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PREVALENCE AND EFFECTS OF MALARIA AMONG HIV/AIDS PREGNANT WOMEN ATTENDING ANC: A CASE OF SALLY MUGABE CENTRAL HOSPITAL IN ZIMBABWE

BY

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUREMENTS FOR THE DEGREE OF BACHELOR OF MEDICAL LABORATORY SCIENCES IN THE COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

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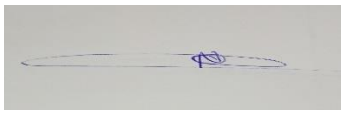
Abstract

Malaria is one of the most severe public health problems, placing almost half of the world's population at risk for infection and is the leading cause of death. The risk and severity of contracting malaria can be elevated by HIV infection, and higher parasite burdens may contribute to higher malaria transmission rates. People who are semi-immune to malaria and live in malaria-endemic areas may also get clinical malaria if they have HIV. This study determined the prevalence and effects of malaria among HIV/AIDS positive pregnant women at Sally Mugabe Central Hospital Zimbabwe; identifying risk factors associated with co-infections of malaria and HIV; find out its impact on pregnancy outcome and the effectiveness of the current available treatments. A sample of 200 participants was randomly picked from the HIV-pregnant women. A cohort-retrospective study method was carried out to collect the data that was used to assess the impact of co-infections. The cohort-retrospective study focussed on assessing patient's from their 2024 records. The collected data was the analysed using the SPSS software. The results revealed a malaria prevalence of 20% among the HIV-positive pregnant women, indicating a serious public health concern for this vulnerable population. The clinical assessments indicated lower haemoglobin levels (mean 9.0d/L) among the malaria-positive HIV pregnant women and higher hospitalisation rates (50%) compared to malaria-negative HIV pregnant women. Treatment adherence was noted to be 85% with an improvement rate of 70% among those who received treatment. However, non-adherence was associated with the worst outcomes, including hospitalisation and severe symptoms. These results indicates a crucial need for integrated healthcare strategies that combine malaria prevention and treatment with HIV care, emphasizing the importance of routine screening, education and support to enhance adherence and improve maternal health outcomes. These strategies can be enhanced by healthcare providers, public health officials, policy makers, researches, community health workers and Non-governmental Organisations. This research provides valuable insights for healthcare providers and policymakers in addressing the dual burden of malaria and HIV among pregnant women.

Keywords: Malaria; HIV; Prevalence; Anaemia; Clinical manifestations

Declaration

I, Nyarende Ngonidzashe Isalencia, student number 210310 do hereby declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a Bachelor of Science degree.



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Main Supervisors Full Name Main Supervisor's Signature

Copyright

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I would like to express my heartfelt gratitude to my supervisor Dr S. Chituku for her invaluable guidance, insights and constant motivation. I would also like to thank Sally Mugabe Central Hospital Ethics Board for their permission to carry out my research at their site. I also extend my appreciation to my colleague's for stimulating discussions that enhanced this project. Above all to God be the glory.

Dedication

I would like to dedicate this dissertation to my family, whose love and belief in me inspired me to reach my goals. I would also like to dedicate this dissertation to my mentor, Prof Alufasi for his inspiration and shaping my academic journey.

Acronyms and Abbreviations

- ✓ WHO- World Health Organisation
- ✓ HIV-Human Immuno-deficiency Virus
- ✓ PLWHA -people living with HIV/AIDS
- ✓ SP- Sulfadoxine pyrimethamine
- ✓ ANC-Antenatal care
- ✓ SPSS- Statistical Package for the Social Sciences
- ✓ OI- Opportunistic clinic

Definition of key terms

- ✓ Plasmodium- parasite that causes malaria (WHO, 2020)
- ✓ Prevalence- a measure of the number of people in a population who have a particular disease at a specific point of time (National Institute of Mental Health, 2020)
- ✓ Co-infection- is when a person is infected with more than one pathogen ("Co-Infection and Syndemics," n.d.)
- ✓ Antenatal-period before birth (WHO, 2018)
- ✓ Gestational age/period-length of time that a fetus has been developing in the womb (Medline Plus, 2018)

List of contents

Contents

List of tables

List of figures

CHAPTER 1 INTRODUCTION

1.1 Introduction

Malaria and HIV/AIDS are two of the greatest public health challenges in sub-Saharan Africa and have profound impacts on maternal and child health (Kwenti, 2018). Pregnant women, particularly those infected with HIV/AIDS, are particularly vulnerable to the harmful effects of malaria due to their weakened immunity (Obase, Bigoga, & Nsagha, 2023). This double burden exacerbates the risks of low birth weight, maternal anaemia, preterm birth, and increased morbidity and mortality. The chapter provides a background to the study that examined the prevalence and impact of malaria in HIV pregnant women attending the ANC at Sally Mugabe Central Hospital. In addition, the section outlines the aims and objectives of the study, research questions, justification of study, statement of the problem, limitations and delimitations of the study.

1.2 Background of the Study

Malaria is caused by a protozoan *Plasmodium* parasites and *Plasmodium falciparum* is the most deadly species (Berger, 2017). Malaria reportedly causes death of over 40% of the world's population and disproportionately affecting pregnant women and young children under the age of five (Tsegaye et al., 2021). The disease remains a major public health challenge, especially in sub-Saharan Africa, where it contributes significantly to maternal and foetal morbidity and mortality (Gebresenbet, et al, 2022). According to World Health Organization (2023), 249 million malaria cases were recorded worldwide in 2022, which was five million more than in 2021 and far more than the figure predicted before to the COVID-19 pandemic. Malaria poses a critical treat to public health with almost half of the world's population at risk for infection and is the leading cause of death (Gontie et al, 2020). Statistics reported by Reddy et al. (2023) showed that out of 247.7 million pregnancies globally in 2020, 156.9 million (63.4%) occurred

in 85 countries with endemic malaria. These pregnancies, which account for 77.7% of all pregnancies in malaria-endemic countries and 49.2% globally, included 121.9 million pregnancies that took place within the spatial limits of *P. falciparum or P. vivax* malaria transmission and were therefore at risk of malaria (Reddy et al, 2023). Furthermore of these 121.9 million pregnant people at risk for malaria, an estimated 70.9 million (58.1%) cases resulted in live births. 1.4 million (1.1%) stillbirths, 33.5 million (27.5%) abortions, and 16.1 million (13.2%) miscarriages. These miscarriages were attributed to residual pregnancy loss. Malaria infections in pregnant women typically result in more severe symptoms and outcome, including increased risk of miscarriage, intrauterine death, premature delivery, low birth weight babies, neonatal mortality and the mothers are more likely to die and suffer from severe anaemia (Schantz-Dunn and Nour, 2009).

According to UNAIDS/WHO (2024) most of the thirty-three (33) million people living with HIV are in the developing countries, where HIV infection in pregnancy has become the most common medical complication. More than 70% of all HIV infections are a result of heterosexual transmission and over 90% of infections in children are a result of mother-to-child transmission (Kassa, 2018). In parts of southern Africa, the HIV prevalence among pregnant women is over 30% (Hoque, Hoque, Hal, & Buckus, 2021). Women are particularly vulnerable to HIV infection due to both biological and socio-cultural sociocultural reasons.

Pregnant women, particularly those who are HIV-positive, are at higher risk of both malaria infection and its complications due to altered immune responses during pregnancy (Schantz-Dunn and Nour, 2009. Alemu et al (2013) states that the combination of HIV and malaria poses a complex interaction, which can lead to worsened outcomes for both the mother and the foetus. According to Anne (2018), 81% of pregnant women with HIV had malaria infection, whereas 75% of pregnant women without HIV had malaria infection. The result of the study also shows that mothers with HIV had a higher rate of moderate parasitemia (53.1%) than mothers without

HIV (28.7%). Studies have also reviewed that the risk and severity of contracting malaria can be elevated by HIV infection, and higher parasite burdens may contribute to higher malaria transmission rates (Orishaba et al., 2020). According to World Vision (2024), from a biological and individual perspective, HIV infection can reduce the protection provided by anti-malarial treatment, and people living with HIV/AIDS (PLWHA) are more susceptible to clinical malaria and serious illness. According to WHO (2024) malaria results in temporal elevation of viral loads in HIV positive individuals, which can worsen clinical symptoms and increase adult and mother-to-child transmission.

There are various methods and technologies to detect the malaria parasites in patients including microscopic analysis, rapid diagnostic and PCR. According to an article published in 2024 by Muhammad Awais; for laboratory confirmation of malaria parasites, microscopic analysis of blood films is the gold standard method. Another option for making a fast diagnosis of malaria is to use a Rapid Diagnostic Test (RDT). Plasmodium species can be identified with the aid of PCR to guarantee appropriate treatment. Chojnowska et al., (2018) mentioned that HIV can be diagnosed through blood or saliva tests. Tests include antigen tests, antibody tests and nucleic acid tests. Antigen-antibody tests usually use blood from a vein. Antigens are substances on the HIV virus itself. They most often appear in the blood within a few weeks of infection with HIV. The immune system produces antibodies when it comes into contact with HIV. It can take weeks to months for antibodies to become detectable in the blood. An antigen-antibody test may not show a positive result until 2 to 6 weeks after HIV infection. Antibody assays target antibodies against HIV in the blood or saliva. Most rapid HIV tests are antibody tests including self-testing kits. Nucleic acid tests (NATs) are capable of detecting the virus in one’s blood, the viral load.

Although studies have investigated the effects of co-infection of Malaria and HIV in other regions of the world, there is little information on possible effects on pregnant women in this sub-region. Understanding the effects of co-infection of malaria and HIV will go a long way developing best interventions and management practices of pregnant women suffering from malaria. This study therefore aims at evaluating the prevalence and effects of malaria among HIV/AIDS positive pregnant women at Sally Mugabe Central hospital.

1.3 Statement of the problem

Many women with HIV use the antenatal care (ANC) services at Sally Mugabe Central Hospital even though these services are also available at other private and government hospitals. This might be because Sally Mugabe Central Hospital has an OI department specifically for those who are HIV-positive. For instance, it is estimated that roughly 200 HIV-positive women attended ANC at the hospital between 1 January 2024 and 31 July 2024. Among these women, about 30 (15%) were diagnosed with malaria during the same period. This high rate of malaria among pregnant women with HIV points to a serious public health concern that calls for more research on the incidence and consequences of malaria in this group. HIV and malaria can interact to worsen health outcomes, increasing morbidity and mortality among mothers and new-borns (Schantz-Dunn and Nour, 2009). Gaining an understanding of this issue is crucial to creating focused interventions and enhancing the health of expectant mothers living with HIV. Table 1 shows the number of HIV-positive women attending ANC and the associated malaria case demonstrating the prevalence of malaria in HIV-positive pregnant women attending ANC at Sally Mugabe Central Hospital.

Table 1 Statistics of HIV-positive women attending ANC & the associated malaria case

Period	Total HIV pregnant women attending ANC	Number of women diagnosed with malaria	% of women with malaria
January-July	200	30	15

1.4 Research Objectives

1.4.1 Broad Objectives

This study aimed at evaluating the prevalence and effects of malaria among HIV/AIDS pregnant women attending ANC at Sally Mugabe Central hospital.

1.4.2 Specific Objectives

- To determine the prevalence of malaria among HIV-positive pregnant women attending antenatal care at Sally Mugabe Hospital for the period of February to November 2024.
- To assess the clinical manifestations of malaria in HIV-positive pregnant women by comparing maternal health indicators like haemoglobin levels and hospitalisation rates of malaria-positive and malaria-negative patients within the same period at Sally Mugabe Hospital.
- To evaluate treatment outcomes of malaria in HIV-positive pregnant women by analysing treatment response rates and side effects for the period February to November 2024.

1.5 Research Questions

- What is the prevalence of malaria among HIV-positive pregnant women attending antenatal care at Sally Mugabe Hospital for the period February to November 2024?

- What are the clinical outcomes (Haemoglobin levels) of HIV-positive pregnant women diagnosed with malaria compared to those who are malaria-negative during the study period?
- What are the treatment outcomes, including response rates and side effects, for HIV-positive pregnant women diagnosed with malaria during the period February to November 2024 at Sally Mugabe Hospital?

1.6 Justification

In areas where HIV and malaria are major burdens, enhancing mother and child health outcomes requires an understanding of the prevalence and consequences of malaria among pregnant women with HIV. This study aims to provide useful information on the prevalence of malaria in pregnant HIV-positive women and its effects on pregnancy outcomes, such as the risk of preterm birth, low birth weight, foetal loss, and maternal anaemia. By identifying the specific challenges faced by this group, targeted interventions can be designed to reduce the dual burden of these diseases. Furthermore, this research will inform local healthcare policies and resource allocation by highlighting gaps in the current malaria and HIV management strategies at the facility level. This is particularly important for optimizing ANC care for HIV-positive women and ensuring that malaria control efforts are more effective for this vulnerable group. In conclusion, this research will help bridge critical knowledge gap and inform the development of comprehensive care plans that address the intertwined HIV and malaria needs of pregnant women. The findings will also provide insights for national and regional health programs aimed at reducing the morbidity and mortality associated with these infectious diseases.

1.7 Limitations

- Time-Pregnant women might enrol into ANC at an earlier period whereby the transmissions of malaria infections are very low

- Geographical location-the chances of people getting affected by malaria at Sally Mugabe Central hospital might be low. This study will only be carried out at Sally Mugabe Hospital.
- Ethical concerns associated with conducting a research on pregnant women
- Biased information-available data might not be reliable
- The availability of resources such as personnel and funding's might also be a limitation to this study.

1.8 Delimitations

This research study will be carried out at Sally Mugabe Central hospital mainly focussing on HIV/AIDS positive pregnant women only. The research focussed on clinical data and this includes the hospital and medical laboratory test records that would have been carried out and recorded about the pregnant women during all their trimesters. The clinical data will also identify the presence of the malaria among the HIV/AIDS positive pregnant women of different ages. The study might be limited by the availability of data on co-infections and the accuracy of the data.

1.9 Summary

This chapter evaluated the prevalence of malaria among HIV/AIDS positive pregnant women and brought about the health problems being faced by these pregnant women as a result of these co-infections during their pregnancy. The chapter discussed the background information and assessed the effectiveness of current prevention and treatment strategies for managing malaria among these HIV/AIDS positive pregnant women.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

Co-infection of pregnant women with HIV and malaria can have devastating effects on the developing embryo. This chapter presents and synthesises literature on prevalence and effects of malaria on pregnant women with focus on pregnant women, identifying study gaps. The literature reviewed is based on the information that has been published in journal articles, book chapters and even review papers.

2.2Literature Review Based On Objectives

2.2.1 Prevalence of malaria among HIV-positive pregnant women attending antenatal care

Malaria and HIV, are two of the world's most deadly diseases (Kwenti, 2018; Wondimeneh et al., 2013) in many developing countries, particularly in sub-Saharan Africa (Wondimeneh et al., 2013). Although the diseases are widespread, their geographical distribution overlaps greatly in sub-Saharan region and hence the common HIV and malaria co-infections (MHCs) leading to over one million pregnancy complications per year (Ssentongo et al., 2020). Studies have also confirmed that malaria is endemic in sub-Saharan Africa, with approximately 25 million pregnant women being at increased risk of infection with *Plasmodium falciparum* each year, particularly during their first two pregnancies (Kuile et al., 2004). Mono-infection or co-infection with these diseases is reported to contribute to maternal morbidity and mortality with co-infection exacerbating health risks for both the mother and the foetus (Mirzohreh et al, 2022; Gontie et al., 2020). HIV-positive pregnant women are at increased risk of all adverse consequences of malaria during pregnancy (Anne, 2022). This is a result of the superimposition of the effects malaria on that of human immunodeficiency virus (HIV) on maternal health (Kuile et al., 2004). The effects of co-infection include maternal anaemia and reduced neo-natal birth weight due to preterm delivery and intrauterine growth retardation (Kuile et al.,

2004). Furthermore, there are reports of high incidences of symptomatic malaria episodes, severe or uncomplicated, and the corresponding parasite density in HIV positive individuals particularly those with lower CD4 count (Anne, 2018; Wondimeneh et al., 2013). According to Kwenti, (2018), 216 million cases of malaria were recorded causing 445,000 deaths in 2016, with about 90% of cases and deaths occurring in sub-Saharan Africa.

Despite efforts applied by several Governments to reduce the risk of infection and co-infection by these diseases, including distribution of long-lasting insecticidal bed nets (LLINs) to pregnant women and implementation of intermittent preventive treatment (IPT) programs, the burden of these infections in pregnant women remains a problem (Belindaka et al., 2019). Kwenti, (2018) posits that pregnant women and their unborn babies are at risk of malaria HIV co-infection (MHC) and: approximately one million pregnancies are complicated by MHC every year in sub-Saharan Africa. Diouf et al. (2024) revealed that nearly 50% of expectant mothers who visits prenatal clinics are infected with *P. falciparum* during the rainy season, an indication of high rate of malaria transmission (Diouf et al., 2024). . A study conducted by Jaén-Sánchez et al. (2023) in Mozambique showed that co-infection of women with HIV and malaria are still very common particularly in the childbearing age group. However, information is scarce on the prevalence of malaria among HIV positive pregnant women in Zimbabwe. There is therefore need to investigate the prevalence of HIV and malaria co-infections and the effects of such infections on pregnant mothers and the developing embryos

2.2.2 Clinical manifestations of malaria in HIV-positive pregnant women, and how do they differ from those in HIV-negative pregnant women

Co-infection of HIV and malaria presents a significant public health challenge, exacerbating the complexities of maternal and foetal outcomes. Clinical manifestations of co-infection with these diseases have been reported in literature and come in different forms including severe forms of malaria (e.g. cerebral malaria, severe anaemia). Study by Anne (2018) on effects of co-infection with HIV and malaria in pregnant women showed that HIV positive mothers had more moderate parasitaemia compared to uninfected pregnant women (Jaén-Sánchez et al., 2023). HIV infected pregnant women have impaired ability to control malaria parasitaemia hence the high frequency and higher density parasitaemia than uninfected pregnant women (Kuile et al., 2004) .Higher levels of parasitaemia increases the severity malaria.

Studies have described negative effects of the combined impact of co-infection with HIV and malaria on maternal haemoglobin (Hb) concentrations. Results from studies conducted in Kenya and Malawi demonstrated that co-infected women were at relatively greater risk of having any anaemia (Hb < 11 g/dL) or moderate-to-severe anaemia (Hb < 8 g/dL) than those with single infections (Kuile et al., 2004). Furthermore, women with single infections with HIV or malaria were more at risk than uninfected women. Wondimeneh et al. (2013) investigated the prevalence of malaria among HIV positive women and effect of co-infection on immune-haematological profiles in Nigeria. Results showed that pregnant women infected with HIV suffered from moderate to severe anaemia compared to those that HIV negative. Corroborating result were observed by Dibua et al. (2013) and Ssentongo et al. (2020), indicating that maternal anaemia is the most important adverse pregnancy outcome.

Research have shown that HIV affects the immune memory mechanism that regulates parity-dependent acquisition of antimalarial immunity in pregnancy (Kuile et al., 2004). However the risk is higher in multigravida individuals. A study conducted in the Democratic Republic of Congo indicated that pregnant women who were hospitalised or attended antenatal facilities had a high prevalence of malaria infection and increased when associated with HIV infection

(Wumba et al., 2015). In an article published in 2019 by an unknown author, it was stated that pregnant women with HIV/AIDS are at higher risk of developing severe malaria with complications (, 2019).

Besides the severity of malaria disease, co-infection during pregnancy often result in low birth weight, high placental plasmodia load, foetal problems and even new-born death (Obase et al.,2023). Wumba et al., (2015) also reiterates that the extent to which malaria is linked to severe anaemia and low birth weight is increased by HIV. The pathophysiological effects of both HIV and malaria are worsened by co-infection. HIV may exacerbate the severity of a malaria infection, increasing placental damage and producing adverse outcomes (Obeagu & Obeagu, 2024).(Jaén-Sánchez et al., 2023) mentioned that moderate malaria parasitaemia was more common in HIV-positive mothers than in HIV-negative mothers, despite the fact that more HIV-positive mothers used insecticide-treated nets (ITNs) during pregnancy.

However, there is no enough information about the prevalence of malaria in HIV-positive pregnant women compared to that in HIV-negative pregnant women attending the same ANC services in Zimbabwe especially at Sally Mugabe Central Hospital and hence this study seeks to find some information about this.

2.2.3 Treatment outcomes of malaria in HIV-positive pregnant women by analysing treatment response rates and side effects.

The response to treatment for malaria in HIV pregnant women is complex due to the interactions between the two conditions. Treatment of malaria therefore require careful consideration of both diseases' interactions and their management strategies. Obeagu & Getrude Uzoma Obeagu (2024) proposed that to maximize maternal health outcomes and lower the risk of vertical transmission, antiretroviral therapy (ART) must be started early in pregnancy and continued throughout gestation. Preventive measures like insecticide-treated

bed nets, vector control measures, and IPTp with antimalarial drugs are advised in the case of malaria in order to lower the risk of infection and its complications. To avoid serious consequences for the mother and lessen the negative effects on the development of the foetus, malaria episodes during pregnancy must be identified early and treated quickly. To quickly detect and treat complications, close monitoring of the mother's parasitaemia, haemoglobin levels, and foetal growth is necessary. Additionally, obstetricians, infectious disease specialists, paediatricians, and other healthcare professionals must work together in an interdisciplinary manner to manage HIV and malaria during pregnancy. In an article published by the WHO, it was mentioned that Sulfadoxine pyrimethamine treatment decreased placental parasitaemia and co-trimoxazole, a medication frequently used to prevent infection in pregnant HIV-positive women, cannot be taken with SP. Furthermore, Malawian data indicate that daily co-trimoxazole is superior to intermittent preventive treatment with SP in lowering anaemia and malaria infections in pregnant HIV-positive women (Choi, Brandeau, & Bendavid, 2017). Since SP is incompatible with co-trimoxazole and SP resistance is rising, more research evaluating alternative antimalarial drugs is necessary (n. d, 2024). Pons-Duran et al. (2024) states that when combined with daily cotrimoxazole, dihydroartemisinin/ piperaquine and mefloquine appear to be more effective than daily co-trimoxazole alone at preventing malaria infection in pregnant HIV-positive women. However, poor drug tolerability and an elevated risk of HIV transmission to the foetus could be obstacles to mefloquine's practical use. According to Obase et al. (2023) when combined with daily co-trimoxazole, mefloquine likely lowers the risk of malaria infection in women with HIV, but it also likely raises the risk of HIV transmission from mother to child. This may increase the risk of adverse drug reactions. When combined with daily co-trimoxazole, dihydroartemisinin/ piperaquine likely lowers the risk of malaria in the placenta of pregnant HIV-positive women (WHO, 2024). It most likely has no bearing on the risk of low birth weight, preterm or postpartum baby loss, or mild adverse effects

like vomiting (n.d, 2023). , In order to lessen the burden of disease in these susceptible groups, chemoprevention is advised (CDC, 2024).

However, there is no enough evidence about the preventive measures and treatment protocols currently in place for managing malaria among HIV-positive pregnant women in Zimbabwe specifically at Sally Mugabe Hospital.

2.3 Conceptual framework

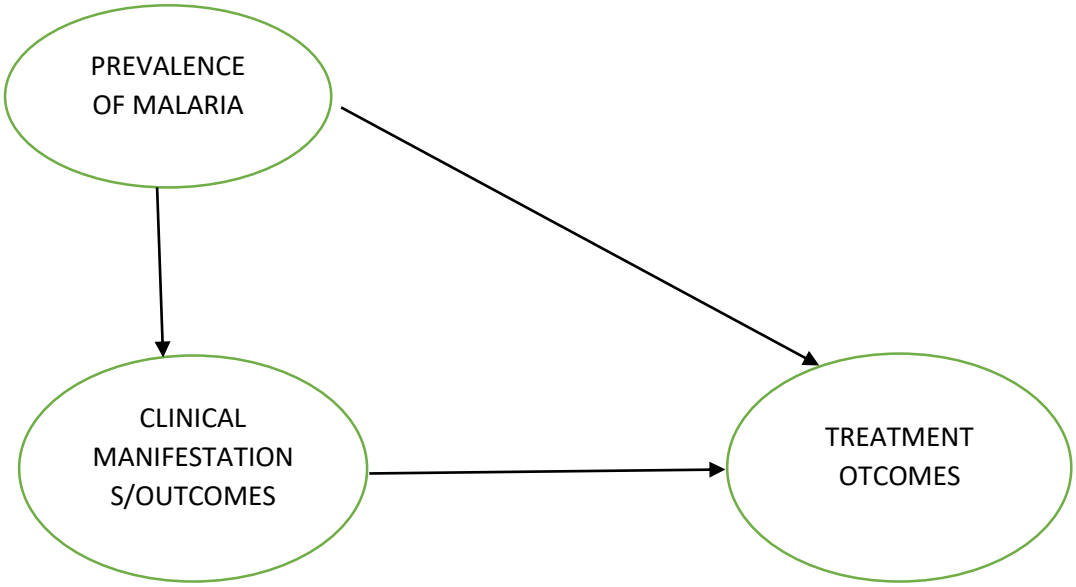

Figure 1 Conceptual framework

Malaria prevalence ➔ clinical results: Because of the complications caused by co-infection, it is anticipated that a higher prevalence in malaria among pregnant women with HIV will be associated with worse health outcomes for both the mother and the new-born.

Clinical outcomes ➔ treatment outcomes: The women's clinical manifestations may have an impact on how well the treatment works for them. Women with severe symptoms for instance, might react differently to treatment than women with mild symptoms.

Malaria prevalence ➔Treatment results: Higher malaria prevalence may result in more stringent treatment protocols, which will impact the methods used for treatment and the results obtained.

2.4 Conclusion

In conclusion, HIV and malaria co-infection among pregnant women is a serious health burden with negative effects. However, there is no enough data on the prevalence and effects of these co-infections in Zimbabwe specifically at Sally Mugabe Central hospital.

2.5 Summary

This chapter serves to outline of findings presented in literature and the research gaps identified. It also includes the literature review published on the prevalence and effects of malaria among HIV/AIDS pregnant women focusing on the risk factors of co-infections, effects on pregnancy outcomes, clinical manifestations and the effectiveness of current prevention and treatment strategies.

CHAPTER 3 METHODOLOGY

3.1 Introduction

This chapter outlines the methods applied to investigate the prevalence and effects of malaria among HIV/AIDS pregnant women, based on the factors associated with these co-infections as well as the effects of these co-infections and the effectiveness of current prevention and treatment strategies. This chapter presents the study design, the study site, population, sampling, study instruments, data collection, data analysis, ethical consideration and the summary.

3.2 Research Design

This study was a cohort-retrospective research design. A cohort-retrospective study is a research design that involves reviewing data collected in the past to analyse trends, outcomes or associations related to a specific disease (George, 2023). In this case, retrospective studies were utilized in order to understand various aspects of malaria from exposure to outcome, including prevalence, co-infection rates and impact. A cohort-retrospective study means both exposure and outcome have already occurred during the period of study.

3.3 Study Site

The research was carried out at Sally Mugabe Central hospital as from February 2024 to November 2024. Sally Mugabe Central Hospital, also referred to as Harare Central Hospital or Gomo Hospital, is the second largest public hospital in Zimbabwe, with a functional ANC and OI department. The OI department focuses with people living with HIV.

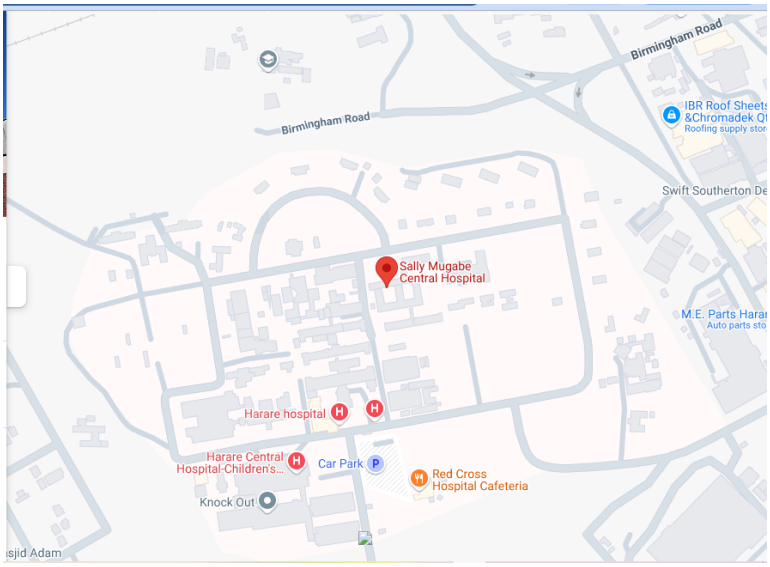

Figure 2 Map of Sally Mugabe Central Hospital3.4 Study Population

The targeted population consisted of 200 HIV-positive women who attended antenatal care (ANC) at Sally Mugabe Central Hospital during the stated period of study that was from 1 February 2024-30 November 2024.

3.5 Inclusion Criteria

- HIV positive pregnant women regardless of gestational age attending ANC at Sally Mugabe Central Hospital and diagnosed for malaria
- typically, women aged 18 years and older, as defined by the ethics guidelines

3.6 Exclusion Criteria

- HIV-pregnant women with severe comorbidities for example severe anaemia and acute illness, that may complicate the study
- Non-pregnant women

3.7 Sampling Procedure

3.7.1 Sample Size

A large sample size was needed in order to provide statistically significant results but not so large that it became impractical or unaffordable. The Cohran sample size formula was used.

Sample size (n) $= \frac{Z^2 * p * (1-p)}{E^2}$

n- Sample size; Z- z value (confidence interval); p-population proportion; E-margin of error

For example z=1.41; p=0.5; E=0.005

Therefore $n = \frac{1.41^2 * 0.5 * (1-0.5)}{0.05}$

$= 198.4$

Therefore a sample of 200 pregnant women was used.

3.7.2: Sampling method

The simple random sampling technique was applied in this study. This sampling procedure allowed every individual in the population to have an equal chance of being selected and ensure that the results were generalizable to the wider population of pregnant women. Medical records were randomly picked from all files for HIV-positive pregnant women.

3.8 Data Collection Instruments

A checklist was used to check medical records/ documentary analysis. Documentary analysis entailed assessing both physical and electronic documents in order to figure out their meaning, gain an understanding of their meaning and expand on the information they offer. The checklist included finding the malaria test result, treatment given to those who were malaria positive and recorded clinical manifestations. The information recorded from the medical records included clinical information (malaria test result, haemoglobin levels), treatment regimens for malaria (type, adherence to treatment and recorded side effects or complications) and maternal and neonatal outcomes (complications, birth weight).

3.9 Pretesting of the research instrument

A mini cross-sectional study involving 20 women who attended ANC at Sally Mugabe Central Hospital as of year 2022-2024 was carried out to assess the validity and reliability of the checklist. The mini cross-sectional study involved a random sampling technique to select the participants and looked at their medical results and analysed the results. This report had a positive feedback. This pilot study informed the design and implementation of a larger study providing valuable insights into the prevalence and effects of malaria among HIV positive pregnant women attending ANC at Sally Mugabe Central Hospital.

3.10 Data collection procedure

The data collection involved a systematic process to ensure the accurate and reliable gathering of information from HIV positive pregnant women attending ANC at Sally Mugabe Central Hospital. Data collection took place over a specified period, as from 1 February 2024 to 30 November 2024. The data was collected from the existing medical records (both electronic and physical) of HIV-positive pregnant women who attended ANC within the specified period of the study. The researcher randomly picked medical records of the patients from both the LIMS (computerised system at Sally Mugabe hospital) and the physical LIMS sheets. The random selection process involved population listing, sample size determination and random selection. For population listing, this included compiling a comprehensive list of HIV-positive pregnant women attending ANC and this list was obtained from Sally Mugabe's LIMS system. A random generator software (SPSS) was then used to select participants from the compiled list, looking at their malaria test results and haemoglobin levels. The study used maternity ward's record books so as to find out the treatment administered, noted symptoms, treatment outcomes and effects.

3.11 Analysis and Organization of Data

The data was analysed using the SPSS software which involves several key steps. The Meta analysis was conducted in order to summarize the overall prevalence and effects of malaria among the HIV-positive pregnant women. The Meta analysis statistical method aggregated the findings of the study to provide a more accurate assessment of the impact of a therapy or intervention. This analysis also involved the descriptive statistics and comparative analysis. The descriptive statistics were used to summarize the prevalence of malaria including frequencies and percentages.

3.12 Dissemination of study results

Disseminating the results of the study results on malaria prevalence and outcomes among HIV-positive pregnant women was essential for ensuring that findings reach relevant stakeholders and contribute to public health improvements. These stakeholders included healthcare provide, public health officials, academic community and the Sally Mugabe Central Hospital community. A research report including the study methodology, findings, conclusions and recommendations was submitted to the stakeholders by the researcher.

3.13 Ethical Consideration

For this study research to be carried out, the researcher got an approval letter from Africa University Ethics Board to conduct the research and permission from the Sally Mugabe Central Hospital Ethics Board in order to look into their medical records of the participants. In order to ensure confidentiality, the data collected did not include any names hence the researcher made use of assigned laboratory number from 001-200. To ensure privacy and security; only the researcher looked at the medical records, and no third party was involved.

3.14 Summary

This chapter outlined the methods that were used by the researcher to carry out the research. The researcher considered suitable data collection instruments to use when carrying out the research. This researcher also looked at the ethical considerations.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents the results of the study conducted at Sally Mugabe Central hospital; on the prevalence and effects of malaria among HIV-pregnant women attending ANC. The results will be presented in form of tables and graphs.

4.2 Data presentation and analysis

For clarity, the collected data from the medical records of 200 HIV-positive pregnant women was compiled into a number of tables and figures. The main areas of interest were haemoglobin levels, malaria test results, treatment administered, treatment adherence, observed side effects and clinical manifestations in both mothers and foetuses. HIV-pregnant, malaria-negative had the highest frequency with 160 of the participants (80%) whilst the malaria-positive had the lowest frequency of 40 participants (20%). The most common symptoms were fatigue (50%), fever (62.5%) and a lower haemoglobin level (30% with a mean of 9.0g/dL) and 10% < 8g/dL). The data indicate that while the majority of HIV-positive pregnant women are not affected by malaria (80%), there is still need for continued monitoring and preventive measures especially among the symptomatic patients.

4.2.1 Demographic data

Table 2 presents the age distribution of the 200 HIV-positive pregnant women attending antenatal care at Sally Mugabe Central Hospital. The frequencies and corresponding percentages for each group are displayed, highlighting the majority of the participants in the 25-34 age group.

Table 2 Demographic data

Age group (years)	Frequency (n=200)	Percentage (%)
18-24	50	25
25-34	100	50
35-44	40	20
>45	10	5

4.2.2 Prevalence of malaria

The prevalence of malaria in HIV infected women is summarised in figure 3. This figure visually represents the prevalence of malaria among the HIV-positive pregnant women in the study. It illustrates the percentage of participants diagnosed with malaria compared to those who were malaria-negative, emphasizing the public health concern

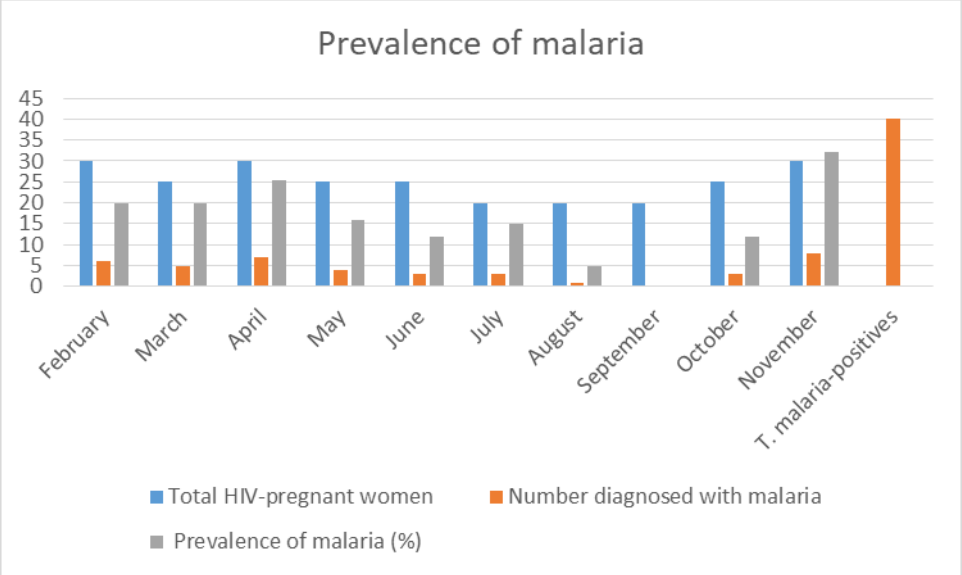

Figure 3 Prevalence of malaria in HIV-positive pregnant women

4.2.3 Clinical manifestations of malaria

Table 4 summarizes the haemoglobin levels of the participants, categorized by specific ranges. It indicates the frequency and percentage of women falling into each category, revealing the prevalence of anaemia among the HIV-positive pregnant women diagnosed with malaria. Table 5 outlines the clinical symptoms experienced by the malaria-positive participants. It details the frequency and percentage of women reporting symptoms such as fever, fatigue, headaches and nausea, providing insight into the clinical manifestations in this study

.Table 3 Haemoglobin levels of participants

Hb level (g/dL)	Frequency (n=200)	Percentage (%)
<8.0	20	10
8.0-10.9	60	30
11.0-12.9	80	40
≥13.0	40	20

Table 4 Other clinical symptoms

Symptom	Frequency (n=40)	Percentage (%)
Fever	25	62.5
Fatigue	20	50
Headaches	15	37.5
Nausea	5	12.5
Asymptomatic	2	5

4.2.4 Treatment outcomes of malaria

Figure 4 shows a pie chart indicating the types of treatment administered to malaria-positive HIV pregnant women. The pie chart also illustrates the proportion of different treatment types, providing a clear understanding of the treatment landscape for this population. It highlights the most common treatments administered. Table 6 presents the adherence rates to malaria treatment among the participants, comparing the number of patients who adhered to treatment versus those who did not. Table 7, details the various side effects reported by the participants following malaria treatment and it also includes the frequency and percentage of women experiencing side effects such as nausea, vomiting, fatigue and headaches.

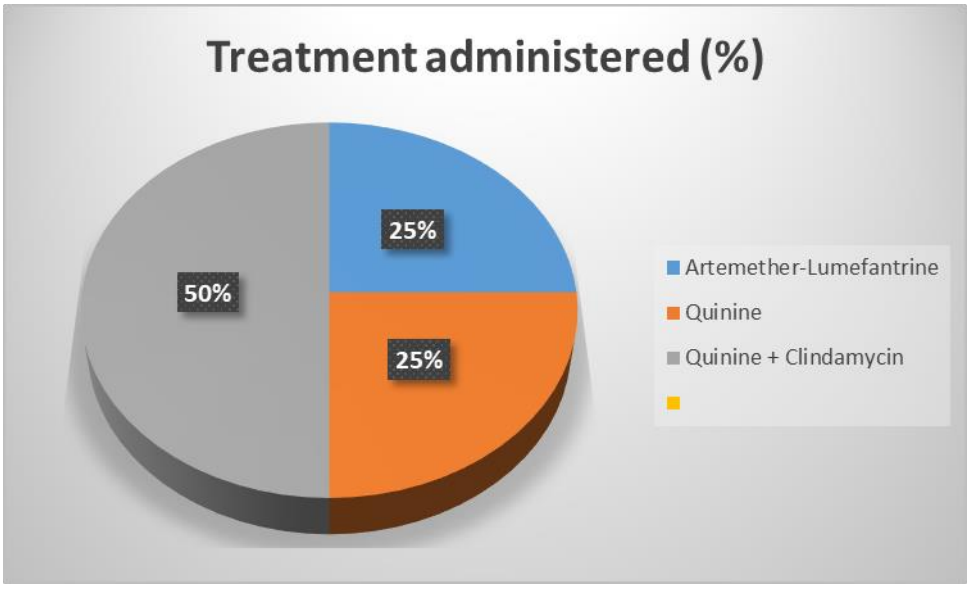

Figure 4 Pie chart indicating the treatment administered

Table 6 Treatment adherence

Treatment administered	Treatment adherence (n=34)	Treatment non-adherence (n=6)
Artemether-Lumefantrine	9	1
Quinine	7	3
Quinine + Clindamycin	18	2

Table 7 Side effects of malaria treatment

Side effect	Frequency (n=40)	Percentage (%)
Nausea	15	37.5
Vomiting	12	30
Fatigue	23	55
Dizziness	7	17.5
Diarrhoea	5	12.5
Rash	3	7.5
Headache	20	50

4.3 Interpretation of data

4.3.1 Prevalence of malaria

According to the study, 20% of the 200 HIV-positive pregnant women were diagnosed with malaria. This suggests that malaria is substantially more common in this susceptible group indicating a public health issue that requires more research and action. April had the highest prevalence at 25.3%, with 7 out of 30 HIV-pregnant women diagnosed with malaria. February and March followed with a prevalence of 20%. There was a significant drop in prevalence from around May to October. In September, no cases of malaria among HIV-positive pregnant women were recorded. The general pattern shows varying prevalence rates, emphasizing necessity of focused interventions during the peak months.

4.3.2 Clinical manifestation

According to the study, 60 (30%) of the participants had haemoglobin levels between 8.0 and 10.9 g/dL an indication of mild to moderate anaemia. A significant 10% had severe anaemia (Hb < 8.0g/dL). This implies that HIV-positive pregnant women are susceptible to anaemia, which can be made worse by malaria, resulting in higher maternal morbidity. Patients with malaria often experienced severe anaemia, fever, fatigue and headaches. Amongst those who were malaria positive; about 25 (62.5%) experienced fever, 20 (50%) experienced fatigue, 15

(37.5%) had headaches, 5 (12.5%) were nauseous and 2 (5%) showed no symptoms. Many patients needed hospitalization and some required blood transfusions, indicating severe clinical manifestations associated with malaria co-infection.

4.3.3 Treatment outcomes

85% of the positive patients adhered the administered treatment. Treatment adherence was high among those receiving a combination of Quinine & Clindamycin and Artemether-Lumefantrine with 53% adherence rates. 70% of malaria-positive patients showed improvement after treatment, while about 15% worsened particularly among those who did not adhere to treatment. Noted side effects of administered treatments included nausea (37.5%), vomiting (30%), fatigue (55%), dizziness (17.5%), diarrhoea (12.5%), rash (7.5%) and headaches (50%). Common side effects were nausea, light headaches and fatigue, some patients needed to be admitted to the hospital because of severe side effects.

4.4 Summary of the findings

The high prevalence rate of malaria (20%) among pregnant HIV-positive women at Sally Mugabe Central Hospital is consistent with findings from other studies carried out in malaria-endemic areas. The substantial ratio of anaemic participants highlights the compounding effects of HIV and malaria, which can result in serious health complications for both mothers and infants. The results of the treatment indicate that although the medications administered were effective, the side effects suggested that careful monitoring and possible modifications to treatment protocols were necessary. To improve maternal and foetal health outcomes, the results also emphasize the significance of integrated health strategies that address both HIV and malaria.

4.5 Summary

This chapter presented and analysed the data gathered from the study on the prevalence and effects of malaria among pregnant women with HIV. The results emphasized the need for targeted interventions and monitoring strategies in order to address the combined burden of malaria and HIV co-infection in this demographic. The results will inform future healthcare policies and practices aimed at improving maternal and child health at Sally Mugabe Central hospital and the country at large.

CHAPTER 5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter is a summary of the research findings regarding the prevalence and effects of malaria among HIV-positive pregnant women attending ANC at Sally Mugabe Central Hospital. This chapter gives answers to the research questions that were stated in Chapter 1. The research questions answered in this chapter are:

1. What is the prevalence of malaria among HIV-positive pregnant women attending antenatal care at Sally Mugabe Hospital from 1 February 2024 to 30 November 2024?
2. What are the clinical outcomes (e.g. Haemoglobin levels) of HIV-positive pregnant women diagnosed with malaria compared to those who are malaria-negative during the study period?
3. What are the treatment outcomes, including response rates and side effects, for HIV-positive pregnant women diagnosed with malaria during the period from 1 February 2024 to 30 November 2024 at Sally Mugabe Hospital?

5.2 Discussion of findings

5.2.1 The prevalence of malaria among HIV-positive pregnant women attending ANC at Sally Mugabe Central Hospital.

Similar studies that have been conducted in the sub-Saharan Africa report varying rates, ranging from 10% to 40% in general. For example, a study by Desalegn et al (2020) found rates as high as 35% in Ethiopia, study by Anne et al (2018) in Nigeria indicated a prevalence of 15% and a study by Tchoua et al (2021) noted a prevalence of 20% in Cameroon. According to the study, 20% of the pregnant women with HIV also had malaria, a slightly lower prevalence indicating effective malaria control measures in place at the hospital but also highlights a significant public health concern, as malaria can exacerbate health complications associated with HIV.

5.2.2 Assessing the clinical manifestations of malaria among the HIV-pregnant women attending ANC at Sally Mugabe Central Hospital

Looking at the clinical manifestations, the most reported symptoms were fatigue (55%) and light headaches (50%). These results are in line with those of Kaddumukasa et al (2019), who found that the most common symptoms among their cohort of pregnant women with malaria were fever and fatigue. In a similar vein, Okolo et al (2022) also highlighted that malaise and fatigue are typical symptoms of malaria, especially in immunocompromised people like those with HIV. The high frequency of these symptoms emphasizes the significance of early diagnosis and treatment of malaria infections.

5.2.3 Evaluating treatment outcomes of malaria

The treatment adherence rate was 85%. This result is consistent with study by Achieng et al (2020), who found that adherence rates among HIV –positive individuals receiving treatment for malaria ranged from 65%-75%. The results indicate that although the treatment regimens are effective, more support and enhanced education is required to ensure adherence especially for the high risk groups. The results in this study emphasize the necessity of patient education

and support networks to enhance adherence. Fatigue (55%) and light headache (50%) were among the negative effects of the medication that were noted. These outcomes are consistent with research by Kafle e al. (2020), which found that patients receiving malaria treatment experienced comparable adverse effects. They pointed out that diarrhoea and headaches were common adverse effects that could interfere with treatment compliance. According to a different study by Nankabirwa et al. (2021), adverse effects may cause patients to stop their therapy, highlighting the importance of supportive care. The high incidence of side effects in this research, medical professionals ought to take the initiative to control these side effects in order to increase patient compliance with treatment plans and enhance patient outcomes.

5.3 Summary of findings

The results of this study show that HIV and malaria in pregnant women interact in a complicated way. The vulnerability of this population is highlighted by the documented prevalence of malaria which calls for focused public health measures. The necessity of integrated healthcare services that address both HIV and malaria by the notable incidence of anaemia and hospitalisation among pregnant women with malaria. The results of the treatment show that following recommended treatment plans are essential for efficient management. The link between progress and adherence emphasizes how crucial patient education and support networks are in medical environments. Improving the health outcomes requires addressing adherence hurdles such as side effects and informational gaps.

5.4 Implications

These findings have significant implications for policymakers and healthcare professionals. Integrated health approaches that combine HIV care with malaria prevention and treatment are desperately needed. ANC visits for women with HIV should include routine screening for anaemia and malaria. Public health initiatives like campaigns that educate patients the

importance of following their treatment plans can also help improve results and lessen the burden of co-infections.

5.5 Limitations

The limitations of this study included the geographical scope, retrospective design and sample size. This study only focussed with Sally Mugabe Central Hospital facility, hence it might not be representative of all HIV-positive pregnant women in Zimbabwe. The study was also conducted retrospectively, it was dependent on pre-existing medical records, which might contain inaccurate or inconsistent information. While the sample size was sufficient for initial analysis, more reliable and broadly applicable results would be obtained from a larger, multi-centre study.

5.6 Conclusion

In conclusion, this study demonstrated the prevalence and effects of malaria among HIV-positive pregnant women at Sally Mugabe Central Hospital, revealing a worrisome dual burden of malaria with important consequence for both the maternal and foetal health outcomes. The study also reaffirms the necessity of integrated health interventions to effectively address co-infections and enhance health outcomes for vulnerable groups.

5.7 Recommendations

Based on the findings of this study, the following recommendations are proposed:

- Healthcare providers for example the nurses and doctors should enhance screening and treatment protocols: to lower morbidity, implement routine malaria screening for pregnant women with HIV attending ANC and ensure timely treatment.
- Public health officials should introduce integrated health services: develop integrated health strategies that address both HIV and malaria, including training healthcare providers on co-management approaches.

- Public health education by community health workers: increase awareness and education among pregnant women regarding the risks of malaria and HIV co-infection and the importance of adherence to treatment regimens.
- Researchers and academics should carry out further research : conduct larger, multi-centre studies to explore the prevalence and impact of malaria among HIV-positive pregnant women across different regions of Zimbabwe, focusing on treatment outcomes and long-term health effects
- Policy development: advocate for policies that prioritize the health needs of HIV-positive pregnant women, ensuring access to comprehensive healthcare services that address both HIV and malaria.
- Non-Governmental Organisations (NGOs) focused on maternal and child health can support the implementation of recommendations through advocacy, funding and grassroots programs

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APPENDICES

Appendix 1 Budget

Table 5Budget

Task	Budget ($)
Transport	100
Food and accommodation	150
Total costs	250

Appendix 2 Timeline/ Work Plan

Table 6 Work Plan

Activity	January 2025	February 2025	March 2025	April 2025
Submission of research for approval				
Collection and evaluation of data				
Data analysis				
Data reviewing				
Submission of research project				

Appendix 3 Data collection tool

Table 7 Data collection tool

LAB ID NUMBER	MALARIA TEST RESULT	HAEMOGLOBIN LEVEL	TREATMENT ADMINISTERED			CLINICAL
			MEDICATION	ADHERENCE	SIDE EFFECTS NOTED	

Appendix 4 Supervisor's approval

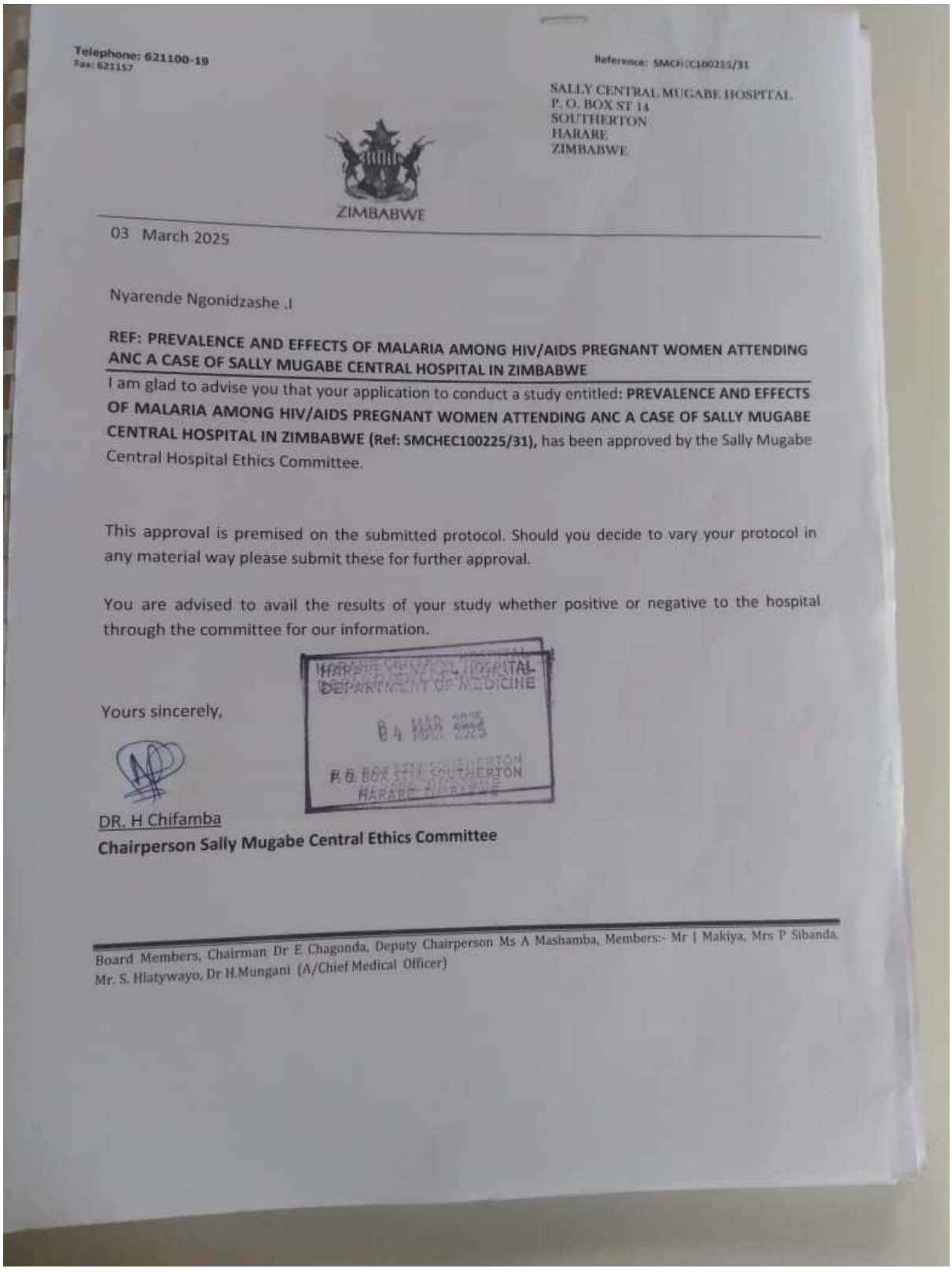
SUPERVISOR'S APPROVAL

I am the supervisor and have supervised Nyarende Ngonidzashe Isalencia's research project proposal entitled, PREVALENCE AND EFFECTS OF MALARIA AMONG HIV/AIDS PREGNANT WOMEN ATTENDING ANC A CASE OF SALLY MUGABE CENTRAL HOSPITAL IN ZIMBABWE.A proposal submitted in partial fulfillment of the requirements for the degree of Bachelor of Medical Laboratory Sciences in The College Of Health, Agriculture and Natural Sciences

SUPERVISOR: Dr S Chituku **DATE: 04/02/2025**

Dr S Chituku .  .

Appendix 5 Approval from Sally Mugabe Central Hospital



Telephone: 621100-19
Fax: 621157

Reference: SMCH:C100225/31

SALLY CENTRAL MUGABE HOSPITAL
P. O. BOX ST 14
SOUTHERTON
HARARE
ZIMBABWE

ZIMBABWE

03 March 2025

Nyarende Ngonidzashe .I

REF: PREVALENCE AND EFFECTS OF MALARIA AMONG HIV/AIDS PREGNANT WOMEN ATTENDING ANC A CASE OF SALLY MUGABE CENTRAL HOSPITAL IN ZIMBABWE

I am glad to advise you that your application to conduct a study entitled: **PREVALENCE AND EFFECTS OF MALARIA AMONG HIV/AIDS PREGNANT WOMEN ATTENDING ANC A CASE OF SALLY MUGABE CENTRAL HOSPITAL IN ZIMBABWE (Ref: SMCHEC100225/31),** has been approved by the Sally Mugabe Central Hospital Ethics Committee.

This approval is premised on the submitted protocol. Should you decide to vary your protocol in any material way please submit these for further approval.

You are advised to avail the results of your study whether positive or negative to the hospital through the committee for our information.

HARARE CENTRAL HOSPITAL
DEPARTMENT OF MEDICINE
04 MAR 2025
P.O. BOX ST14 SOUTHERTON
HARARE ZIMBABWE

Yours sincerely,

DR. H Chifamba
Chairperson Sally Mugabe Central Ethics Committee

Board Members, Chairman Dr E Chagonda, Deputy Chairperson Ms A Mashamba, Members:- Mr I Makiya, Mrs P Sibanda, Mr. S. Hlatywayo, Dr H.Mungani (A/Chief Medical Officer)

Appendix 6 AUREC's approval

"Investing in Africa's future"

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 Website: www.africau.edu

Ref: AU 3703/25

12 March, 2025

NYARENDE NGONIDZASHE ISALENCIA
C/O Africa University
Box 1320
MUTARE

RE: ***PREVALENCE AND EFFECTS OF MALARIA AMONG HIV/AIDS PREGNANT WOMEN ATTENDING ANC: A CASE OF SALLY MUGABE CENTRAL HOSPITAL IN ZIMBABWE***

Thank you for the above-titled proposal you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

a) Research proposal

- **APPROVAL NUMBER** AUREC 3703/25
  This number should be used on all correspondences, consent forms, and appropriate document
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** March 12, 2025
- **EXPIRATION DATE** March 12, 2026
- **TYPE OF MEETING**: Expedited
  After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be submitted a month before the expiration date for renewal purposes.
- **SERIOUS ADVERSE EVENTS** All serious problems concerning subject safety must be reported to AUREC within 3 working days on the standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

Yours Faithfully

MARY CHINZOU
FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE