KIBOGORA POLYTECHNIC

FACULTY OF HEALTH SCIENCES DEPARTMENT OF BIOMEDICAL LABORATORY SCIENCES

PREVALENCE OF MALARIA PARASITE AND ITS ASSOCIATED RISK FACTORS AMONG PATIENTS ATTENDING AT AVEGA NTARAMA HEATH CENTRE, EASTERN RWANDA

Period: From June to December 2020

Undergraduate Research Paper presented in partial fulfillment of the requirements for the award of Bachelor degree with honor in Biomedical Laboratory Sciences.

PREPARED BY:

UWASE Grace **Reg N^{0}: 1900494**

SUPERVISOR:

Mr. RURABIYAKA Joseph **(ass. Lecturer**)

Kibogora, September, 202

DECLARATION

DECLARATION BY THE CANDIDATES

I, **UWASE Grace** declare that this is our own original work and not a duplication of any similar academic work. It has therefore not been previously or concurrently submitted for any other degree, diploma or other qualification to Kibogora Polytechnic or any other institution. All materials cited in this paper which are not our own have been duly acknowledged.

UWASE Grace

Signed……

Date……...

DECLARATION BY THE SUPERVISOR

We declare that this work has been submitted for examination with my approval as Kibogora Polytechnic Supervisor

Supervisor's name: **RURABIYAKA Joseph**

Signed……..

Date…….

ABSTRACT

This research was directed to Prevalence Of Malaria Parasite And Its Associated Risk Factors among patients attending at AvegaNtarama health centre, eastern rwanda. The The general objective of the study was to assess the extent malarial load among malaria infected patients attending at AvegaNtarama Heath Centre. The Specific objectives of this study are (1)to identify malaria parasite to species level among patient attending at AvegaNtarama Heath Centre.(2)to determine the most prevalent plasmodium species among patient attending at AvegaNtarama Health Centr,(3)to identify associated risk factors related to malaria species among patients attending at AvegaNtarama Heath Centre.

The study adopted a retrospective cross-sectional study design with quantitative approach. The study were included total population of 400 and sample size of 400 patients attending at AvegaNtarama health centre. Secondary data from June to December 2020,were used and questionnaire to assess the risk factors. Data analysis was performed using the statistical package for social sciences (SPSS) software, version 20 The result found show that the prevalence of malaria parasite into the all patients attending Avegantarama health center 90(22.5%) and also It reveals that the most prevalent plasmodium species is Falciparum with 50 (55.6 %), followed by ovale species with 17 (18.9%), vivax with 14 (15.6%), *malariae*, 9 (10%) and then the non-related species is knowlesi with 0 (0%) among the patients in the area under study. The risk factors associated with malaria in patients under study were stagnant water sites near the home, overnight staying outdoors and bush. This decision has been set due to the facts that the corresponding p-value associated to the Chi-square statistics of these factors is all less than the cutoff (5%). That is, for the Stagnant water sites near the home χ^2 (394) = 52.703, p-value=0.02$<$ 0.05, Overnight Staying outdoors χ^2 (396) = 67.09, p-value=0.043$<$ 0.05 and Bush sites near the home χ^2 (389) =78.09, p-value=0.01$<$ 0.05. We conclude that AvegaNtarama Heath Centre should improve the ways of covering Malaria Species parasite.The results show does not reduce the risk of malaria incidence during patients this Study they have to take majors to prevent malaria parasite. We recommend ministry of health to give fund for education researches and invest money in further research with more time in all regions of Rwanda to determine the prevalence of malaria Species and associated risk factors. Many trainings should be given to community health care workers on how to do follow up to all Person.

DEDICATION

This research is dedicated to:

To almighty God

To my parents

To my husband

To my brother and sisters

And all friends

ACKNOWLEDGEMENT

I greatly recognize the encouragement from KIBOGORA POLYTECHNIC, especially all staff and lecturers of Faculty of health Sciences and the department of Biomedical Laboratory Sciences who in diverse ways provided the highly valued and appreciated knowledge and skills that considerably contributed to the completion of this work.

I submit my thanks from the bottom of my heart to my beloved and respected supervisor **Mr. RURABIYAKA Joseph** for giving me an opportunity to undertake the project work as a part of my academic requirement.

I am thankful to my beloved parents, brother and sisters for their unforgettable whole hearted support.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OFABBREVIATION AND ACRONYMS

P.f: Plasmodium falciparum

DHS: Demographic and Health Survey

HMIS: National Health Management Information System

WHO: World Health Organization

FMH: Federal Minister of Health

ITNs: Insecticide-treated mosquito nets

IRS: Indoor residual spraying

SMC: Seasonal Malaria Chemoprevention

RTD: Rapid Diagnostic Test

IPTp : Intermittent Preventive Treatment during Pregnancy

HHs: Households

HC: Health Center

GIS: Geographical Information System

PCR: Polymerase Chain Reaction

M.P: Malaria parasite

CHAPTER ONE: GENERAL INTRODUCTION

1.0. INTRODUCTION

The chapter one concerned with background of the study, statement of the problem, purpose of the study, research questions, and objectives of study, significance of the study, limitations of the study and scope of the study.

1.1. BACKGROUND OF THE STUDY

Malaria is caused by necessitate intraerythrocytic protozoa of the species *Plasmodium*. Humans can be impure with one or more of the following four species: *P. malariae, P. vivax*, *P. falciparum*, and *P. ovale*. Plasmodia are first and foremost transmitted by the bite of an infected female *Anopheles* mosquito, but infections can also occur through exposure to infected blood products (transfusion malaria) and by congenital transmission. In 2018, there were an estimated 228 million cases compared to 231 million in 2017. The global incidence rate of malaria (number of cases per 1000 population) fell from 71 in 2010 to 57 in 2014 and remained at similar levels through 2018.Global, species of malaria during male and female remains a serious public health problem. Malaria is the most dangerous type of malaria, which is caused by five species of parasite Plasmodium. Malaria is associated with high levels of parasites in the blood and has the highest death rate and rate of complications of all types of malaria. Red blood cells that are infected with the parasite tend to sludge and lead to micro infarctions (tiny areas of dead tissue due to lack of oxygen) in capillaries in the brain, liver, adrenal gland, intestinal tract, kidneys, lungs, and other organs. Patients should be treated in a hospital setting, using intravenous medications(Nosten, 2007)

In African countries, Malaria infection in pregnancy compromises the mother's health and can lead to her death. In 2018, an estimated 11 million pregnant women living in 38 countries with moderate-to-high transmission in sub-Saharan Africa were infected with malaria (29% of all pregnancies).Malaria among pregnancy women is a serious public health problem in Sub-Saharan Africa. It is estimated that each year, approximately 25 million pregnant women in Sub-Saharan Africa are at risk of Plasmodium falciparum malaria infection during pregnancy.

Malaria during pregnancy leads to serious adverse effects on the mother and the child (M.E.Parise, 2011).

The escalating burden, pathogenesis, and clinical sequel of malaria during pregnancy have combinatorial adverse impact on both mother and fetus that further perplexed the situation of diagnosis, treatment, and prevention. This prompted us to evaluate the status of population at risk

of MIP in Hazaribag, Jharkhand, India. Cross-sectional study was conducted over a year at Sadar Hospital, Hazaribag. Malaria was screened using blood smear and/or RDT. Anaemia was defined as hemoglobin concentration. In malaria endemic areas, pregnant women are the highest risk group for malaria infection and to develop a severe form of the disease that results in mortality. Thus, increasing the use of anti-malaria interventions that target pregnant women which can address the social, cultural, and economic factors that heighten susceptibility has the potential to control the disease in most of the susceptible and underserved groups. (B.Decludt, 2008)

Indeed although malaria during pregnancy might be asymptomatic due to high level of acquired immunity in mothers residing in high transmission areas, it is still associated with maternal anemia, abortion, prematurity and low birth weight (Serge, 2011).

In Rwanda two major data sources that track malaria-related indicators in Rwanda are: The Demographic and Health Survey (DHS) and the National Health Management Information System (HMIS). The most recent DHS was conducted in 2010 which showed that national prevalence was 0.7% among women of reproductive age. The 2007-8 Interim DHS reported 0.9% among pregnant women although the number of such mothers in that survey is small (n=642). Even so, this figure is much lower than a 2002 study that found an overall prevalence of malaria infection in pregnancy of 13.6% at 6 health centers in Rwanda. In Rwanda malaria was first reported in the early 1900s with significant heterogeneity and volatility in transmission over subsequent decades. Here, a comprehensive literature review of malaria transmission patterns and control strategies in Rwanda between 1900 and 2018 is presented to provide insight into successes and challenges in the country and to inform the future of malaria control in Rwanda. (Gahutu.et.al, 2011)

1.2. STATEMENT OF THE PROBLEM

Malaria is the principal cause of morbidity and mortality in subtropical and tropical countries and malaria parasitemiais caused by protozoa of the species *Plasmodium*. Humans can be impure with one or more of the following four species:*P. malariae, P. falciparum, P. vivax*and *P. ovale*. The fight against malaria was continued but malaria was estimated to cause 214 million cases and 438 000 deaths in 2015.what was stranger is that most of these cases 89% and deaths 91% occurred in sub Saharan Africa. Even though different interventions were putted in place to fight against malaria, Malaria is still the major killer in our life .Dependable maps of the prevalence or show the strength of malaria are straight away needed, particularly in endemic areas of sub-Saharan Africa. Such maps are primary for estimate the scale of the problem, and hence the resources needed to combat malaria. They offered benchmarks for assess the progress of control and indicate which location areas should be prioritized (Serge, 2011)

For Rwanda, Prevalence of malaria Species and incidence rates were estimated at 114 and 86 per 100,000 populations respectively, in that year Rwanda notified 6,208 Malaria cases, 63.3% of the 9,800 estimated incident Malaria cases. The 2007-8 Interim DHS reported 0.9% among pregnant women although the number of such mothers in that survey is small (n=642). Even so, this figure is much lower than a 2002 study that found an overall prevalence of malaria infection in pregnancy of 13.6% at 6 health centers in Rwanda. In Rwanda malaria was first reported in the early 1900s with significant heterogeneity and volatility in transmission over subsequent decades. Here, a comprehensive literature review of malaria transmission patterns and control strategies in Rwanda between 1900 and 2018 is presented to provide insight into successes and challenges in the country and to inform the future of malaria control in Rwanda. (Gahutu.et.al, 2011).Impact on the health systems and socioeconomic of Rwandans. The problem raised since 2012 where malaria incidence start to increase from 48 per 1,000 in 2012 to 403 per 1,000 in 2016. Rwanda have seen more than an 8-fold increase in reported malaria cases from 567,407 in 2012 to 4,794,778 in 2016. (Karema.et.al, 2012). The results of this study have determined the prevalence of malaria Species and associated risk factors among The patients attending AvegaNtarama health center and it will also help to educate people how to take measures or how to prevent malaria species infection at Bugesera District.

1.3.GENERAL OBJECTIVES

The general objective of the study was to assess the extent malarial load among malaria infected patients attending at AvegaNtarama Heath Centre, Eastern Rwanda

1.4. SPECIFIC OBJECTIVES

- To identify malaria parasite to species level among patient attending at AvegaNtarama Heath Centre.
- To determine the most prevalent plasmodium species among patient attending at AvegaNtarama Health Centre.
- To identify associated risk factors related to malaria species among patients attending at AvegaNtarama Heath Centre.

1.5. RESEARCH QUESTIONS

- What are malaria parasite to species level among patient attending at AvegaNtarama Heath Centre?
- What is the most prevalent plasmodium species among patient attending at AvegaNtarama Health Centre?
- What are associated risk factors related to malaria species among patients attending at AvegaNtarama Heath Centre?

1.7. PURPOSE OF THE STUDY

The main goal of this study was to assess the extent malarial load among malaria infected patients attending at AvegaNtarama Heath Centre, Eastern Rwanda

1.8. SIGNIFICANCE OF THE STUDY

This Research will be contribute in prevent malaria parasite infection among the patients attending AvegaNtarama Heath Centre and also helps to find out the risk factors associated with

malaria parasite infection among the patients attending AvegaNtarama Heath Centre, to take decision for prevention of Malarie at Ntarama sector.

1.9. LIMITATIONS OF THE STUDY

Travelling was not easy due to covid-19 in lockdown.

1.10. SCOPE OF THE STUDY

Area of study and its physical boundary within a specific time frame (Time, field, space).
The study wasretrospective, conducted at AvegaNtarama Heath Centre located in BUGESERA District, Eastern Province. The study was limitated in parasitology unit. It was conducted from June to December 2020.

CHAPTER TWO: LITERATURE REVIEW

2.0. INTRODUCTION

An African country with 30 million in Malaria transmission in Rwanda varies widely with two seasonal peaks in May to June and November to December. Although the participants in the present study were apparently healthy, infection prevalence of 12.2% was observed. The prevalence was high as compared to the previous reports (Gahutu.et.al, 2011)

2.1.DEFINITIONS OF KEY CONCEPTS/TERMS

2.1.1. PREVALENCE

Prevalence is a term that means being widespread and it is distinct from incidence. Prevalence is a measurement of all individuals affected by the disease at a particular time, whereas incidence is a measurement of the number of new individuals who contract a disease during a particular period of time (Menendez, 2011).

2.1.2. Description of malaria

Malaria is considered to be one of the main global health problems, with it causing approximately 438,000 deaths in 2015. Ninety percent of these deaths occur in sub-Saharan Africa and 70 % are of children under the age of 5 years old. According to the World Health Organization (WHO), the number of deaths due to malaria in children under the age of 5 years has decreased significantly since 2000, and thus malaria is no longer considered the leading cause of death in children within this age group. However, malaria remains a major cause of morbidity in children in sub-Saharan Africa with 10 % of all deaths of children under the age of 5 years due to malaria (Pullan, 2010)

This is equivalent to one child in sub-Saharan Africa dying of malaria every 2 min Uganda, ranked third in the total number of malaria cases in sub-Saharan Africa, experiences weather conditions that often allow transmission to occur all year round with only a few areas that experience low or unstable transmission Climate affects both the parasite and the mosquito. Mosquitoes are unable to survive in low humidity and their breeding grounds are expanded by

rainfall. Plasmodium parasites are affected by temperature where their development slows as the temperature drops and stops at high temperatures, which are the reason why parasites can be found in temperate areas. Malaria is the leading cause of morbidity in Uganda with 90–95 % of the population at risk and it contributing to approximately 13 % of under-five mortality. Children under the age of 5 years are among the most vulnerable to malaria infection as they have not yet developed any immunity to the disease (Roberts et al., 2016)

2.1.3. Falciparum plasmodium malaria

Falciparum malaria is the most serious form of the malaria disease. It is most common in Africa, especially sub-Saharan Africa. Current data indicates that cases are now being reported in areas of the world where this type was thought to have been eradicated (P. Deloron, 2004).Falciparum malaria is the most dangerous type of malaria, which is caused by the parasite and is associated with high levels of parasites in the blood and has the highest death rate and rate of complications of all types of malaria(Kalilani, 2005).

Most of the estimated 0.6 million malaria deaths every year are in children up to 5 years old who live in areas of intense transmission of P. falciparum sub-Saharan Africa (World Health Organization, 2013) Childhood mortality levels are decreasing in Rwanda. Currently, infant mortality is 50 deaths per 1,000 live births for the five-year period before the survey compared with 73 deaths for the five-to-nine-year period before the survey. Fewer than 5 mortality levels have also decreased from 133 deaths per 1,000 live births to 76 Mortality rates differ slightly by province. The less than 5 mortality rate for the ten-year period before the survey ranges from 79 deaths per 1,000 live births in the City of Kigali to 125 deaths in the East province.Under-5 mortality differs dramatically by a mother's level of education. Children born to a mother who has a secondary education or higher are markedly less likely to die before their fifth birthday than children whose mothers have received no education (63 and 125 deaths per 1,000 live births, respectively) Different types of RDTs detect different antigens. Some antigens are produced by a single species of malaria parasite (e.g. Plasmodium falciparum), some are produced by all malaria species (including P. vivax, P. ovale and P. malariae). If present, the antigens cause microscopic particles to stick to a band on the RDT, eventually forming a visible, coloured line in the 'test' area. In the past, most people have used two methods to diagnose malaria. The first method is called 'microscopy'. Microscopy means taking a small amount of

blood from the patient and looking at it under a microscope to check for malaria parasites (Cohen, 2015)

The epidemiology of malaria is very complex, involving factors pertaining to malaria parasites, the insect vectors, the human hosts, and the environment. An understanding of the link between malaria transmission, climatic variables, and other human related factors is therefore necessary for developing appropriate measures that will significantly reduce transmission and eliminate malaria in endemic areas (Ostfeld, 2005)

In Rwanda, other factors that influence malaria in the country include high human concentration such as boarding schools in proximity to marshlands, population movement from low transmission to high transmission areas; irrigation patterns especially for rice crops which are mostly practiced in the Eastern and Southern parts of the country and cross-border movement of people especially in the Eastern and South-Eastern parts of the country (Mediannikov al, 2013)

2.1.4. Vivax plasmodium malaria

Vivax Malaria in humans caused by Plasmodium *vivax*, it is the one of parasite species that has been neglected for many years, it is also a very serious problem into the Red blood cells. Mostly *Plasmodium vivax* malaria has been presenting as an endemic disease in Korea, According to the World Health Organization (WHO) state thatPopulations affected: In the WHO Region of the Americas, about 120 million people in 21 countries are estimated to be at some risk for malaria, of which 25 million people are considered at high risk. P.vivax is responsible for <30% of malaria cases overall in the region, although the proportion is more than 50% in Guyana and Suriname and almost 100% in the Dominican Republic and Haiti. The region has made substantial progress in reducing malaria case incidence in the past decade. Reductions in incidence of >75% in confirmed malaria cases were reported in 13 countries between 2000 and 2012, and a further 3 countries are projected to achieve reductions of >75% by 2015. Seven countries are now classified as being in the pre-elimination phase. However, increases in malaria incidence in Guyana and Venezuela indicate a need for intensification of control efforts in some parts of the region. It was not possible to accurately assess trends in Haiti, owing to incompleteness and inconsistencies in malaria surveillance over time and other factors, including those related to the earthquake in 2010 (WHO, 2017).

In 2000, eight countries in the European Region had ongoing transmission of malaria; however, in 2013, local transmission was confined to just three countries (Azerbaijan, Tajikistan and Turkey) in which 2.9 million people were living in areas with some risk for malaria. All locally acquired cases are due to P. vivax (Richardson.M, 2018).

In the Western Pacific Region, 711 million people in 10 countries are at some risk for malaria, and 70 million people are at high risk. Malaria transmission is intense in most of Papua New Guinea, Solomon Islands and Vanuatu. It is highly focal in the Greater Mekong sub region, including Cambodia, Yunnan province (China), the Lao People's Democratic Republic and Viet Nam (where it is most intense in remote forested areas, and disproportionately affects ethnic minorities and migrants. Malaria is also restricted in distribution in Malaysia, the Philippines and the Republic of Korea. Most countries have both P. falciparum and P. vivax, but cases are entirely due to P.vivax in the Republic of Korea and in central areas of China. Populations affected: Approximately 15 million people in the five countries of the low-transmission South African sub region are at some risk for malaria, and 10 million people are at high risk. About 80%, or 55 million people, live in areas that are free of malaria. Malaria transmission is highly seasonal. Most malaria cases are caused by P. Vivax (Willey.B, 2013).

Pregnant women with relatively lower levels of previously acquired immunity are particularly at high risk of the most severe complications of malaria during pregnancy, such as cerebral malaria, severe malaria anaemia, abortions, intrauterine fetal death, premature delivery, stillbirths, and maternal and infant mortality (Valea, 2003).

2.1.5. Plasmodium Ovale Malaria

Plasmodium ovale is a cause of malaria infection. Disease transmitted by the bite of infected Anopheles mosquitoes**,** malaria is a mosquito-borne infection caused by Plasmodia parasite. It is present in the majority of the tropical region all over the world. It manifests started with nonspecific signs and symptoms follow as headache, fever, nouse, irritability, muscle aches, malaise, etc. These symptoms often happen at regular intervals coinciding with the erythrocytic stage. (Okafor & Finnigan, 2021)

The epidemiology of malaria is very complex, involving factors pertaining to malaria parasites, the insect vectors, the human hosts, and the environment. An understanding of the link between

malaria transmission, climatic variables, and other human related factors is therefore necessaryfor developing appropriate measures that will significantly reduce transmission and eliminate malaria in endemic areas (Ostfeld, 2005).

There are five types of Malaria: Plasmodium Ovalethe most serious form of the disease. It is most common in Africa, especially sub-Saharan Africa. Current data indicates that cases are now being reported in areas of the world where this type was thought to have been eradicated.. This type has the widest geographic distribution globally. This parasite has a liver stage and can remain in the body for years without causing sickness. If the patient is not treated, the liver stage may re-activate and cause relapses – malaria attacks - after months, or even years without symptoms (Stepniewska.et.al, 2008).

However, the infected animal still needs treatment because no treatment can also lead to a host of health problems. This type of parasite has been known to stay in the blood of some people for several decades. However, the infected human still needs to be treated because it may progress and cause a host of health problems. This parasite has a liver stage and can remain in the body for years without causing sickness. If the patient is not treated, the liver stage may re-activate and cause relapses - malaria attacks - after months, or even years without symptoms (Purohit, 2003).

According to Singh, B. Purohit, (2003), Extensive malarial epidemiology related to study sites mentioned in methodology section, detailed demographic information about the subjects investigated during this study as part of method section of manuscript text and some additional and supportive findings mentioned in the results section, which further consolidate and substantiate our observation of asymptomatic prevalence of malaria anemia in the investigated region has been given in Supplementary material attached to this article.The overall prevalence of malaria infection and all infections but two were caused by Plasmodium Ovale. The prevalence of anemia and splenomegaly mirrored that of malaria infection (Singh, 2003).

2.1.6. Plasmodium malariae

Plasmodium malariae is a parasitic protozoan that causes malaria in humans worldwide, it causes a so-called "benign malaria this plasmodium is not nearly as dangerous as that produced by P. vivax or P. falciparum. Different types of RDTs detect different antigens. Some antigens are produced by a single species of malaria parasite (e.g. Plasmodium falciparum), some are produced by all malaria species (including P. vivax, P. ovale and P. malariae). If present, the antigens cause microscopic particles to stick to a band on the RDT, eventually forming a visible, coloured line in the 'test' area. In the past, most people have used two methods to diagnose malaria. The first method is called 'microscopy'. Microscopy means taking a small amount of blood from the patient and looking at it under a microscope to check for malaria parasites (Cohen, 2015). In Rwanda, other factors that influence malaria in the country include high human concentration such as boarding schools in proximity to marshlands, population movement from low transmission to high transmission areas; irrigation patterns especially for rice crops which are mostly practiced in the Eastern and Southern parts of the country and cross-border movement of people especially in the Eastern and South-Eastern parts of the country (Mediannikov al, 2013)

2.1.7.PATHOPHYSIOLOGY OF MALARIA

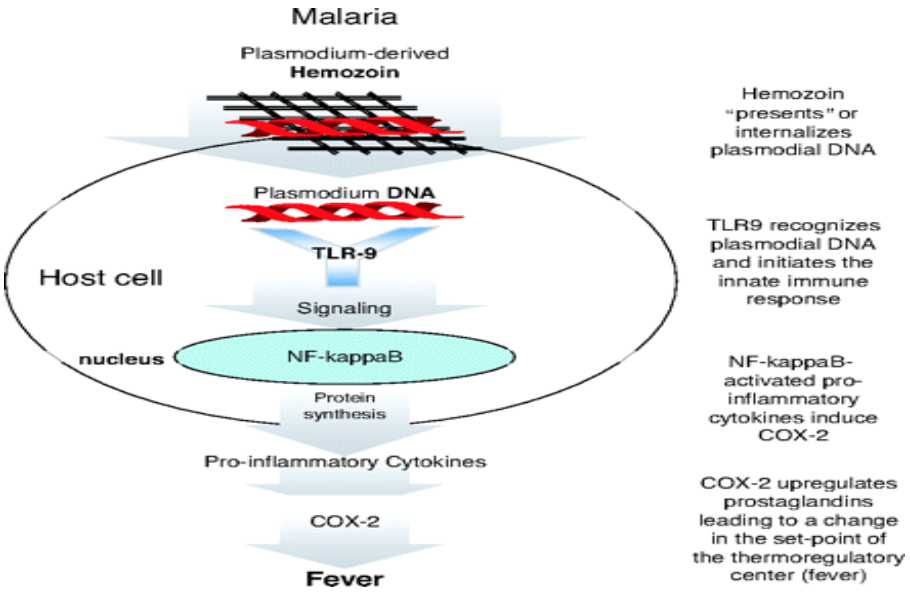

Figure 1. Pathophysiology of malaria

2.1.8.Diagnosis OF Malaria species.

2.1.8.1. Microscopic examination of malaria parasite

Microscopic examination are called the "gold standard" for laboratory confirmation of malaria species. These tests be supposed to be performed directly when prepared by a health-care supplier. this test is done by using stained blood film(Thick blood film, thin blood film, sensitivity of thick blood film) with GIEMSA STAIN in order to diagnose all plasmodium species, if we are using that stain there are some appearance of all those parasite in the slide with the different morphology of some different parasite which is present into the blood samples. It is vital that health-care providers take delivery of results from these tests in few hours in order to suitably treat their patients infected with malaria.

2.1.8.2. Rapid test of malaria parasite

A Rapid Diagnostic Test (RDT) is antechnic way of quickly establishing the diagnosis of malaria infection by detecting specific malaria antigens in a person's blood. Weused this technique for

diagnose all plasmodium species, whichwas allocate into the blood samplesby using some reaction between detecting specific malaria antigens.

2.2. Conceptual framework

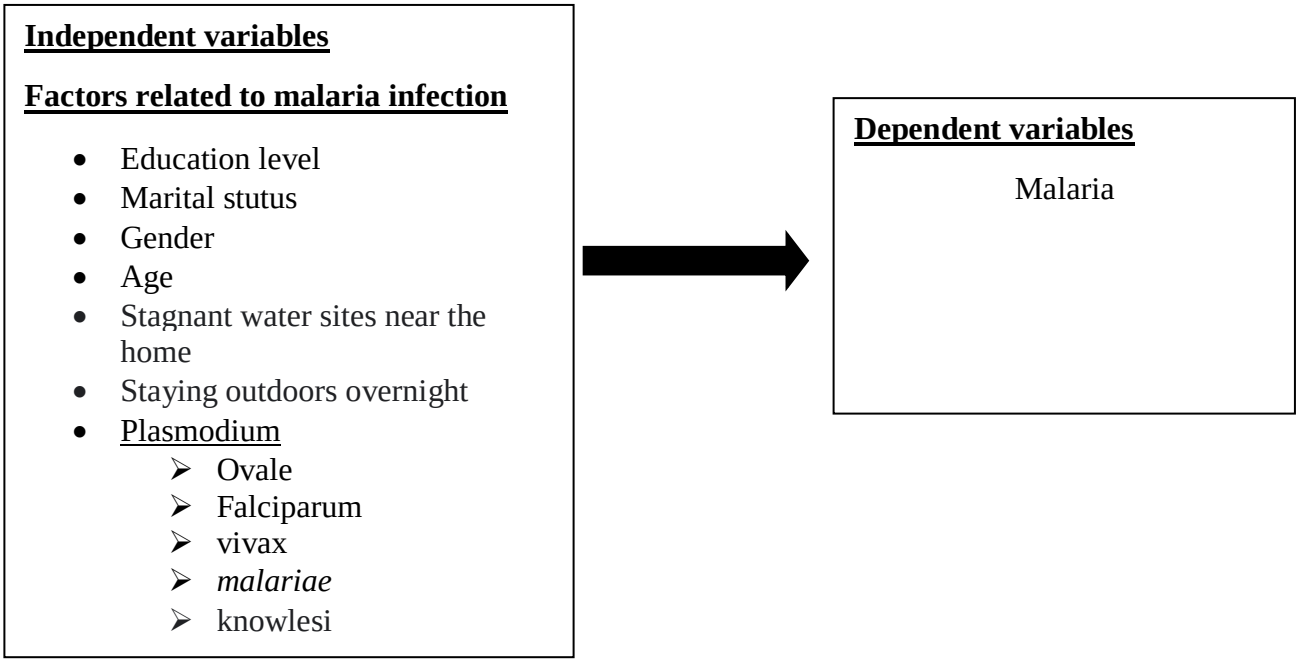

Figure 2. Conceptual framework

CHAPTER THREE: RESEARCH METHODOLOGY

3.0. Introduction

The chapter three focus on introduction**,** research approach (quantitative) and design (retrospective)**,** total population**,** sample size**,** research instruments for data collection**,** data collection procedures**,** ethical issuesand data analysis.

3.1. Study design and approach

Our study is retrospective cross section quantitative approach which analyzed data from AvegaNtarama Heath Centre in the period of from June - December, 2020.

3.2. Total population

The study population are all patient presented symptoms for malaria. The number of these patients presented symptoms for malaria are 400 Patients tested malaria Parasite attending at AvegaNtarama Heath Centre during June up to December, 2020.

3.3. Sample size

Due to the results from the whole population are accurate than those from the sample and the facts that all total population were easy in accordance to reach their information governing the study. And there was no time consuming and cost were required in data collection, the whole target population under study was considered as the sample size of the study in area under study within the specified time period. The sample size was 400 patients tested malaria Species from AvegaNtarama Heath Centreduring June up to December, 2020.

3.4. Inclusion criteria

These are all Patients Who Presented to AvegaNtarama Heath Centre with Symptoms of malaria infection during June up to December, 2020

3.5. Exclusion criteria

These are all patients not have symptoms of malaria attending at AvegaNtarama Heath Centre during June up to December, 2020

3.6. Data Collection tools and procedures

The data were collected from Parasitogy section of AvegaNtarama Health centre by using the following tools: Record book, Laptop, Excel, Pens, Papers and the semi structured proforma was used to extract needed data from patient's files. The proforma found out the data on socio demographic variables, risk factors associated with malaria parasite infection.

3.7. Data analysis

Quantitative data were entered and analyzed using Statistical Package for Social Sciences(SPSS) version 20, and they were presented using tables. Descriptive statistics were used to calculate the frequencies and percentages. A chi-squared test was applied to determine the association between categorical variables with a p-value less than 5% at a 95% confidence interval.

3.8. Reliability and validity measures

Validity and reliability of the instruments used in this study was given assurance in the way the researchers take some instruments for the necessary corrections. To ensure the validity of the instrument, researchers checked the Record book in parasitological for the consistency of the items, intelligibility and clarity, for adjustment and realignment purposes. As for reliability, the concept refers to the degree to which the same results would be obtained in repeated attempt of the same tests. Moreover, ensuring the reliability of the instruments, the study be conducted into the data are collected and the data are analyzed by SPSS program.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS, INTERPRETATION AND SUMMARY

4. 0. INTRODUCTION

This chapter deals with the analysis and interpretation of results from collected in relation to the study objectives the data collected was presented in form of descriptive statistical tables and percentages. The chapter is divided into three parts. Part one presents different data gathered while carrying out this research, their interpretation and analysis; part two presents the discussion of result and part three deals with summary of findings.

4.1. PRESENTATION OF FINDINGS + INTERPRETATIONS

Table 1. Prevalence of malaria Parasite according to Education level

Education Level	Frequency	M.P. negative	M.P. positive	M.P. negative (%)	M.P. positive (%)	Total percentage
Under-Primary	10	7	3	70	30	2.5
Primary	12	8	4	67	33	3
Secondary	376	293	77	63	22	94
University	2	2	0	100	0	0.5
Total	**400**	**310**	**90**	**61**	**39**	**100**

Source: Secondary data, 2020

From the table above the results indicate prevalence of Malaria Parasite among Patients attending AvegaNtarama Health centre according education level that being in under primary with Malaria parasite negative were 70% and Malaria parasite with positive were 30%. In primary Malaria parasite with negative were 67% and Malaria parasite withpositive were 33%. In secondary Malaria parasite with negative were 77 % and Malaria parasite withpositive were 22 %.In university Malaria parasite with negative were 100% and Malaria parasite with positive were 0%.

Table 2. Prevalence of Malaria parasite (M.p) by marital status

Marital status	**Frequency**	**M.P negative**	**M.P positive**	**M.P negative (%)**	**M.P positive (%)**	**Total percentage**
Single	64	52	12	81.3	18.75	9.75
Married	336	258	78	72.3	28.01	90.25
Total	**400**	**310**	**90**	**153.6**	**46.76**	**100**

Source: Secondary data, 2020

From the table above the results indicate the single statuses of malaria parasite with negative were 81.3 % and single with positive were 18.75% of respondents and the married statuses of **Malaria parasite** with negative were 72.3 % and married statuses with positive were 28.01% of respondents.

Table 3. Distribution of respondents byAge group

Age group	Frequency	Percentage
[0, 5[	51	12.75
[5, 10[	42	10.5
[10, 15[	62	15.5
[15, 20[	71	17.75
[20, 25[	32	8
[25, 30[	20	5
[30, 35[	18	4.5
[35, 40[	50	12.5
[40, 45[	12	3
[45, 50[	18	4.5
[50, 55[	22	5.5

[55 and above	2	0.5
Total	**400**	**100.00**

Source: Secondary data 2020

In the table 4 above we see that there were 51 (12.75%) patients in the age group of [0, 5[, 42(10.5%) patients in the age group of 62 (15.5%) in the age group of [10, 15[, 71(17.75%) patients in the age group of [15, 20[, 32 (8 %) Respondents in the age group of [20, 25[,20 (5 %) Respondents in the age group of [25, 30[, 18 (4.5 %) Respondents in the age group of [30, 35[, 50 (12.5 %) Respondents in the age group of [35, 40[, 12 (3 %) Respondents in the age group of [40, 45[, 18 (4.5 %) Respondents in the age group of [45, 50[, 22 (5.5 %) Respondents in the age group of [50, 55[and2 (0.5 %) Respondents in the age group of [55 and above.

Table 4. Identification of Malaria parasite to species level among patient attending at AvegaNtarama Heath Centre

		Infection				
Malaria species		**Positive (+)**	**Percentage**	**Negative (-)**	**Percentage**	**Total number of Participant/ All patient Of Malaria parasites**
	Falciparum	50	55.6	40	44.4	**90**
	Ovale	17	18.9	23	25.5	**40**
	Vivax	14	15.5	9	10	**23**
	Malariae	9	10	0	0	**9**
	Knowlesi	0	0	0		**0**
Total		90	**100**			

Source: Secondary data

The above table 4 illustrates the malaria parasite to species level among patient attending at AvegaNtarama Heath Centre and the most prevalent plasmodium species among patient attending the area under study. It reveals that the most prevalent plasmodium species is Falciparum with 50 (55.6 %), followed by ovale species with 17 (18.9%), vivax with 14 (15.5%),

malariae 9 (10%) and then the non-related species is knowlesi with 0 (0%) among the patients in the area under study.

Table 5. To assess possible factors associated to malaria in the area under study, the researchers attempted to compute the chi-square statistical metrics as a measure of association. The output extracted from SPSS is illustrated in the table below:

Factors	**χ^2 -statistic**	**Degree of freedom (d.f)**	**Probability value (P-value)**
Gender	2.582	396	0.09
Age	7.964	392	0.07
Stagnant water sites near the home	52.703	394	0.02
Overnight Staying outdoors	67.09	396	0.043
Bush sites near the home	78.09	389	0.01

The above table shows that the factors associated with malaria in patients under study stagnant water sites near the home, overnight staying outdoors and bush. This decision has been set due to the facts that the corresponding p-value associated to the Chi-square statistics of these factors is all less than the cutoff (5%). That is, for the Stagnant water sites near the home χ^2 (394) = 52.703, p-value=0.02$<$ 0.05, Overnight Staying outdoors χ^2 (396) = 67.09, p-value=0.043$<$ 0.05 and Bush sites near the home χ^2 (389) =78.09, p-value=0.01$<$ 0.05.

4.2. DISCUSSION OF FINDINGS

In this research paper the researchers attempted to identify malaria parasite to species level among 400 patients attending at AvegaNtarama Heath Centre with Symptoms of malaria parasite were tested malaria parasite 90 (22.5%) were positive Patients. The Prevalence of malaria parasite at AvegaNtarama Health Centre is high compared to the Prevalence of malaria in Rwanda the prevalent rate were 18.5% according to (WHO 2018). The most prevalent plasmodium species among patient attending the area under study. It reveals that the most prevalent plasmodium species is Falciparum with 50 (55.6 %), followed by ovale species with 17 (18.9%), vivax with 14 (15.5), *malariae*9 (10%) and then the non-related species is knowlesi with 0 (0%) among the patients in the area under study and the risk factors associated with malaria in patients under study stagnant water sites near the home, overnight staying outdoors and bush. This decision has been set due to the facts that the corresponding p-value associated to the Chi-square statistics of these factors is all less than the cutoff (5%). That is, for the Stagnant water sites near the home χ^2 (394) = 52.703, p-value=0.02$<$ 0.05, Overnight Staying outdoors χ^2 (396) = 67.09, p-value=0.043$<$ 0.05 and Bush sites near the home χ^2 (389) =78.09, p-value=0.01$<$ 0.05.

4.3. SUMMARY OF FINDINGS

In Distribution of respondentsthe results indicate prevalence of Malaria Parasite among Patients attending AvegaNtarama Health centre according education level that being in under primary with M.P negative were 70% and M.P with positive were 30%. In primary M.P with negative were 67% and M.Pwith positive were 33%. In secondary M.P with negative were 63% and M.P with positive were 37%.In university M.P with negative were 100% and M.P with positive were 0%. A single statuses of Plasmodium malaria with negative were 81.3 % and single with positive were 18.75% of respondents and the married statuses of Plasmodium malaria with negative were 72.3 % and married statuses with positive were 28.01% of respondents.There were 51 (12.75%) patients in the age group of [0, 5[, 42(10.5%) patients in the age group of 62 (15.5%) in the age group of [10, 15[, 71(17.75%) patients in the age group of [15, 20[, 32 (8 %) Respondents in the age group of [20, 25[, 20 (5 %) Respondents in the age group of [25,

30[,18 (4.5 %) Respondents in the age group of [30, 35[, 50 (12.5 %) Respondents in the age group of [35, 40[, 12 (3 %) Respondents in the age group of [40, 45[, 18 (4.5 %) Respondents in the age group of [45, 50[, 22 (5.5 %) Respondents in the age group of [50, 55[and2 (0.5 %) Respondents in the age group of [55 and above. Malaria parasite to species level among patient attending at AvegaNtarama Heath Centre and the most prevalent plasmodium species among patient attending the area under study. Among 400 patient with symptoms of malaria 90(22.5%) were tested positive for Malaria. the findings of our study reveals that the most prevalent plasmodium species is Falciparum with 50 (55.6 %), followed by ovale species with 17 (18.9%), vivax with 14 (15.5%), *malariae* 9 (10%) and then the non-related species is knowlesi with 0 (0%) among the patients in the area under study and Risk factors associated with malaria in patients under study stagnant water sites near the home, overnight staying outdoors and bush. This decision has been set due to the facts that the corresponding p-value associated to the Chi-square statistics of these factors is all less than the cutoff (5%). That is, for the Stagnant water sites near the home χ^2 (394) = 52.703, p-value=0.02$<$ 0.05, Overnight Staying outdoors χ^2 (396) = 67.09, p-value=0.043$<$ 0.05 and Bush sites near the home χ^2 (389) =78.09, p-value=0.01$<$ 0.05.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.0. CONCLUSION

The general objective of the study was to assess the extent malarial load among malaria infected patients attending at AvegaNtarama Heath Centre, Eastern Rwanda. **T**he results indicate prevalence of Malaria Parasite among Patients attending AvegaNtarama Health centre according education level that being in under primary with M.P negative were 70% and M.P with positive were 30%. In primary M.P with negative were 67% and M.Pwith positive were 33%. In secondary M.P with negative were 63% and M.P with positive were 37%.In university M.P with negative were 100% and M.P with positive were 0%. From the table above the results indicate the single statuses of Plasmodium malaria with negative were 81.3 % and single with positive were 18.75% of respondents and the married statuses of Plasmodium malaria with negative were 72.3 % and married statuses with positive were 28.01% of respondents. The table above we see that there were 51 (12.75%) patients in the age group of [0, 5[, 42(10.5%) patients in the age group of 62 (15.5%) in the age group of [10, 15[, 71(17.75%) patients in the age group of [15, 20[, 32 (8 %) Respondents in the age group of [20, 25[, 20 (5 %) Respondents in the age group of [25, 30[, 18 (4.5 %) Respondents in the age group of [30, 35[, 50 (12.5 %) Respondents in the age group of [35, 40[, 12 (3 %) Respondents in the age group of [40, 45[, 18 (4.5 %) Respondents in the age group of [45, 50[, 22 (5.5 %) Respondents in the age group of [50, 55[and2 (0.5 %) Respondents in the age group of [55 and above.

The above table illustrates the malaria parasite to species level among patient attending at AvegaNtarama Heath Centre and the most prevalent plasmodium species among patient attending the area under study. It reveals that the most prevalent plasmodium species is falciparum with 50 (55.6 %), followed by ovale species with 17 (18.9%), Vivax with 14 (15.6), *malariae*

9 (10%) and then the non-related species is knowlesi with 0 (0%) among the patients in the area under study. AvegaNtarama Heath Centre should improve the ways of covering Malaria Species parasite because. The results show does not reduce the risk of malaria incidence during patients this Study they have to take majors to prevent malaria parasite.

5.2. RECOMMENDATION

According to the results of this study, the following recommendations for improving the diagnosis, control and prevention of malaria Species**.**

To the ministry of health

Due to the result obtained we recommend ministry of health to give fund for education researches and invest money in further research with more time in all regions of Rwanda to determine the prevalence of malaria Species and associated risk factors. Many trainings should be given to community health care workers on how to do follow up to all Person.

To the health Advice

To give some advice to peoples to follow themeasures to prevent malaria infection such as to close the door at night, cut the bush near the house, to remove the stagnant water sites near the home.

To the researchers

To conduct further researches related to prevalence and risk factors associated with malaria Species in different areas of Rwanda because it is most causative agent of malaria infection in Rwanda.

To general population

All People have to follow prevention measures against malarial infection given by minister of health.

REFERENCE

B.Decludt. (2008).*Use of anti malaria intervention in pregnant women.*

Cohen. (2015).intermittent preventive treatment of malaria with sulphadoxine-pyrimethamine during pregnancy *in Burkina Faso:effect of adding a third dose to the standard two-dose regimen on low birth.*

Gahutu.et.al. (2011).*Malaria transmission and control strategies in Rwanda.*

Kalilani. (2005).*Types of malaria parasites and its complications.*

Karema.et.al. (2012).*Prevalence during malaria transmission season.*

M.E.Parise. (2011).*Definition, Diagnosis. Classification of Falciparum malaria and its Complications.*

Mediannikov al. (2013).*Active Malariaantiretroviral treatment cohort in South Africa: comparison with rates in the community*

Menendez, C. (2011).*Malaria widespread and its distinct incidence.*

Nosten. (2007).*Malaria in pregnancy in rural Mozambique:the role of parity,submicroscopic and multiple Plasmodium falciparum infections.Trop Med Int Health.*

Okafor, C. N., & Finnigan, N. A. (2021).*Plasmodium Ovale Malaria.* Stanford: April 7, 2021.

Ostfeld, a. (2005). *Most cases in areas of free malaria*

Pullan. (2010). *An overview of managment issues in adult patients with malarial malaria.*

Purohit. (2003).*Treatment of malaria parasite in blood.*

Richardson.M. (2018).*Transmission and risk factors of malaria in europe.*

Roberts et al. (2016). *An overview of managment issues in adult patients with vivax malaria.*

Serge. (2011).*An overview of managment issues in adult patients with Falciparum malaria.*

Singh. (2003).*Extensive malarial epidemiology.*

Stepniewska.et.al. (2008).*Malaria parasite in liver stage.*

Valea. (2003).*intermittent preventive treatment of malaria with sulphadoxine-pyrimethamine during pregnancy in Burkina Faso:effect of adding a third dose to the standard two-dose regimen on low birth.*

WHO. (2017).*Incompleteness and inconsistencies in malaria surveillance.*

Willey.B. (2013).*Most cases in areas of free malaria.*

World Health Organization. (2013).

APPENDICES

APPENDIX 1.

I. Please complete the point below

1. Marital status …….

2. Educational level …….

3. Malaria negative…….

4 Malaria positive……

5. Prevalence of Malaria by Education…….

6. Risk factors associated with Malaria Parasite **……**

APPENDIX 2. DATA COLLECTION SHEET

	TOTAL CASES TESTED FOR MALARIA PARASITES		**TOTAL CASES CONFRIMED FOR MALARIA PARASITES**	
	FEMALE	MALE	FEMALE	MALE
2020				
TOTAL				
GRAND TOTAL				

APPENDIX 3: QUESTIONNAIRE

SECTION A: socio demographic information

Questionnaire of socio-demographic information

Iterm	**Factor**	**YES/ NO**
Age	…….	
Sex	Female	
	Male	
Religion	Christians	
	Muslims	
	None	
Socio-economic category	Category A	
	Category B	
	Category C	
	Category D	
	Category E	

APPENDIX 4. APPROVED LETTER FOR DATA COLLECTION

KIBOGORA POLYTECHNIC

STUDENT PROJECT'S LETTER

DATE: 20th September, 2021

To whom it may concern;

We write this letter to humbly request you to allow **Mrs UWASE Grace** to conduct project work at **Avega Ntarama Heath Centre**

The above mentioned are bonafide students of Kibogora Polytechnic pursuing Bachelor's degree in Biomedical Laboratory Sciences.

This candidate is currently conducting a project entitled **"Malaria parasitemia and plasmodium identification to species level among malaria infected patients attending at Avega Ntarama Heath Centre, Eastern Rwanda**

". We are convinced that your institution will constitute a valuable source of information pertaining to their work. The purpose of this letter is to humbly request you to avail them with the pertinent information they may need. We pledge to ensure that all provided information will be used in the strict academic purpose.

Any assistance rendered to the candidate will be highly appreciated.

Approved by:

MUNYANDAMUTSA Fulgence

Head of department/Biomedical Laboratory Sciences

Kibogora Polytechnic

KIBOGORA POLYTECHNIC HEAD OF DEPARTMENT BIOMEDICAL LABORATORY SCIENCE

CENTRE DE SANTE AVEGA - NTARAMA BUGESERA