. (Ahmed, 2009)

Malaria can also be transmitted accidentally by the transfusion of blood-containing malaria parasites, or through contaminated needles or syringes during pregnancy, fetus can become infected with parasites from the blood of the mother (Trans placental transmission) (Ahmed, 2009)

2.8 DIAGNOSIS OF MALARIA:

2.8.1 Suspected malaria:

Malaria is suspected when a patients with fever (or history of fever) and other symptoms and signs suggesting of malaria (e.g. headache, vomiting, sweating). The health care worker in this case has to exclude clinically other common causes of fever in this area, such as: tonsillitis, chest infection, measles, abscess, urinary tract infection, etc…

2.8.2 Laboratory diagnosis of malaria:

For microscopic diagnosis of malaria, thick blood film is required. Good laboratory setup is essential in addition to trained personnel. Giemsa stain is recommended to be used in most country of the world. In the result form the following should be stated clearly:

- Presence of infection (positive or negative).
- Stage of the parasite.
- Parasite count

2.9.3 Rapid diagnostic Test (RDTS):

At present the usefulness of RDT, e.g. Immuno-chromatographic test (ICT), should be considered in relation to the intensity of transmission. In areas of high transmission (irrigated schemes and the south of Sudan), RDTS in their present form are not much use in general, since a lot of asymptomatic Parasitaemia and Antigenaemia are present in the community. Despite of their high cost, RDTS are useful:

- In the peripheral as they can be performed by unskilled personnel in
- Areas of moderate to low transmission.
- At emergency and epidemics situations.
- Where the cost of malaria treatment high to avoid unnecessary use of drugs. (NMCP, 2004)

2.9.4 Confirmed Malaria:

A malaria cases is confirmed by demonstration of a sexual forms (trophozoite stage) of the parasite in the thick or thin peripheral blood film or by rapid diagnostic test in the presence of fever. (NMCP, 2004)

2.10 CORRELATION OF MATERNAL AGE AND MALARIA INFECTION

A number of studies conducted in sub-Saharan Africa have reported a significant association between maternal age and malaria infection during pregnancy. In a study conducted in Blantyre, Malawi, after stratifying by gravidity, associations between age and parasite prevalence were stronger than those between gravidity and prevalence after stratifying by age. Under conditions

of low-to-moderate transmission, pregnancy-specific immunity is slow to develop, and age-related immunity may influence malaria prevalence in child bearing years. (Akindele, 2010)

Studies have shown that young women of child-bearing age may be more susceptible than older women to malaria because they are still in the process of acquiring natural immunity to malaria. (Aziem, 2011) In Cameroon, age was a major risk factor for placental malaria, with younger first-time mothers more likely to have placental malaria. Similarly, in DRC mothers with malaria placentas were younger (mean age 24) than mothers with non-malarious placentas (mean age 29). It was suggested that development of pregnancy-associated immunity, i.e., production of antibodies that inhibit the adherence of placental parasites to chondroitin sulfate, may be very important in women less than 25 years of age who have lower levels of acquired immunity (through less frequency of exposure to the bites of p. Falciparum infected mosquitoes) than in older women who may have obtained adequate immunity following repeated exposures and thus are less dependent on anticyto adherent antibodies (Moureen, 2016) . However, it is important to state that in malarious areas, pregnancy-associated and age-dependent immunity to placental malaria may be influenced by host or environmental factors

2.11 CORRELATION OF MALARIA AND GLYCEMIA

Hypoglycemia due to malaria is seven times more frequent in pregnancy than in a non-pregnant woman. Lactic acidosis and hypoglycemia result from hepatic involvement. Due to the metabolic requirements of both the fetus and the parasites, a pregnant woman may suffer from severe hypoglycemia. The plasmodium parasites not only consume maternal glucose but also stimulate the pancreatic beta cells, leading to hyperinsulinemia, and ultimately severe hypoglycemia. The hypoglycemia is manifested by dizziness, blurred vision, cold extremities, and hypotension. When hypoglycemia is severe can progress to mental status changes and convulsions. Early recognition and treatment of patients with falciparum malaria and hypoglycemia can significantly affect the patient's ultimate outcome(Aziem, 2011)

2.12 CORRELATION OF MALARIA AND ANEMIA

Anemia is one of the world's leading causes of disability (Kowalski m, 2001) and thus one of the most serious global public health problems. It affects nearly half of the pregnant women in the world: 52% in non-industrialized countries as compared with 23% in industrialized countries

(pathmanathan et al., 2003). The commonest causes of anemia are poor nutrition, iron and other micronutrient deficiencies, malaria, hookworm and schistosomiasis, HIV infection (loudon i., 1992) and haemoglobinopathies make important additional contributions. Anemia during pregnancy has serious clinical consequences. It is associated with greater risk of maternal death, in particular from hemorrhage (seneviratne hr, 2000) the most significant effect of malaria in pregnancy on the mother is anemia and WHO defines anemia in pregnancy as hemoglobin levels of 11g/dl or less.

Anemia is commonly seen in all forms of malaria, but may be especially severe with p. Falciparum. In sub-Saharan Africa, it is estimated that between 200,000 and 500,000 pregnant women develop severe anemia as a result of malaria, and p. Falciparum malaria in pregnancy is the primary cause of up to 10,000 maternal anemia-related deaths in sub-Saharan africa

Severe anemia results in infected patients for two reasons. First is due to RBC destruction associated with release of merozoites. Secondly, the elevated tnf-a produced from falciparum malarial infection causes suppression of hematopoiesis, all those will cause decreases in hemoglobin (Hb) concentration to < 11g/dl.

The mechanism of malaria-driven anemia can be described in association with iron status in pregnancy. The iron status in pregnancy is affected by malaria parasites, which influence the anemia observed in pregnancy. P. Falciparum may affect iron status through (1) reducing intestinal iron absorption, (2) sequestrating iron within the malarial pigment hemeozoin, (3) consuming iron for its own metabolism, (4) promoting/stimulating the mobilization of iron to body stores, and (5) releasing iron into the circulation during intravascular hemolysis

Anemia is more common in pregnant women than non-pregnant women for a variety of reasons, including the delusional effects of increased intravascular volume during the second trimester as well as the increased demand on iron and folate stores (Shulman ce, 1999; Menendez c, 2003).

2.13 CORRELATION OF MALARIA AND GESTATION AGE

. Maternal factors associated with the risk of malaria in pregnancy include gestational age, which is length of time that a fetus grows inside the mother's uterus. Gestational age is related to the fetus's stage of growth as well as its cognitive and physical development Gestational age is divided into two periods: embryonic and fetal. Preceded by the embryonic period, the fetal

period begins at the gestational age of week 10 and continues until birth. In general, gestational age is measured by the number of weeks that have passed since the first day of the mother's last menstrual period, it is well established that younger women, particularly adolescents, are at higher risk of malaria infection than older women, most of the available data on malaria relate to the second and third trimesters. the peak of malaria prevalence seems to occur during the second trimester. Studies on malaria burden in the first trimester of pregnancy are scarce, but it is believed that the rates are similar to that of the second trimester. However, considering the difficulty of collecting this information (pregnant women start to attend the antenatal clinic after the first trimester), and of determining the gestational age with accuracy, it is unclear whether the risk starts to increase towards the end of the first trimester. Indeed, in Burkina Faso, malaria prevalence was higher during the first as compared to the second and third trimesters,(Halidou, 2015). The gestational age of a fetus is particularly important when determining the potential negative effects of a fetal exposure to toxins or infection and has a direct impact when planning appropriate medical treatment for such situations

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.0 INTRODUCTION

This chapter discussed the methodology that is used in this study.it shows Description of study area, study design, study period, study population, sampling procedure, sample size, sample collection and preparation, research instrument for data collection and data analysis.

3.1 DESCRIPTION OF STUDY AREA

HHC is one of health center under Kibogora district hospital, is located in western province, Nyamasheke district, in Macuba sector, Rugali cell, village of Gatyazo.

3.2 RESEARCH APPROACH

The numerical data in terms of quantitative approach was used to explore the situation and also the qualitative will be used to explain in what we shows in numerical and explained in terms of word.

3.3 STUDY DESIGN:

Study was a retrospective antenatal record of HHC by comparing outcomes during pregnancy like anemia and hypoglycemia between pregnant women with malaria parasites and pregnant women without malaria parasites by identifying the age and gestation period as risk factors

3.4 STUDY PERIOD:

The study was carried out in HHC during two weeks by recording data which was recorded from July 2017 to July 2018.

3.5 STUDY POPULATION

The Study population was pregnant women who attend antenatal care of HHC during period of July 2017 to July 2018, and the total of corrected data was 471 pregnant women.

3.5.1 Inclusion criteria

All women with positive pregnancy test and had at least done the checkup of hemoglobin level, blood glucose level and albuminuria test.

3.5.2 Exclusion criteria

- All pregnant women where their both hemoglobin and glycaemia was not analyzed
- All pregnant women where their age and gestation period was not recorded
- All pregnant women where their malaria parasites was not examined

3.6 SAMPLE SIZE

This study was carried out among 471 pregnant women who attend HHC antenatal care during the study period.

3.7 SAMPLING PROCEDURE

Stratified random sampling is used, this is done by collecting data of all pregnant women who attended antenatal care of HHC from July 2017 to July 2018 as they was registered in record book of HHC antenatal department.

3.8 SAMPLE COLLECTION AND PREPARATION

Urine sample was taken for every pregnant woman who visited the antenatal care for testing pregnant test and albuminuria. Pregnancy test is done for those who come for their first time for making sure if she was pregnancy. Venous blood samples will be collected from every pregnant woman in two different tube, one in dried tube and another in EDTA tube for biochemistry (especially glycemia) and hematology (especially hemoglobin) test respectively. And also thick blood smear was done for every pregnant women who shows the symptoms of malaria

Hemoglobin was tested using sysmex machine while cobas machine was used for glycemia, malaria diagnosed using thick blood smear performed on dried slide and stained with giemsa with dilution of 1/10 (1ml of giemsa solution and 9ml of water), albuminuria and pregnant test was examined using deep stick rapid test.

3.9 RESEARCH INSTRUMENTS FOR DATA COLLECTION

- Papers
- Laptop
- Pen
- Antenatal care department record book
- Different laboratory record book
- PPE

3.10 DATA ANALYSIS

Data analysis is mainly done using excel and SPSS by comparing percentages in both pregnant women with malaria parasites and those without malaria parasites, the result will be shown as presented in tables and graph in next chapter. We checked on the normality of data of each variable by inspecting their plots, and ran a General Linear Model (GLM) to test the effect of malaria on hemoglobin and glycemia levels. We ran also a Generalized Linear Model to test whether season, age, pregnancy term, and interaction between age and pregnancy term can predict malaria in pregnant women.

3.11 ETHICAL CONSIDERATION

This research project submitted to the ethics committee of KP for approval. Researchers also sought and got the permission from the authorities HHC to run this research. Confidentiality of the participant's information was censured by using codes while recording tests results.

CHAPTER FOUR: RESULTS, INTERPRETATION AND DISCUSSION

4.1. RESULT INTERPRETATION

Our GLM analysis showed that malaria affects significantly the levels of hemoglobin and glucose ($F=140.38$, $p<0.005$; Table1). Between-variables analysis showed that malaria affects both hemoglobin and glucose levels (Table 2; Figures 1&2) while the age influences levels of hemoglobin but not glycemia (Figure 3), and pregnancy term influences the levels of glucose but not hemoglobin (Figure 4).In fact, among 471 pregnant women who attended antenatal care at Hanika health center, 125 (26.53%) was diagnosed with malaria positive (Table 3). Among those who were positive to malaria, 34(27.20%) had hypoglycemia while those who were negative to malaria,only 5 (1.40%) had hypoglycemia (Table 4).Our results also showed that among pregnant with positive malaria, 95(76%) had anemia while we had a lower number of anemia cases in women who were negative to malaria with 126(36.40%). There was 2(1.60%) albiminuria cases, in pregnant women with positive malaria and there was no albiminuria cases in pregnant women with negative to malaria (Figure 5).

Our analysis testing whether season, age, pregnancy term, and interaction between age and pregnancy term can predict malaria in pregnant women showed that the full model did not fit data than the null model, suggesting that a pregnant woman can be diagnosed positive to malaria at any season, at any age, and at any pregnancy term. However, we have to point out that that delimitation of the year in season may have biased our variable if rain pattern across 2017-2018 did not follow the conventional delimitation of seasons (Figure 6).

Table 1:Results of GLM analyzing the effect of malaria on hemoglobin and glucose levels

Model Term	Variable Type	F	P
Malaria	Predictor	140, 38	<0.005
Age of Woman	Control	3,63	0.027
Pregnancy Term	Control	6, 17	0.02
Hemoglobinemia	Response	NA	NA
Glycemia	Response	NA	NA

Table 2:Between-subjects analysis of predictors of hemoglobin and glucose levels

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	Hb	379,182	3	126,394	59,258	,000
	Glycemia	4719,465	3	1573,155	48,970	,000
Intercept	Hb	1118,601	1	1118,601	524,439	,000
	Glycemia	75435,863	1	75435,863	2348,214	,000
Age	**Hb**	**13,567**	**1**	**13,567**	**6,361**	**,012**
	Glycemia	18,228	1	18,228	,567	,452
Pregter	Hb	,155	1	,155	,073	,787
	Glycemia	**388,246**	**1**	**388,246**	**12,086**	**,001**
Mal	**Hb**	**369,288**	**1**	**369,288**	**173,135**	**,000**
	Glycemia	**4177,339**	**1**	**4177,339**	**130,035**	**,000**
Error	Hb	885,174	415	2,133		
	Glycemia	13331,785	415	32,125		
Total	Hb	54444,000	419			
	Glycemia	2504051,998	419			
Corrected Total	Hb	1264,357	418			
	Glycemia	18051,250	418			

Table 3: Pregnant women diagnosed with positive malaria

Anemia				Hypoglycemia				Albiminuria			
pos	%	neg	%	Pos	%	neg	%	pos	%	neg	%
95	76 %	30	24 %	34	27.20 %	91	72.8	2	1.60 %	123	98.40 %

Table 4: Pregnant women diagnosed with negative malaria

Anemia				Hypoglycemia				Albiminuria			
pos	%	neg	%	Pos	%	neg	%	pos	%	neg	%
126	36.40%	220	63.50 %	5	1.40%	341	98.60 %	0	0	346	100%

Table 5: comparison of mean and standard deviation in different categories

	All pregnant women		**Women for positive malaria**		**Women for negative malaria**	
	Hb	Glycemia	Hb	glycemia	Hb	glycemia
mean	11.65	76.69	9.7	70.4	12.2	77.6
SDV	6.9	4.2	1.6	1.8	1.4	5.2

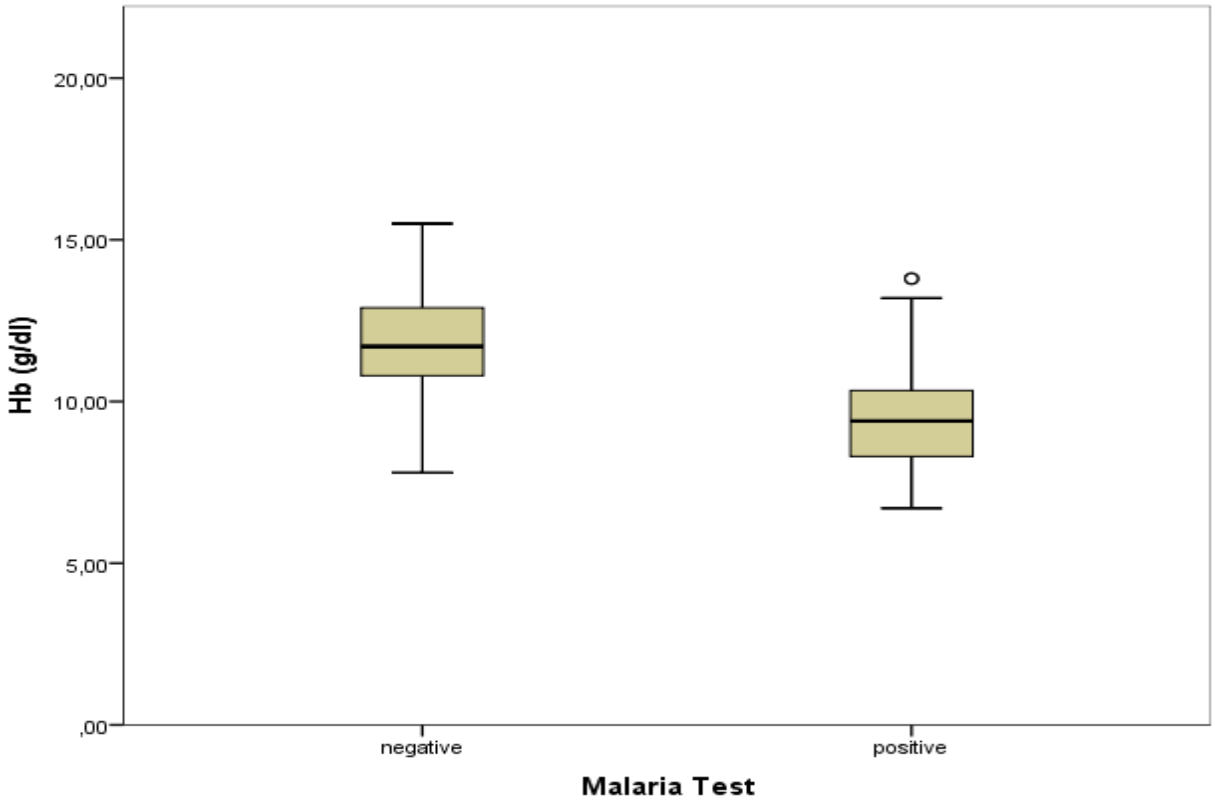

Figure 1:Pregnant women with malaria have lower levels of hemoglobin

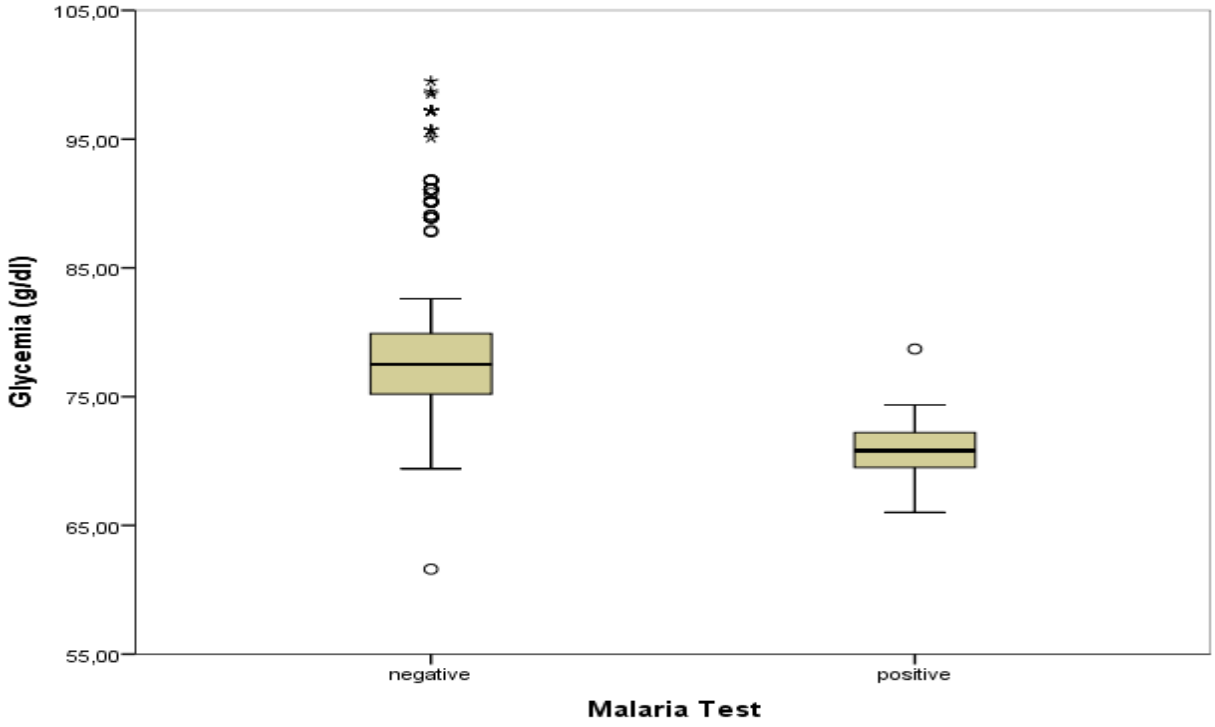

Figure 2:Pregnant women with malaria have lower levels of glycemia

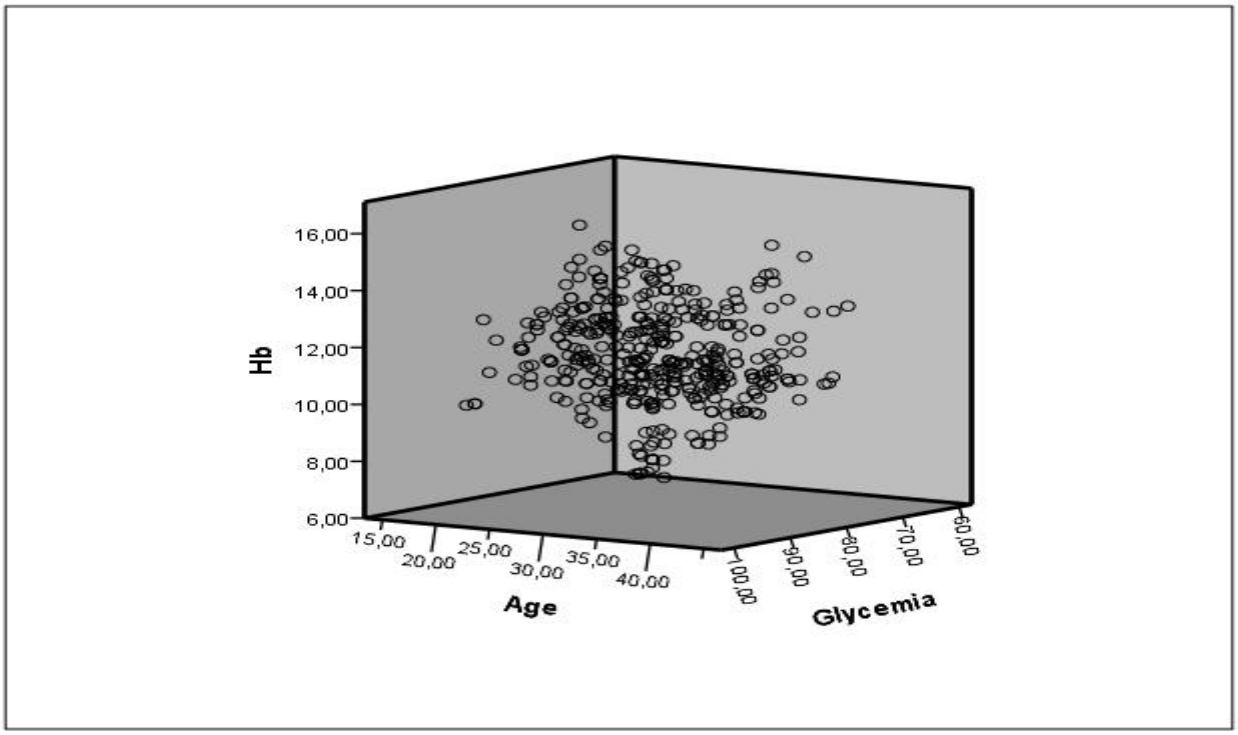

Figure 3:Hemoglobin levels are inversely associated with age

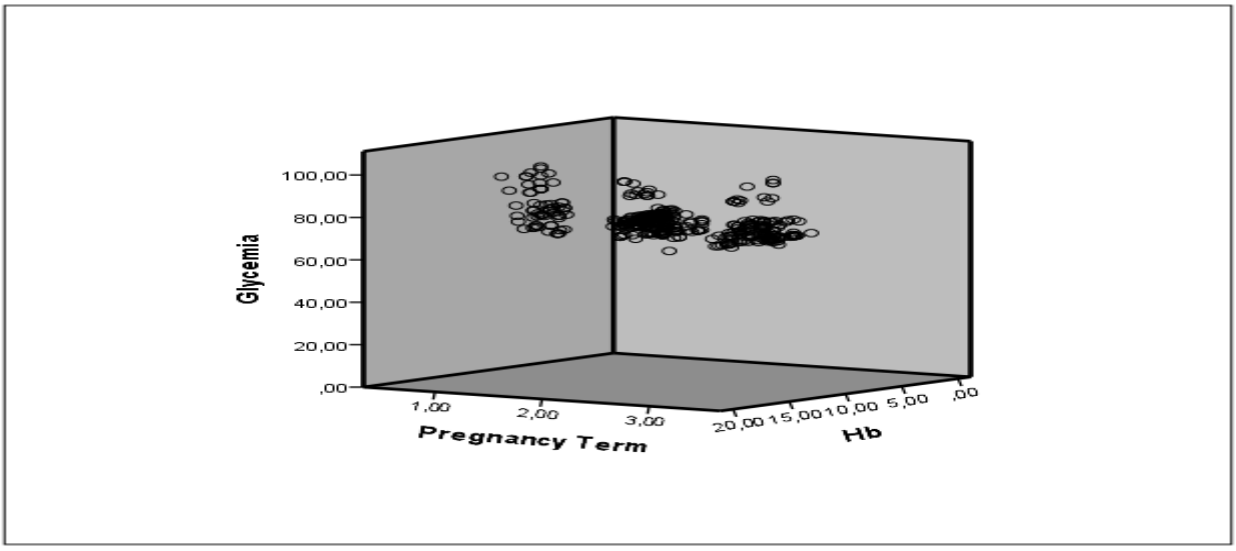

Figure 4:Glycemia levels versus pregnancy term

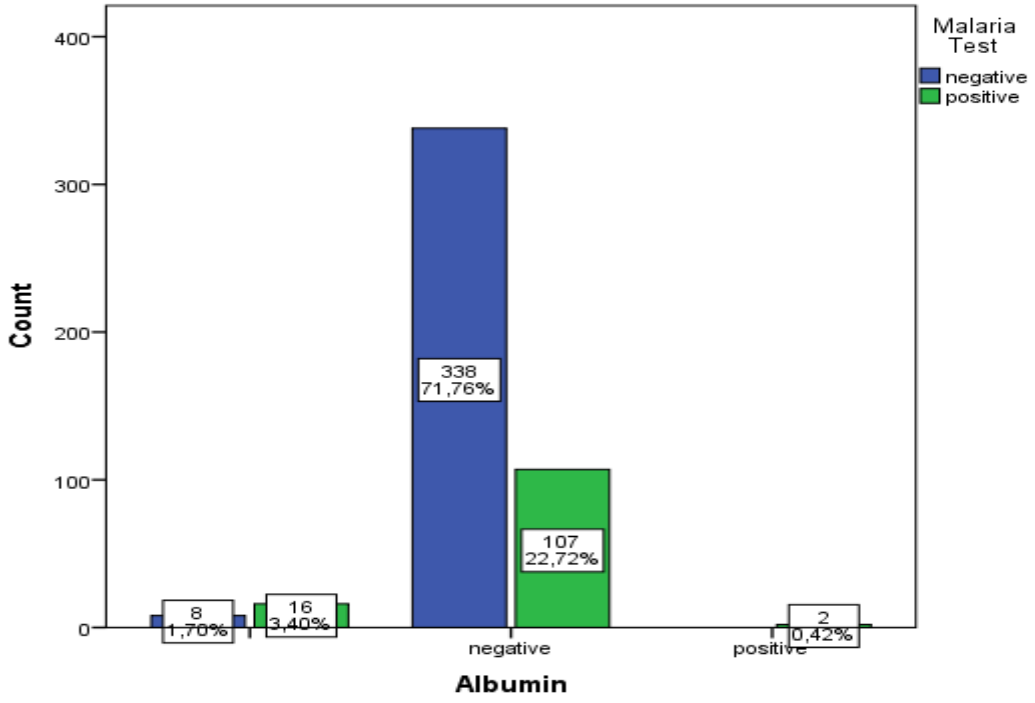

Figure 5:Albumin test results in relation to Malaria test results

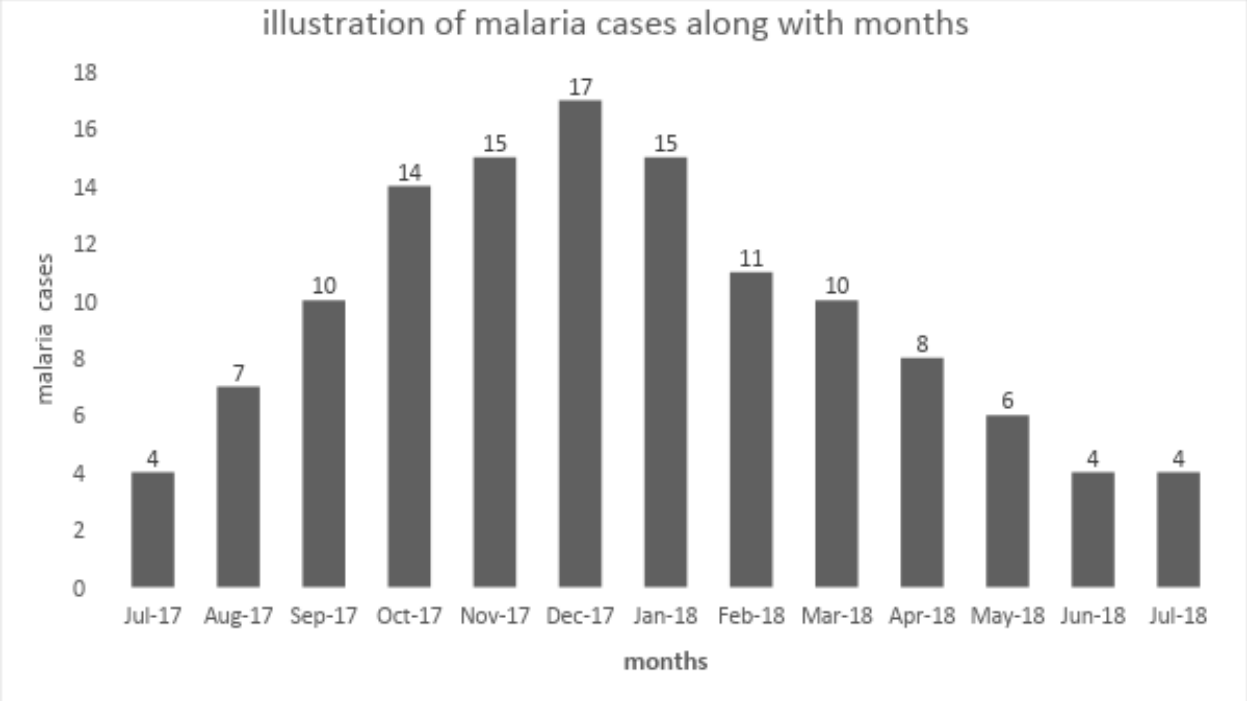

Figure 6:Distribution of malaria cases across the year

4.2 DISCUSSION

Our study showed that hemoglobin levels and glycemia are associated with malaria status among pregnant women visiting HHC. Our study also shows that pregnant term, age and season change, had no significant on malaria. This agrees with Lander (2002) who mentioned that age didn't have any significant association with malaria, however it also contrast to(menendez, 2000) where it was observed that maternal age was associated with malaria prevalence, showing that a pregnant woman of younger maternal age is at a greatest risk of malaria infection, as well as having the highest parasite densities.The mean haemoglobin was significantly lower in women with malaria infection which agree with ROGERSON, (2000) study who reported the similar pattern. Reduction of haemoglobin has been reported in areas of unstable transmission of malaria in Thailand and in Ethiopia, as well as in areas with stable transmission.Our study shows that glycaemia was negatively affected by malaria infection.N.J, (1983) argued that hypoglycemia is a frequently encountered complication in malaria that is usually ascribed to increased glucose use and impaired glucose production caused by the inhibition of gluconeogenesis.

Our study shows that there is no association between pregnancy prevalence and season change (dry and wet), which looks controversial to what is known. Even there are many researchers like (L.abel, 2013) who showed that there is significance effect of season on prevalence of malaria, it shows that in rain season there is high prevalence of malaria compared to dry season. In Rwanda, this pattern may have been buffered by a successful distribution and use of mosquito nets in all households.

Our study had some limitations like where some variables were missing for some pregnant women, just because the test was not conducted or recorded. Also, we didn't get chance to see how the variables especially those of response changed across pregnancy because some variables like hemoglobin or albiminuria were conducted once in all three antenatal visits. Furthermore, some pregnant women started to visit antenatal care service when they were already in the second term instead of first term. Lastly, we have faced a challenge of time limitation as we had very short period to carry out this research.

CHAPTER 5: CONCLUSION AND RECOMMENDATION

5.1: CONCLUSION

Outcomes of our study confirm that there are effect of malaria on health of pregnant women as it is shown on how hemoglobin and glycemia are more affected during pregnancy period more than how it is in contrast to that, and in our study, there is no effect of age, season change or pregnant term on prevalence of malaria on pregnant women. Therefore, malaria case must be taken as seriously problem in all season period, in all age group and even in each pregnant term because any pregnant woman at any season period regardless to pregnant term she is in, can suffer to low level of hemoglobin and glycemia which will further cause serious problem of anemia and hypoglycemia respectively

5.2: RECOMMENDATION

Firstly our recommendation are addressed to all women especially those who live in Macuba sector and its around where HHC located, that may take more attention on malaria parasites when they are in pregnancy period than any other time because is there they are more susceptible to be affected or get more complication of malaria, this attention must taken by using all means of prevention of malaria like using bed nets and IPTp (in country where it is still applicable) and all others measures

Secondary for health institution or others who are in charge must increase sansibilization to the citizens especially women by using all method of prevention of malaria as it is, especially in time of pregnant, and tell them to attend antenatal care service on time means from first term until the last one and all also make follow up of the how the different changes like hemoglobin and glycemia they are, so that they may take same measures on time when there is problem

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APPENDICES