RAPID DETECTION TEST OF MALARIA PARASITES IN PREGNANT WOMEN ATTENDING ANTINATAL CARE IN NAHUCHE PRIMARY HEALTH CARE BUNGUDU LOCAL GOVERNMENT AREA ZAMFARA STATE NIGERIA

BY

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NOVEMBER 2018

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A PROJECT
SUBMITTED TO THE
DEPARTMENT OF BIOLOGICAL SCIENCES
FEDERAL UNIVERSITY GUSAU

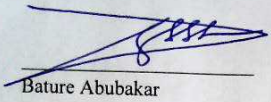
in partial fulfilment of the requirements
for the award of the Degree of

BACHELOR OF SCIENCE
ZOOLOGY

NOVEMBER, 2018

DECLARATION

I hereby declare that this project is written by me and it has not been presented before in any institution for a Bachelor Degree except for quotations and summaries which have been duly acknowledged.



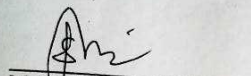
Bature Abubakar

21/01/2019

Date

CERTIFICATION

This project entitled"Rapid detection test of malaria parasites in pregnant women attending antenatal care in Nahuche Primary Healthcare, Bungudu Local Government Area,Zamfara State, Nigeria" meets the regulation governing the award of Bachelor of Science of the Federal University Gusau and is approved for its contribution to knowledge and literary presentation.



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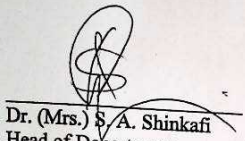

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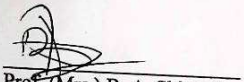

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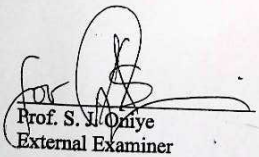

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DEDICATION

This project is dedicated to my parents Muhammad keku, Usman Balarabe Keku Nahuche and My mother Aisha Namakka Nahuche, Hajiya Yelwa Abu Nahuche and Hajiya Maikudi Kwatar kwashi, with the rest of my family.

ACKNOWLEDGEMENTS

My gratitude goes to Allah the Almighty for making this project a success. I would also like to extend my sincere appreciation to my able and capable Supervisor Malam Sirajo Isma'ila Moyi, who sacrificed his precious time and diligently worked towards the completion of this project. I appreciate your outstanding contributions and your efforts will forever linger in my mind, may Allah (S.W.T) bless him and his family with Jannatul Firdausi. I also thank the entire Staff of the Department of Biological Sciences, Faculty of Science for their moral and scholarly counseling throughout the time of my study.

Also my sincere gratitude goes to my beloved Family who rendered enormous assistance towards the success of my study in this University. May Allah guide them, protect them and reward them with Jannatul Firdausi. My acknowledgement also goes to my beloved brothers and sisters for their prayers, support and assistance towards the success of my study. May Allah reward them abundantly?

I also like to extend my acknowledgement to Malam Hassan Usman, Malam Sufiyanu and Malam Nurudeen Salisu for their kind help during the period of my research work; I really appreciate their outstanding contributions. May Allah reward them abundantly.

Finally, my acknowledgement goes to all my friends such as Ahmed Usman, Amina Usman, Sadiq Usman, Aminu Usman, Mahi Usman, Arabi Lawali and all my Coursemates. Thank you all and God bless, Amin.

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ABSTRACT

Malaria is a life- threatening disease caused by protozoan parasite of genus plasmodia that are transmitted to people through the bites of infected mosquitoes. 100 blood samples of pregnant women attending Nahuche PHC, Bungudu Local Government Area, Zamfara state were collected and examined for malaria parasites using rapid diagnostic test kits. Out of 100 pregnant women examined, 60 were malaria positive in this study representing 60% prevalence. The highest malaria prevalence was seen in pregnant women within 21 - 26 years age group. This was due to the fact that the pregnant women mostly were their first pregnancy and has depressed immunity due to pregnancy, whereas age group of < 24 year was reported to be at a high risk. The results showed that malaria prevalence decreased with increasing age but increased in age group > 34 years, this could be attributed to their weakened immune status due to their old ages. Also according to trimester showed that pregnant women that were in first trimester have higher prevalence of 71.8%, followed by those in second trimester 60% and those in third trimester 42.3%. This result showed there is high prevalence of malaria among pregnant women in the study area and therefore prompt treatment has to be employed and pregnant should be encouraged to use insecticide treated nets in order to reduce human-vector contacts.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Malaria is a life- threatening disease caused by protozoan parasite of genus *Plasmodia* that are transmitted to people through the bites of infected mosquitoes. *Plasmodium* is by far the best known of all protozoan parasites, because of the life threatening nature of the disease it cause to both humans and animals. Malaria is a debilitating infection disease characterized by chills, shaking and periodic bouts of intense fever. It is transmitted from person to person by the bite of infected female *Anopheles* mosquito. The infection leads to paroxysm, nausea fever, sweats, anaemia, hepatomegaly, chronic relapsing course and even death (Moyi *et al.,* 2013).

Plasmodium causes multiple manifestations or complications (some severe, others fatal), these include hyper-parasitaemia, cerebral malaria, hyperpyrexia, severe anaemia, hypoglycemia, renal failure and shock. *Plasmodium falciparum* malaria is the most lethal of the infections caused by human malaria parasites. It exhibits the most complications and its manifestations can mimic several diseases including typhoid, influenza and infections of the central nervous system such as meningitis (Moyi *et al.,* 2013).

Malaria parasites have the widest distribution, extending through the tropics, subtropics, temperate zones, central West Africa and some south pacific islands defending on the species. Some occur sporadically in different parts of the world like *p. malaria* (Moyi *et al.,* 2013).

Mosquito were perceived as the transmitter of malaria, but the causation/transmission model of people differed from the biomedical facts. Convulsion, a common complication

of malaria was perceived as a supernatural illness, best treated by traditional medicine, as was splenomegaly. Fever with convulsion remains an important and one of the commonest emergencies among pregnant women/children in the tropics. The commonest cause is malaria. Others are upper respiratory tract infections, pneumonia, urinary tract infections, and viral infections. Local understanding of fever illness and associated treatment was complex. Some fever illness classifications were more commonly mentioned, including fever of mosquito, chest problem, the disease of stomach and jerk, all of which could be biomedical malaria (Chessborough, 2005).

Malaria parasites also found in all countries extending from 40° South to 60° N. The tropical zone is the endemic home of all malaria parasite of sub-tropical zone, *P. vivax* is the prevailing specie of the temperate zone (Chessborough, 2005).

Plasmodium can infect mammalian red blood cells, reptiles and birds. Several specie of *anopheles* Mosquitoes can be infected by protozoa depends on nectar for feed, as such are not involved in the transmission of disease. The female depends on products from blood as to burst egg production. Due to this variation in the feeding habit only about 50 species is concern in the transmission of human malaria (Beeson and Duffy, 2005).

1.2 Statement of research problem

WHO (2016) reported that nearly half of the worlds population was at risk of malaria. Most malaria cases and deaths occur in sub-saharan Africa with 91 countries and areas had ongoing malaria transmission.

Some population groups are at considerably higher risk of contracting malaria, and developing severe disease, than others. These include infants, children under 5 years of age, pregnant women and patients with HIV/AIDS, as well as non-immune migrants,

mobile populations and travelers. National malaria control programmed need to take special measures to protect these population groups from malaria infection, taking into consideration their specific circumstances (WHO, 2016).

1.3 Justification

The increase level of morbidity and mortality of people at all age because of malaria parasite infection and continuous effort by World Health Organization (WHO) to eradicate malaria which has been a health problem because of high transmission rates especially pregnant women and children under five, this lead to this research work to find out the prevalence of malaria infection among patients attending Nahuche PHC Bungudu local Government Zamfara state.

1.4 Aim of the study

The aim of this study is to determine the prevalence of malaria parasites among pregnant women attending antenatal care at Nahuche Primary HealthCare, Bungudu Local Government, Zamfara state.

1.5 Objective of the study

a To determine the prevalence of malaria parasites among pregnant women attending antenatal care at Nahuche PHC Bungudu local Government Zamfara state.

b To determine the prevalence of malaria parasites based on age of the pregnant women.

c To determine prevalence of malaria parasites base on trimester.

1.6 Hypotheses

a. There is no malaria parasites among pregnant women attending antenatal care at Nahuche PHC, Bungudu local Government, Zamfara state.

b. The Prevalence of malaria parasites among women does not depend on age of the women.

c. Prevalence of malaria parasites among pregnant women does not depend on trimester.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Malaria is one of the world's major diseases. It affects many millions of people and the world health organization estimates that up to million people die from Malaria each year in Africa alone. Malaria is common in many parts of the tropic, and occurs in some sub-tropic area. It is caused by parasitic protozoan of the genus *Plasmodium* (Beeson and Duffy, 2005).

The parasites are sucked up in the blood when a female *anopheles* mosquito feeds on an infected person. They then reach the mosquito's stomach and undergo complicated changes, which result in young parasites finding their way to the mosquito's slivery glands. When another victim is bitten, the parasites pass to him from the salivary duct of the mosquitoes (Beeson and Duffy, 2005).

2.2 Life cycle of *plasmodium falciparum*

The Malaria parasite passes its life cycle in two different hosts.

In Man; the parasite residing inside the liver cell and the red blood cell reproduces by a sexual method (Schizogony) hence man represents the intermediate host.

In Female *Anopheles* mosquito; for the initiation of the mosquito cycle, sexual forms (male and female gametocytes) are first developed inside the human host.

They are then transferred into their insect host where they develop further and are transformed into sprozoites. These sporozoites are infective to man. In this sexual method of reproduction, mosquito represents the definitive host of malaria parasite (Beeson and Duffy, 2005).

In the case of feeding, fluid was released by the female mosquito from the salivary gland into the host which may contain sporozoites, if the mosquito had feed on blood meal for two to four weeks previously, which contained male and female gametocytes, sporozoites enter the circulation immediately and a brief parasitemia occur which exists for less than an hour. The sporozoites which precedes to hepatic parenchyma cells, initiating a pre-erythrocytic stage is usually short in *P. falciparum* (5 to 7 days) and *P. vivax* (6 to 8 days) but some what longer in *P. ovale* (9 days) and *P. malariae* (13 to 16 days). The resulting merozoites from the hepatic cell are released into the circulating erythrocytes, occasionally, when the number of sporozoites inoculated is very low, the period from injection to onset of erythrocyte infection takes a month or even a year (Beeson and Duffy, 2005).

The merozoites which made their way into the red blood cells by inducing erythrocyte, endocytosis, and the organism begins to developed with a vacuole in the erythrocyte. Using giemsa of right stains, the parasite is first identified with light microscope as a characteristic ring-form an early trophozoite; the organism increases in size partially filling the red blood cells. The nuclear material late differentiated by schizogony, and the red blood cell becomes partially with cytoplasm and the multiple nuclear of the schizont, The erythrocyte is complete when the red blood cells rapture, releasing the merozoite formed from the schizont, which then invade other erythrocytes. This cycle take 48 hours in *P. vivax, P. ovale, P. falciparum* 72 hours in *P. malariae* by mechanism which contain completely unknown, some merozoites do not continue the cycle of schizogony but develop into female and male gametocytes (Bradley *et al.*, 1996).

2.3 Classification of malaria parasite

Plasmodium vivax .

Plasmodium malariae.

Plasmodium falciparum.

Plasmodium ovale.

Plasmodium knowlesi.

They all belong to the:

Domain: Eukaryota

Kingdom: Protoctista

Phylum: Apicomplexa

Class: Sporozoea

Subclass: *Coccidia*

Order: *Eucoccidiida*

Suborder: Haemosporina

Family: - *Plasmodiida*

Genus: *Plasmodium*

Species include: *P. vivax, P. ovale, P. falciparum, P. malariae* and *P. knowlesi* (Dickson and Karapelou, 1997).

2.4 General life cycle of malaria parasite

The malaria parasite life cycle is divided into sexual life cycle and asexual life cycle.

2.4.1 Sexual life cycle (Malaria parasite)

Different species of *anopheles* mosquito transmit different species of malaria; the mosquito becomes infected when she ingests the macro gametocytes and micro

gametocyte present in the peripheral blood of an infected human host (intermediate host). The red cell cytoplasm is digested away from the gametocyte within the lumen of the mosquito stomach (Thovang, *et al.*, 1991).

Micro gametocytes differentiate and divide into 6 flagellated micro gametes. The process of micro gamete formation is termed ex flagellation. Each micro gamete can fuse with a single macro gamete, thus forming zygote, termed the ookinete. After fusion of the two nuclei, the organism become diploid, ookinete formation takes about 18hours for completion.

The ookinete penetrates between the columnar epithelium and comes to rest just under the connective tissue sheath and further differentiates into the oocyst, each oocyst undergoes nuclear reduction, then a series of nuclear and cytoplasm division cycle, resulting in the production of thousands of haploid sporozoites. Sporozoites production is complete within 8-10 days after ingestion of gametocytes. The sporozoites enter the haemocoel by penetrating the wall of the oocyst. Each sporozoites is approximately 2-3um long and possesses a single centrally located nucleus (Thovang, *et al.*, 1991).

Sporozoites site select within the cytoplasm of the cuboidal epithelium lining the salivary glands and the lumen of the gland. They gain entrance into the human intermediate host when the mosquito injects them, together with salivary secretions, during the taking of her next blood meal. Female mosquito in the genus *anopheles* is the definitive host for all species of malaria including *Plasmodium vivax* (Dickson and Karapelou, 1997).

2.4.2 Life cycle

2.4.2.1 *Plasmodium vivax*

The sporozoite is the infectious stage and is 2-3um long. Sporozoite is injected, along with the salivary secretion of the mosquito, into the human intermediate host when an infected female *anopheles* mosquito takes a second or third blood meal. The sporozoites travel via hematogenous route to the liver, where they enter parenchyma cells, there by initiating the exo-erythrocytic cycle. Following differentiation into merozoites, the organisms divide by schizogony into hundred infectious units. The exo-erythrocytic cycle takes about 6-8 days to complete, culminating in the rapture of the infected parenchyma cell, with the consequent release of about 10,000 parasites into the blood stream. Merozoites cannot enter new parenchyma cells but can enter red blood cells. Entry into the red cell signals the unset of erythrocytic cycle. Some merozoites, instead of repeatedly dividing within the parenchyma cell, differentiate into a dormant non dividing stage termed as hypnozoite, this stage can go on to replicate into merozoite at a later time in the infection. Activation of hypnozoites results in a release of infection and can occur at any time after initial infection up to 5years. Replication of *P. vivax* within the red blood cell occurs through an asexual division process, and begins the sporozoites stage. The single nuclea sporozoite grows within the red cell, feeding mainly upon the protein portion of hemoglobin. During this time, the infected red cell becomes deformed and enlarged. Nuclear division occur repeatedly, resulting in 16 to 32 nuclei the cytoplasm then divides, separating each nucleus into a merozoite (Dickson and Karapelou, 1997).

The infected red cell ruptures, releasing the parasite into the blood stream, after entering a new red cell, the division cycle is repeated, one erythrocytic cycle is completed within 41-45 hours. These two stages are infective for the definitive host, there is no reservoir host for any species of human malaria (Dickson and Karapelou, 1997).

2.4.2.2 *Plasmodium ovale*

The sporozoite is the infectious stage and is 2-3um long. The sporozoites of *Plasmodium ovale* are injected along with salivary secretion of the mosquito, into the host when an infected female *anopheles* mosquito takes a second or third blood meal. Sporozoites are passively carried by the blood stream to all organs, but only survive if they reach the liver. In the liver, the sporozoites breakout of the capillaries and penetrate parenchyma cell initiating the exo-erythrocytic cycle. The parasite differentiate into merozoite, some merozoites differentiate further into hypnozoites, a non-dividing stage, while others undergo multiple divisions resulting in the formation of mature schizonts. Each schizont give rise to about 15,000 organism and take 9 days to fully mature.

Mature schizont rupture, there by releasing merozoites into adjacent capillaries invasion if red cells by the merozoites then ensues, thus beginning the erythrocytic cycle. merozoites are un able to invade parenchyma cells. Hypnozoites can mature into schizonts with attendant release of merozoites, thus initiating a new erythrocytic cycle, when this occur the infected individual experiences a relapse of the infection. Relapse can apparently occur at any time up to 5years after the initial infection. Invasion of a red cell by a merozoite results in the development of the early tropozoite stage, known as the signet ring stage (Thovang, *et al.*, 1991).

Growth of the tropozoite culminates in the digestion of most of the hemoglobin of the red cell. A particular waste product of hemoglobin digestion, hemozoin, accumulates in the un occupied portion of host cell cytoplasm. The overall diameter of the infected red cell increases and its shape become irregular. Nuclear division takes place within a sanctum of parasite cytoplasm. Following nuclear division. The cytoplasm divides. Thus 8 to 10 merozoites are formed and are collectively termed the mature schizont. The entire process of nuclear and cytoplasmic division is termed schizogony.

The mature schizont ruptures, freeing its complement of merozoites into the blood stream. Each released merozoites has the opportunity to invade a new red cell. The erythrocytic cycle takes 49-50 hours to complete. Not all merozoites that enter red cells divide, rather some differentiate into pre-sex cells. The female pre-sex cell is termed macro gametocyte (Thovang, *et al*., 1991).

The male pre-sex cell is called micro gametocyte. The mosquito acquires her infection by ingesting macro and micro gametocyte along with her blood meal there are no reservoir host for any species of human malaria (Dickson and Karapelou, 1997).

2.4.2.3 *Plasmodium malariae*

The sporozoite is 2-3um long and is the infectious stage. Infection in the human host by *Plasmodium malariae* begins when the sporozoites are ingested, along with the salivary secretion into the blood vessels in the skin by an infected female *anopheles* mosquito. The sporozoites are passively carried to the liver as well as to other part of the body by the blood stream. In the liver, the sporozoites enter parenchyma cell and differentiate into merozoites, signaling the beginning of the exo-erythrocytic cycle. Division of the

merozoites results in the production of about 2,000 parasites, taking about 12-16 days to complete (Luzzi, *et al*., 1991).

The mature schizont ruptures the infected cell and the merozoites enter the blood stream. Merozoites are unable to invade parenchyma cell *P. malariae* does not form hypnozoites, however initial infection can last for up to 30 yeaers, even after treatment. The erythrocytic cycle start with the invasion of the red cell by the merozoite as with all other species of malaria, the early trophozoite stage is commonly referred to as the signet ring stage. The trophozoite feeds upon the protein portion of hemoglobin and enlarge to fill most of the host cell cytoplasm, unlike *P.vivax* and *P.ovale*, *P.malariae* infection does not alter either the size or shape of the infected erythrocyte.

Nuclear and cytoplasmic division (schizogony) sequentially occur, resulting in the production of merozoites. Hemozoin, a solid waste product of hemoglobin digestion, is sequestered into the center of the infected red cell cytoplasm. The red cell plus the organism inside it's called the mature schizont (Luzzi, *et al*., 1991).

2.4.2.4 *Plasmodium falciparum*.

The sporozoite is the infectious stage and is 2-3um in length. Infection begins in the human host when an infected female *anopheles* mosquito injects sporozoites, along with the salivary secretion, into blood vessels in the skin while she is taking a second or third blood meal. The blood stream transports the sporozoites to all part of the body. However, in order to continue the life cycle, sporozoites must reach the liver and penetrate into parenchyma cells.

Once in their intra cellular niche, each sporozoite differentiates into a merozoite and begin to divide, beginning the exo-erthrocytic cycle. Schizogony takes 5-7days to

complete, resulting in the production of approximately 40,000 parasites per infecting sporozoite. The mature tissue schizont ruptures its infected parenchyma cell and the merozoites enter the blood stream, merozoites only infect red cells. Hence are invasion of the liver is not possible. Only a sporozoite transmitted by the bite of another infected mosquito can initiate new exo-erythrocytic cycle if division. No hypnozoites are formed by *P.falciparum.*

Merozoites begin the erythrocytic cycle by invading red cells with *P. falciparum* it is common to have more than one parasite in each red cell. This early stage of development is called the trophozoite and is commonly found in the peripheral circulation. Unlike other species of malaria that infect humans *P. falciparum* develops beyond the trophozoite, inside red cell attached to endothelial cell lining the capillaries of the body, especially those in the deep tissues. The mechanisms by which this take place apparently involves the parasite- directed elicitation of "knobs" on a portion of the infected red cell membrane. The physicochemical properties of these knobs together with other parasite, derived proteins enable them to bind to endothelial cell membrane. The attachment last throughout schizogony, the trophozoite grows within the immobilized infected red cell, feeding upon protein portion of hemoglobin. Schizogony occur every 48hours and result in the production of 8-16 merozoites. The mature schizont breaks open, releasing its complement of merozoites (Dickson and Karapelou, 1997).

2.4.2.5 *Plasmodium knowlesi.*

Is the fifth species of malaria that infect man accidentally, naturally and artificially? It's from species of *knowlesi* it's found in south Asia and it causes malaria in long tailed. It

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2.4.2.5 *Plasmodium knowlesi.*

Is the fifth species of malaria that infect man accidentally, naturally and artificially? It's from species of *knowlesi* it's found in south Asia and it causes malaria in long tailed. It

first emerge to infect human in 1965 it account for up to 70% malaria cases in certain areas in south east Asia where it mostly found (Cheesbrough, 2005).

2.5 Transmission of malaria parasite

In most cases, malaria is transmitted through the bites of female *Anopheles* mosquitoes. There are more than 400 different species of *Anopheles* mosquito; around 30 are malaria vectors of major importance. All of the important vector species bite between dusk and dawn. The intensity of transmission depends on factors related to the parasite, the vector, the human host, and the environment (WHO, 2016).

Anopheles mosquitoes lay their eggs in water, which hatch into larvae, eventually emerging as adult mosquitoes. The female mosquitoes seek a blood meal to nurture their eggs. Each species of *Anopheles* mosquito has its own preferred aquatic habitat; for example, some prefer small, shallow collections of fresh water, such as puddles and hoof prints, which are abundant during the rainy season in tropical countries (WHO, 2016).

Transmission is more intense in places where the mosquito lifespan is longer (so that the parasite has time to complete its development inside the mosquito) and where it prefers to bite humans rather than other animals. The long lifespan and strong human-biting habit of the African vector species is the main reason why nearly 90% of the world's malaria cases are in Africa.

Transmission also depends on climatic conditions that may affect the number and survival of mosquitoes, such as rainfall patterns, temperature and humidity. In many places, transmission is seasonal, with the peak during and just after the rainy season. Malaria epidemics can occur when climate and other conditions suddenly favor transmission in areas where people have little or no immunity to malaria. They can also occur when

people with low immunity move into areas with intense malaria transmission, for instance to find work, or as refugees (WHO, 2016).

Human immunity is another important factor, especially among adults in areas of moderate or intense transmission conditions. Partial immunity is developed over years of exposure, and while it never provides complete protection, it does reduce the risk that malaria infection will cause severe disease. For this reason, most malaria deaths in Africa occur in young children, whereas in areas with less transmission and low immunity, all age groups are at risk (WHO, 2016).

2.6 Clinical Signs

The smallest interval between the infecting mosquito bite and appearance of parasite in erythrocytes is 5 days, but this proponent period i.e. the interval infection and the first, symptom ranges from 7 to 14 days and may be prolonged further by immunity (Markel and Gilles 1991).

None of the clinical features of malaria is diagnostic. Their pattern and intensity vary with the age, state of immunity, general health, and nutritional status of the patient and the geographical origin of the infection. Hyper immune patients may have parasitaemia without symptoms, pregnant woman may develop febrile convulsion with an otherwise uncomplicated infection, gastro-intestinal symptoms, such as diarrhea are particularly common in West Africa, elderly and debilitated patient seem particularly vulnerable to the effects of malaria (Markel and Gilles, 1991).

Patient with malaria experience chills and fever often associated with headache and weakness. In the early period of illness, the fever may be persistent for several days before development into a synchronous period city the hallmark of tertian or guar tan

malaria. When the typical pattern has been established, the patient has chills, a rise in temperature to 40- 41°C.

This is followed in several hours by diffusive sweating and a fall temperature. These may begin with non-specific symptoms such as sore throat, dry cough, and abdominal pain. Most patients have anorexia and nausea, vomiting is less common these symptom may mislead the physician into making or diagnoses of pharyngitis, influenza or gastroenteritis, Occasionally the only sign of malaria is fever that is cause by drug allergy. Rarely fever may be absent (Beeson and Duffy, 2005).

However, relapse of *vivax or ovale* infection may occur months or even years later. The illness at the time of relapse is usually milder and of shortest duration than the initial illness. Death caused by infection with these organisms is very uncommon (Beeson and Duffy, 2005).

2.7 Epidemiology and Pathophysiology

The epidemiology of malaria is determined by the climatic and ecological requirements of the Mosquito vector coupled with the habits of human population (Harold and Franklin, 1993).

Malaria today is generally confined to the tropic and sub-tropic. This is because the temperature of 60-34^{0}C relative humidity of 60%, which is suitable for the transmission of malaria generally, disappears at altitudes above 6,000 feet (Jawitz and Aldeberg, 1989).

The genes for the red cell membrane protein band 3 and the ABO blood group polymorphism have also been found to confer immunity to malaria infection. Remarkable few days are available on the influence of ABO blood group and susceptibility to malaria.

In the recent Gambian study a small but significant association of blood group O with resistance to malaria was found. Interestingly red cell of this blood group when parasitize with *P. falciparum* stains are less likely to exhibit phenomenon of resetting (Andrian, 1992).

Resetting parasites have been associated with more severe malaria in African children, offering a possible mechanism for ABO blood group effect; South East Asian and Malaysia *ovalocytosis* is associated with increased red cell membrane rigidity, decreased *P. falciparum* invasion in vitro, and lower parasite densities of both *P. vivax* and *P. falciparum* in the field (Nurse and Belson, 1997).

It has now been shown that the molecular basic of this disorder is a 9- amino acid deflection of the cytoplasm and membrane spawning regions of the band 3 proteins consistent with abnormal membrane mechanical properties, however Abayomi (2007) found that this defect was also associated with altered anion transport ability across red cell and potentially other membranes (Mavoungou and Kabila, 2003).

West African black and their descendants in the American and elsewhere possess relative immunity to *P. vivax* and also to experimental infection with *P. cynomolgi,* an explanation to this is explained by the observations of miller in (1978). Whom he first noticed that Duffy negative human erythrocyte are resistant to invasion in vitro of *P. knowlesi* a species of monkey (Markel and Gilles, 1991). Duffy negative individual comprise of great than 90% of West Africa populace and more than 90% of American blacks (Harold and Franklin, 1993). Agricultural practices such as water use or wastage that provides breeding state or the use of agriculture insecticides are often closely like to malaria epidemiology (Jawitz and Alderberg, 1989).

2.8 Laboratory Diagnosis.

Various laboratory methods are employed on diagnosis of malaria parasite in laboratory, they include:-

2.8.1 Rapid diagnostic test (RDT)

For rapid qualitative detection of malaria HRP2 (histidene-rich protien2) in human blood as an aid in the diagnosis of malaria *P. falciparum* infection. This test is designed to detect an antigen of malaria *plasmodium sp.* Although the test is highly reliable in detecting HRP2, false result may be possible in rare occasions. Therefore other clinically available test are required of questionable result is obtain.

2.8.2 Thick blood film

A thick blood film is usually prepared before thin film. Since its rapid and sensitive method for detection of malaria parasite when they are few in numbers. Especially in mild infection, the red cells are lyses during staining because they are not freed. The parasites and the white cell are clearly seen, the film must be handle with care to prevent blood from been washed away from slide (Bayomi, 2007).

2.8.3 Thin blood film

A thin blood film is prepared from the same blood specimen and examined to identify the specific parasite seen in the thick film. In thin film the blood cell are fixed and the characteristic features of the parasite are demonstrated, the size, inclusions and shape of the red cell are use to identify the various *plasmodium* species. Examination of a thin film is significant in the identification of mixed infections (Bayomi, 2007).

2.9 Treatment of Malaria.

Early diagnosis and treatment of malaria reduces disease and prevents deaths. It also contributes to reducing malaria transmission. The best available treatment, particularly for *P. falciparum* malaria, is artemisinin-based combination therapy (ACT). WHO recommends that all cases of suspected malaria be confirmed using parasite-based diagnostic testing (either microscopy or rapid diagnostic test) before administering treatment, results of parasitological confirmation can be available in 30 minutes or less. Treatment, solely on the basis of symptoms should only be considered when a parasitological diagnosis is not possible. More detailed recommendations are available in the "WHO Guidelines for the treatment of malaria", third edition, published in April 2015.

2.10 Prevention and Control.

- Treat the infected person with appropriate drugs such as ACT and IPT for pregnant women.
- Proper sanitation should be checked.
- Avoid improper damping of refuse.
- Our goiters should be covered.
- Spray with insecticide in a place where mosquito is disturbed.
- Always sleep in a treated mosquito net.
- Enlighten programs on planting anti mosquito tree and vegetation.

CHAPTER THREE
MATERIALS AND METHODS

3.1 Study Design.

There are different types of research design available for researchers. The purpose of research design is to guide the researcher and increase the validity of his findings. The study is design to find out the prevalence of malaria parasite infection among pregnant women's attending Nahuche PHC.

3.3 Sample Size.

The target of this study consists of 100 pregnant women attending antenatal care at PHC Nahuche, Bungudu Local Government Area of Zamfara state.

3.4 Sampling Technique

Random sampling technique was conducted, based on their age, the sample were collected from 100 pregnant women attending antenatal care at Nahuche PHC, Bungudu. Blood is a sample used for the test and Test kits were used to find the result.

3.5 Procedure

Ask the patient to sit down properly and rest on chair, registered all the patient information in to daily laboratory register. Used tunicate to tired the vein, for easy identification, used 2ml syringe collect the sample, deliver to EDTA bottle and Transport from study area to Zoology Laboratory, Federal University Gusau. RDT kits is used to diagnose.

3.6 Statistical Analysis

Chi-square test of independent and was use to analyses the result with odds ratios (OR) determined when there is significant difference. P- Value less than or equals to 0.05 was considered statistically significant.

CHAPTER FOUR
RESULTS

4.1 Results

The result showed that malaria prevalence increased with increasing age but increased in age group >45 year this could be attributed to their weakened immune status due to their old age. Also according to trimester showed that pregnant women that were in first trimester have higher prevalence of 71.8%, followed by those in second trimester 60% and those in third trimester 42.3%, this is in contrary with the findings of Chimere, *et al.* (2008) and Aliyu (2016) conducted in Lagos and Kaduna respectively, which showed that pregnant women that were in second trimester have higher prevalence of 53.8% followed by those in first trimester 42.4% and those in third trimester 30%.

Table 4.1: Prevalence of malaria parasite in pregnant women based on age

Age Group (years)	No. examined	No. positive	Prevalence (%)
15-20	30	20	66.67
21-25	26	18	69.23
26-30	14	18	57.14
31-35	14	6	42.90
36-40	16	8	50.00
Total	**100**	**60**	**60.00**

(χ^2=9.48, df=4, p>0.05)

Table 4.2: Prevalence of malaria parasite in pregnant women base on trimester

Trimester	No. examined	No. positive	Prevalence
First trimester	39	28	71.80
Second trimester	35	21	60.00
Third trimester	26	11	42.30
Total	**100**	**60**	**60.00**

χ^2 =3.814, df=2, p>0.05

4.2 Discussion

Maintaining and improving on current gains made on malaria is imperative for an effective control of the disease, especially in high endemic countries. Nigeria is made up of many cultural diverse settlements and communities and is essentially segmented into 6 geographical zones (Northwest, Southeast, South, North Central, Northeast, and Southwest). each of these zones has own particular geographical and whether features and so requires strategies well planned control intervention methods and tools targeted at individual settings in order to achieve the projected goal of 50% reduction in burden malaria Aina and Aldeberg (2016).

The overall prevalence of 60% reported in this study was quite high. A similar figure was reported for the same site the previous year. The prevalence was also similar to figure obtained in Bungudu Local Government Zamfara state, one of the Northwestern zone state of Nigeria who reported prevalence of 40% and 45% respectively the figure however lower than the 69% reported by Aina and Aldeberg (2016). For calabar in cross river state (South South) but significantly higher than the 14.7% reported for Ibeshe community in Ikorodu Lagos state (southwest) by Aina and Aldeberg (2016). The large difference between our study and Aina and Aldeberg (2016). Aina study was conducted during dry season rather than in the raining season when malaria transmission is much higher however, a study is carried out in the 6 geographical zones of the country in 2016.

The predominant *plasmodium* spp. Based on this study is *plasmodium falciparum* which is the most virulent and also has the greatest prosperity for developing resistance; this finding is consistent with other reported studies.

A well designed control study that can probe reason for such occurrences and this may provide valuable information in our understanding of host parasite interaction. Majority of women age 40 years and above tested for this study negative for malaria. This further demonstrated that adult living in endemic region have form of protective immunity against the disease even during peak transmission period also in pregnant women.

Data from this study emphasized the need to perform more regroups control measures and enlightened campaigns to further preventable and curable; this will lead to a further reduction in the morbidity and mortality associated with disease.

Out of 100 pregnant women examined, 60 were malaria positive in this study representing 60% prevalence. The highest malaria prevalence was seen in pregnant women within 21 - 26 years age group. This was because the pregnant women mostly are their first pregnancy and have depressed immunity due to pregnancy. This finding is consistent with earlier reports Bradley *et al.* (1996) and Tanko *et al.* (2005) where age group of < 24 year was reported to be at a high risk.

The results showed that malaria prevalence decreased with increasing age but increased in age group > 34 year this could be attributed to their weakened immune status due to their old ages. Also according to trimester showed that pregnant women that were in first trimester have higher prevalence of 71.8%, followed by those in second trimester 60% and those in third trimester 42.3%, this is in contrary with the findings of Chimere *et al.* (2009) and Aliyu (2016) conducted in Lagos and Kaduna respectively, which showed that pregnant women that were in second trimester have higher prevalence of 53.8% followed by those in first trimester 42.4% and those in third trimester 30%.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In conclusion, it was noticed that the prevalence of malaria parasites in pregnant women attending antenatal care at PHC Nahuche, Bungudu Local Government was moderately high. Many factors have been adduced for the continuous persistence of malaria infection in disregard to instituted control measures; these factors include the spreading resistance of *Plasmodium falciparum*, impoverished economy, and increased urbanization, weakened immunity due to pregnancy, self-treatment and poor compliance to treatment.

5.2 Recommendations

It is therefore recommended that:

- Pregnant women should be given a great priority if it comes to malaria diagnosis, treatment, prevention and control.
- Great attention should be paid to pregnant women living in rural areas, towns and villages where there are no secondary or specialized health care facilities.
- Should always use Insecticide Treated Nets for beds, windows and doors.
- National malaria control programmed need to take special measures to protect these population groups from malaria infection.

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