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PREVALENCE AND RISK FACTORS OF *CHLAMYDIA TRACHOMATIS* AND *BACTERIAL VAGINOSIS* AMONG YOUNG ADULT WOMEN (21-40 YEARS) AT PARIRENYATWA GROUP OF HOSPITAL, HARARE

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF MEDICAL LABORATORY SCIENCE (HONOURS) IN THE COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

Abstract

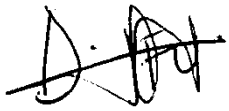
This study assessed the prevalence and risk factors of *Chlamydia trachomatis* and *Bacterial vaginosis* among young adult women aged 21–40 years attending Parirenyatwa Group of Hospitals in Harare, Zimbabwe. A descriptive cross-sectional study design was adopted, with 281 participants recruited using simple random sampling. Data were collected through structured interviewer-administered questionnaires to assess sociodemographic characteristics, sexual behaviors, contraceptive use, and history of sexually transmitted infections (STIs) and High vaginal swabs were obtained for laboratory diagnosis, or CT and for BV. The results revealed a prevalence rate of 35.5% for either Chlamydia trachomatis or Bacterial vaginosis, or both, with co-infection observed in 20% of positive cases. Behavioral risk factors such as unprotected sexual activity, high contraceptive use, and smoking showed a significant association with infection rates. Additionally, co-infections were linked to adverse reproductive health outcomes, including pelvic inflammatory disease, infertility, and negative pregnancy outcomes. The study emphasizes the importance of routine STI screening, comprehensive sexual health education, and public health interventions aimed at mitigating risk factors and improving reproductive health outcomes among young women in resource-limited settings.

The findings highlight a substantial burden of *Chlamydia trachomatis* and *Bacterial vaginosis* among adult women at Parirenyatwa Group of Hospitals, underscoring the need for enhanced screening programs, sexual health education, and targeted interventions to mitigate risk factors. Strengthening reproductive health services and promoting preventive strategies could be crucial in reducing the prevalence and complications associated with these infections.

Keywords: Resistance, Prevalence, Risk factors, Chlamydia trachomatis, and Bacterial Vaginosis infections.

Declaration

I, Deborah Domini Ifu, declare that this research project proposal is my original work, except where sources have been cited and acknowledged. It has not been submitted for degree award in any other college or university.



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Acknowledgments

I want to thank God for making this possible when I thought I wouldn't scale through. Special thanks to my dad and mum for their unwavering support. To my academic supervisor, Prof. Emmanuel Obeagu for his unending support and contribution in supervising me throughout this dissertation. I thank Mr. Dobyo Amos for his support and Mr. Jonathan Auta for his encouragement during my research. I want to thank the Parirenyatwa Group of Hospital Laboratory Scientists for allowing me to carry out this study at their laboratory.

Dedication

I dedicate this work to my family for their love and support during my studies. I would like to express my sincere gratitude to my dear father and mother for their great role in my life and their numerous sacrifices for me. Many thanks to my sister Glory Ifu for her support.

List of acronyms and abbreviations

Acronyms& abbreviations	Meaning
AUREC	Africa University Research Ethics Committee
BV	Bacterial Vaginosis
CT	Chlamydia Trachomatis
HIV	Human Immunodeficiency Virus
PID	Pelvic Inflammatory Disease
STI	Sexually Transmitted Infections
NCSP	National Chlamydia Screening Program

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CHAPTER ONE: INTRODUCTION

1.1 Study background

Chlamydia trachomatis and Bacterial vaginosis are two of the most common sexually transmitted infections (STIs) affecting young adult women worldwide (Ardizzone *et al.,* 2023). *Chlamydia trachomatis* is a major public health concern due to its association with pelvic inflammatory disease (PID), ectopic pregnancy, and infertility. Conversely, *Bacterial vaginosis* increases the risk of PID, preterm labor, and Human immune Virus (Mazraani *et al.,* 2021). According to the Zimbabwe National HIV and AIDS Estimates 2020, the prevalence of CT among women aged 15-49 years is estimated to be around 5.5%. BV prevalence in Zimbabwean women has been reported to range from 22.1% to 43.6% in different studies. Risk factors for CT and BV among young adult women include Multiple sexual partners, Inconsistent condom use, History of STIs, Limited education, and Smoking (Zeng *et al.,* 2023).

Chlamydia trachomatis has evolved over the years leading to a complexity of the organism's biology and the inflammatory infection it causes. A review indicates that *Chlamydia* was 'discovered' in 1907, although Chlamydial illness had been recognized for centuries before that. It is established that in 1907, a German dermatologist and radiologist Ludwig Halberstädter teamed for a research expedition to study syphilis. *Chlamydia trachomatis* was first and definitively isolated from trachoma patients using chick embryos by Tang et al., as reported in a series of papers published in 1956 and 1957. The ocular *Chlamydia trachomatis* exerts pressure and is responsible for most preventable blindness in underdeveloped countries with inadequate hygiene, genital

Chlamydia trachomatis strains are known to be major sexually transmitted infections (STI) pathogens globally (Hafner *et al.,* 2013). Globally the incidence of *chlamydia* under STI is 4-5 times higher than that of gonorrhea, and 100 times higher than that of syphilis (Sinka *et al.,* 2024).

According to Jaton *et al*. (2006), *Chlamydia trachomatis* is so minute, that its infectivity is preserved after filtering via filters employed to separate the virus from bacteria at the time. It is a bacterium, though, because it synthesizes its macromolecules. It is one of a limited group of obligatory intracellular prokaryotes. *Chlamydia trachomatis* replicates exclusively within a vacuole, known as an inclusion, in the host cell's cytoplasm. The mucosal epithelial cells are the main cell type that is being targeted. According to Low *et al.*, (2016), the mucous membrane is the only area of infection for the majority of *Chlamydia trachomatis* strains, however, lymphogranuloma venereum (LGV) strains target deep lymphatic tissues. Manavi (2006) states that gram-negative, nonmotile, intracellular, obligatory *Chlamydia* bacteria have a distinctive biphasic life cycle that includes extra- and intracellular forms. Lipopolysaccharide (LPS) and membrane proteins make up the outer membrane of chlamydia. In the septum of dividing bacteria is peptidoglycan. *Chlamydia* has DNA, RNA, and ribosomes, but they need the host cell to provide them with high-energy phosphate molecules (Jadhav *et al.*, 2024). The main outer membrane protein (MOMP or OmpA), which is abundant and surface exposed, is the primary determinant of serologic categorization and is encoded by *Chlamydia trachomatis*.

Chlamydia has a distinct biphasic developmental cycle that incorporates two highly specialized distinctive morphologic forms. The extracellular form, or elementary body

(EB), is stable outside of the cell and possesses a thick, stiff outer membrane with many disulfide cross-links both inside and between outer membrane proteins (McSorley, 2015). The tiny (350 nm in diameter) EB is metabolically inert yet contagious. An EB attaching to a mucosal epithelial cell starts the developmental cycle. There have been several possible adhesins put forth, however, it is still unknown what they are and what epithelial cell receptors they are connected with. The EB shields itself from enzymatic degradation inside the cell by residing in a membrane-limited endosome and preventing the endosome from fusing with lysosomes (McSorley, 2015). Infection with *Chlamydia trachomatis* (CT) is still common, and young women are disproportionately impacted. The majority of CT-infected women are asymptomatic, and their illness frequently remains unnoticed and untreated (Kogler *et al.,* 2024). We hypothesized that testing for active CT infection with molecular diagnostics and obtaining a reported history of CT infection underestimated the prevalence of current and past CT infection and that adding serum CT antibody testing to these other measures would yield more accurate estimates of CT infection prevalence in asymptomatic young women.

Chlamydia may infect the rectum as well. If a woman has a *chlamydia* infection in the rectum, she may not feel any symptoms. However, signs of a rectal infection may include rectal discomfort, discharge, and bleeding (Manavi, 2006). Women can also get a throat infection if they have oral intercourse with someone who has the virus. Cough, fever, and sore throat are indications of a *chlamydia* infection in your throat, which can occur without your knowledge. Because the symptoms of STIs differ between men and women, it is critical to consult a healthcare expert if you encounter any of the aforementioned symptoms.

1.2 Problem statement

Sexually transmitted infections (STIs), particularly Chlamydia trachomatis and bacterial vaginosis (BV), represent a significant public health challenge globally, especially among women of reproductive age. These infections are often asymptomatic, leading to delayed diagnosis and treatment, which increases the risk of complications such as pelvic inflammatory disease, infertility, and adverse pregnancy outcomes. Despite global awareness efforts and diagnostic advancements, the burden of C. trachomatis and BV remains high in many low and middle-income countries, including Zimbabwe. At Parirenyatwa Group of Hospitals, one of the largest referral hospitals in Zimbabwe, there is limited recent data on the prevalence and associated risk factors of these infections among adult women. This lack of local epidemiological evidence hinders the effective planning and implementation of targeted interventions aimed at prevention, early detection, and treatment. Without accurate and current data, it is difficult to identify high-risk populations and tailor health education and screening programs to address the needs of this demographic. This study seeks to address this gap by determining the prevalence and identifying key risk factors associated with CT and BV among adult women attending Parirenyatwa Group of Hospitals. The findings will contribute valuable insights for healthcare policy-makers and clinicians in enhancing STI management strategies in Zimbabwe.

1.3 Justification of the study

The research study on *Bacterial vaginosis* and *Chlamydia trachomatis* is important since it focuses on the risk factors of the infection. Most young women lack the knowledge and awareness of what it means for them to do early screening for *Bacterial vaginosis* and *Chlamydia trachomatis*. The study will create an understanding of the health impact and understanding of late diagnosis of the disease which could lead to inflammatory diseases in the pelvic area. Young women between the ages of 21 to 40 are likely to fall pregnant during these years which may be a major concern. If a pregnant woman is infected with any BV or CT, it is dangerous for the proper growth of the fetus let alone for the pregnant mother (George *et al.,* 2022*)*. Therefore, identifying the risk factors can protect young women from developing STIs as a result of the lack of knowledge about screening for *Chlamydia trachomatis*.

Chlamydia infection in women can be particularly problematic due to its potential to cause pelvic inflammatory disease, which in turn, in addition to causing serious infection, can lead to infertility and increased risk of ectopic pregnancy. *Chlamydia* can also increase one's chances of contracting another STI, such as gonorrhea and HIV. In pregnant women, it can cause miscarriage, stillbirth, and preterm birth. Therefore, research on this subject is crucial as it informs young women and the health authorities on what strategies to implement to reduce the rate of infections among young women. Ectopic pregnancies are amongst the top causes of mortality in the first trimester of pregnancy. Most young women may not be aware of the need

to undergo early screening whereas the research study imparts knowledge in women on the need and importance of early screening.

Researching on *Bacterial Vaginosis* and *Chlamydia trachomatis* is an important study, especially in the wake of HIV. This may assist in the diminishing of maternal mortality and HIV predominance in the body. The negative effect on infected young women, particularly young ladies and youthful ladies who live in hardship as well as young ladies and youthful ladies with inabilities, who "encounter four times more viciousness than those living without inabilities." In comparison to non-disabled individuals, ladies and men with incapacities have several basic, mental, and physical obstructions that damage their psychological well-being. They experience extra impediments when attempting to get medical treatment for *Chlamydia*.

1.4.1 Broad objectives

This research aims to determine the Prevalence and risk factors of *Chlamydia trachomatis* and *Bacterial vaginosis* among young adult women (21-40 years) at Parirenyatwa group of Hospital, Harare.

1.4.2 Specific objectives

I. To determine the prevalence of *Chlamydia trachomatis* and *Bacterial vaginosis* (BV) in the same population of young adult women (21-40) at Parirenyatwa Group of Hospital Harare in 2024.

II. To assess behavioral risk factors (e.g., sexual practices, contraceptive use, smoking) contributing to *Bacterial vaginosis* and *Chlamydia trachomatis* infections (21-40) at Parirenyatwa Group of Hospital Harare.

III. To evaluate the association between co-infection *with Chlamydia trachomatis* and *Bacterial vaginosis,* and its impact on the reproductive health of the study population (21-40) at Parirenyatwa Group of Hospital Harare.

1.4.3 Research questions

I. What is the prevalence of *Bacterial vaginosis (*BV) and *Chlamydia trachomatis* in the same population of young adult women (21-40) at Parirenyatwa Group of Hospital Harare?

II. What sociodemographic factors (e.g., age, education level, marital status) are associated with the risk of *Chlamydia trachomatis* infection and *Bacterial vaginosis* in young women (21-40) at Parirenyatwa Group of Hospital Harare?

III. What are the behavioral risk factors (e.g., sexual practices, contraceptive use, smoking) that contribute to the occurrence of bacterial vaginosis and *Chlamydia trachomatis and Bacterial vaginosis* infections (21-40) at Parirenyatwa Group of Hospital Harare?

1.5 Study limitations

Self-reported data, subject to social desirability bias. Different measurement tools may yield varying results.

1.6 Delimitations

The study was conducted at the Parirenyatwa Group of Hospital and mainly focused on the Prevalence and risk factors of *Chlamydia trachomatis* and *Bacterial vaginosis* among young adult women (21-40 years) at Parirenyatwa Group of Hospital, Harare. This study was not focused on the whole patients at PGH but instead, it focused on patients whose samples were received in the laboratory. This study did not focus on patients from another hospital experiencing the same crisis of urinary tract infection prevalence. STIs and their risk factor in young women were the topics to be investigated in this study.

1.7 Chapter Summary

This chapter presented an outline of the *Chlamydia trachomatis* and *Bacterial vaginosis* experience when attempting to get to sexual and regenerative well-being care, highlighting the requirement for investigating the infection. This chapter included the research study background, objectives, and inquiries on the research questions. The research gave an account of the delimitation of the study in this particular research. The next chapter will focus on the Literature Review and structure of the theoretical framework.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Bacterial vaginosis and *Chlamydia trachomatis* are mainly sexually transmitted infections (STI) and are the most common and treatable around the globe. Males suffer from urethritis, whereas females suffer from Endo cervicitis. Untreated BV and CT in women have no or few symptoms which may lead to the development of endometritis, also known as pelvic inflammatory disease (PID), ectopic pregnancies, or tubal factor infertility. This section presents the literature review of the research on the prevalence of *Bacterial vaginosis* and *Chlamydia trachomatis* in young adult women between the ages of 21 and 40.

2.2 Conceptual framework

This framework explains the influence of the risk factors of *Bacterial vaginosis* and *Chlamydia trachomatis* in young adult women between the ages of 21 and 40 such as age, sexual intercourse, and socio-demographics.

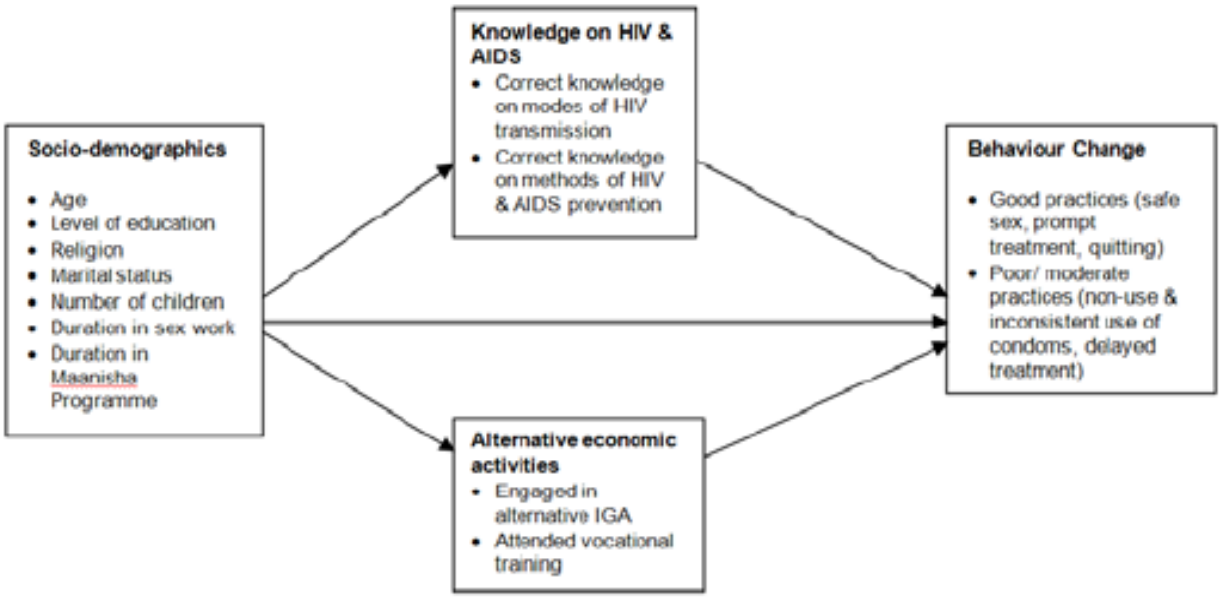


Figure 1. A conceptual framework on Sexually transmitted infection

Chlamydia trachomatis and *Bacterial vaginosis* have been related to a higher risk of HIV transmission or acquisition and a higher risk of cervical cancer. High rates of *Chlamydia* and *Bacterial vaginosis* are a result of the level of knowledge on HIV and AIDS There is a lack of knowledge that infected people must be detected and treated as soon as possible to prevent the disease from spreading. The lack of technologies that can provide early detection and diagnosis is also another shortfall to the prevalence of *Chlamydia* (Cao *et al.,* 2023).

This conceptual framework depicts that the prevalence of *Bacterial vaginosis* and *Chlamydia* is also a result of socio-demographics. Socio-demographics are nothing more than characteristics of a population. Generally, characteristics such as age, gender, ethnicity, education level, income, type of client, years of experience, location, etc. are being considered as socio-demographics and are being used in determining the prevalence of chlamydia (Balakrishnan, *et al.*, 2020).

This infection is most common among young people. Two-thirds of new STI infections occur among youth aged 15-24 years. Estimates show that 1 in 20 sexually active young women aged 21-40 years has chlamydia. As a result of behavioral patterns, *Chlamydia* becomes more prevalent. Sexually active young people are at high risk of getting *Bacterial vaginosis* and *Chlamydia* for behavioral, biological, and cultural reasons.

2.3 Prevalence of *Bacterial Vaginosis* and *Chlamydia Trachomatis* on a Global Scale

Globally, sexually transmitted infections (STIs) are a major public health problem affecting the quality of life and causing serious morbidity. *Chlamydia trachomatis* and BV are the most common bacterial STIs worldwide. Globally, the prevalence of CT among pregnant women is similar or even higher than among non-pregnant women as suggested by some studies, though limited data are available. In sub-Saharan Africa, pooled prevalence rates range from 0-31.1%, with West Africa having a pooled prevalence of 6.1%. Prevalence rates of 2%-13.2% have been reported among pregnant women in Nigeria. *Bacterial vaginosis* is the most common cause of vagina discharge among women of reproductive age with a prevalence of 9-37% depending on the population (Goldberg *et al.,* 1996).

The infection is mostly asymptomatic in women, which perpetuates an ongoing source of efficient disease transmission and also results in silent disease, which can result in adverse reproductive outcomes. CT and BV are now being considered an “obstetric pathogen” due to their potential to cause adverse pregnancy and perinatal outcomes. Pregnant women are regarded as an important population because this infection in pregnancy is

associated with additional morbidity. This is because intrauterine or perinatally transmitted CT infection has grave consequences on pregnant women, their partners, and their fetuses. This study gathered that CT infection causes miscarriage, pre-labor rupture of membranes, stillbirths, puerperal endometritis, preterm birth, low birth weight, neonatal conjunctivitis, and neonatal pneumonia (George *et al.,* 2022).

2.4 Signs and Symptoms of *Chlamydia* and *Bacterial vaginosis*

These infections may cause discharge, back pain, bleeding in between periods, and a burning sensation while urinating (Paul, 2024). The bacteria infect the urinary tract and the cervix, before traveling to the fallopian tubes. Infection in the cervix can also spread to the rectum. When *Chlamydia* goes untreated, 40% of those infected will develop pelvic inflammatory disease (PID), a condition that can cause permanent damage to the uterus and fallopian tubes (Ozdemir *et al.,* 2023). Such damage can lead to infertility, chronic pelvic pain, and ectopic pregnancies (Liu *et al*., 2020). In pregnancy, this damage can lead to premature birth, neonatal conjunctivitis, and pneumonia in the infected babies. Other symptoms include cervicitis, urethritis, endometritis, swelling of the Bartholin glands, postcoital bleeding, and dysuria (Black, 2007).

In a retrospective study conducted among teenage adult women infected with CT, 54% of subjects under fifteen at initial infection and 30% of those between fifteen and nineteen suffered recurrent infections (Brito *et al.,* 2023). A subsequent study found that 38% of the same subjects reported a recurrent disease within 3 years (Black, 2007). There is evidence that indicates that the risk of infertility or ectopic pregnancy increases with repeated episodes of the infection (Gaydos, 2004).

The incidence of *Chlamydia* urethritis among bisexual and homosexual men is about one-third of that reported in heterosexual men (Setyowatie *et al.,* 2023). In genitourinary clinic populations, between 4 and 8% of homosexuals were found to suffer from asymptomatic rectal *Chlamydia* infection (Black, 2007). When symptoms are present, men and women who suffer from rectal infection as a result of receptive anal intercourse may have rectal discharge and pain during defecation (Black, 2007). *Chlamydia* infection rarely causes sterility in men but when it travels to the epididymis it may cause fever and pain (CDC, 2007). In expectant mothers, reports show that C. trachomatis infection is ten times as likely to cause stillbirth, neonatal death, and considerably shorter Gestational age (Black, 2007).

2.5 Screening, Detection, and Treatment

Chlamydia qualifies for the World Health Organization's criteria for screening, The United Kingdom and other countries mandate that a national screening program be in place to offer opportunistic screening to detect *Chlamydia* in selected healthcare settings (Adam *et al,* 2004). The National Chlamydia Screening Program (NCSP) was set up by the Department of Health in 2003, as a sexual health program that is part of the National Health Service (NCSP, 2010). The NCSP aims to ensure that all sexually active young people under age 25 are aware of *Chlamydia* and its effects and have access to free and confidential testing, prevention, treatment, and partner services, all designed to reduce their risk of infection or transmission (NCSP, 2010).

However, since 2005, The Health Protection Agency (HPA) has coordinated, facilitated, and supported the establishment of local *Chlamydia* screening programs (NCSP, 2010). Because this infection can easily be treated with antibiotics, detection and treatment of individuals infected with *Chlamydia* is a key aspect of any control program (Gaydos *et al.,* 2004). Data shows that *Chlamydia* infection among young women between the ages of 16 to 24 is very high, with over two-thirds of *Chlamydia* infections among women in 2005 within this age group (Adam *et al.,* 2004). The NCSP (2010), reports that in the UK one in fourteen tested young persons under the age of twenty-five have *Chlamydia*. It is hence recommended that any sexually active adolescents and females under age twenty-five be screened for CT infection every year (Gaydos *et al.,* 2004).

Ideally, all women with symptoms or clinical signs would be tested for CT infection and treated, as should their sexual partners (Black, 2007). Presumptive treatment of women with mucopurulent cervicitis or other clinical signs is a reasonable approach based on the increased prevalence of CT infection in women, but this decision should be supported by findings or estimates of prevalence by local screening programs (Black, 2007, CDC 2010).

The traditional approach to laboratory diagnostic testing for CT infections consisted of a cell culture of inoculants prepared from urogenital specimens (Black, 2007). in the 1980s, antigen and nucleic acid detection technologies were developed that have found widespread application in diagnosis because they cost less, require less expertise, take less time to obtain results, and preserve infectivity during transport (Black, 2007). Nucleic acid amplification tests (NAAT) have been recently developed for diagnosing *Chlamydia*

trachomatis infection of the genitals. Not only are the NAATs more sensitive than any previous test, but they are also extremely specific (Schachter et al, 2003). Low prevalence populations can be screened using these tests and will provide results with high predictive value. Studies have shown that NAATs can be used to test first-catch urines (FCUs) from symptomatic and asymptomatic men (Schachter *et al.,* 2003), The sensitivity obtained is similar to cervical swabs, which results in the detection of *Chlamydia* bacteria in the urethra and vaginal secretions that enter the urine specimen during collection (Schachter *et al.,* 2003).

Specimens collected in a non-invasive manner used for the diagnosis of *Chlamydia* infections in both men and women allow *Chlamydia* infection control for true population-based prevalence surveys and sophisticated screening approaches (Schachter *et al,* 2003). Being able to diagnose asymptomatic infections is imperative for the control of bacterial sexually transmitted diseases, particularly for CT, which is often asymptomatic (Schachter *et al,* 2003). The application of these tests has brought to light the fact that culture is not as sensitive and that the prevalence of C. trachomatis infection is higher in most populations than was previously known (Black, 2007).

In women, the most common anatomic site used to obtain specimens for the isolation of C. trachomatis is the endocervix, which is sampled with a swab or cytologic brush (Black, 2007). This swab is typically inserted past the squamocolumnar junction, about 1 to 2 cm deep, rotated for 15 to 30 seconds, and removed without touching the vaginal mucosa. The preferred site of sample collection from males is the anterior urethra (CDC, 2007). In this test, a dry swab is placed 3 to 4 cm into the urethra and rotated before removal. The individual being tested should not pass urine for an hour before the test, because

urination can wash away the infected columnar cells and reduce the sensitivity of diagnostic testing (Black, 2007).

A more specific and sensitive test is the Nucleic acid amplification test for screening *Chlamydia,* but they are often unaffordable for some clinics (Mahilium-Tapay *et al.,* 2007). It takes a week or two for the results to be produced, though this does not exclude immediate initiation of treatment and partner notification (Mahilium-Tapay *et al.,* 2007). An alternative to typical methods of testing for *Chlamydia* is the rapid test (CRT), which has not yet been approved for medical use (Mahilium-Tapay *et al,* 2007). This could be a useful way of screening for *Chlamydia* A test with the characteristics of the *Chlamydia* Rapid Test could be a useful way of screening for *Chlamydia* as it is non-invasive and results are immediate and could attract more young women to come forward for the test it approved (Mahilium-Tapay *et al.,* 2007).

Mahilium-Tapay assessed the performance of the CRT as a possible *Chlamydia* screening tool. They used a non-invasive procedure, using urine specimens and vulva vaginal swabs to screen 1349 women between the ages of 16-54. These researchers reported that the Rapid Test kits were appropriate for diagnosing infections because they offered good sensitivity and specificity. It showed 83.5% and 86.7% sensitivity and predictive value respectively among the study's participants. These researchers also found that the load of *Chlamydia trichomonas* in vaginal swabs was higher than that found in the urine samples. Their participants reported that they preferred the self-collecting vaginal swabs to urine as they did not have to wait two hours after voiding to void again so the doctors could

collect a sample. The self-collecting vagina swab was the preferred method for the rapid test kits (Mahilium-Tapay *et al.,* 2007).

The CRT has a thirty-minute turnaround time which permits treatment while the individual is still at the clinic (Mahilium-Tapay *et al.,* 2007). Given that nearly 3% of women detected with *Chlamydia* go on to develop PID in the space of testing positive and their return for treatment, the use of the *Chlamydia* Rapid Test is crucial for prompt diagnosis and treatment (Mahilium-Tapay *et al.,* 2007). Testing and treating the individual can help to prevent *Chlamydia* from spreading too quickly. Tracing of contacts should also be started immediately, to aid in the treatment of other sexual partners (Mahilium-Tapay *et al.*, 2007).

2.6 Attitudes and perceptions that can affect the uptake of screening for Chlamydia

How a *Chlamydia s*creening service is organized and delivered can affect its success (Low *et al.*, 2009). In the UK, the opportunistic approach for screening is used, where practitioners offer the test to individuals who are part of the target population, and who use the health service or the sexual health clinics for other reasons (Low *et al.,* 2009). As a result, high-risk individuals who do not attend the clinic do not get screened while those at low risk are repeatedly screened (Low *et al.,* 2009).

Pavlin *et al*. (2006), suggest that to control the spread of *Chlamydia*, it is crucial to understand the reasons why people choose to or not to undertake *Chlamydia* screening. They relate this to an existing psychological theory, the Theory of Planned Behaviour (TPB) (Pavlin *et al*., 2006). According to the TPB, an individual's behavior is affected by Attitude; this can be explained based on the kind and amount of information possessed by the individual about *Chlamydia* infection and screening (Adjzen, 1991; Pavlin *et al*., 2006). Hence, by creating awareness about BV and *Chlamydia*, Women who are mostly infected, are more likely to accept screening for *Chlamydia* if they know about the seriousness of the condition and the long-term effect of infertility, how widespread it is, and if they are aware that it can be asymptomatic. This is likely to make them see the importance of and understand the testing process (Pavlin *et al*., 2006). Whether the person prefers the behavior or sees it as a Subjective Norm (Adjzen, 1991), in this case, it becomes important to give individuals, especially women some control over the screening process.

2.7 Preventative Measures on the Reduction of Chlamydia and Bacterial Infections

Chlamydia Trachomatis and Bacterial vaginosis are best prevented by abstinence from vaginal, anal, or oral sex. If this is not possible then the best sexual relationship is one with a single partner who tests negative for *Chlamydia (*Schoenstatt, 2006). The use of condoms during sex can also reduce the risk of *Chlamydia* transmission (Schoenstatt, 2006). Latex condoms have been proven through studies to provide an impermeable

barrier for particles of *Chlamydia* and other STIs (CDC, 2010). As such, the consistent and correct use of condoms can reduce the risk of contracting and transmitting *Chlamydia* (CDC, 2010). Healthcare practitioners need to educate clients that, birth control methods including pills, injectables, implants, and diaphragms do not protect against *Chlamydia*. Individuals who use any of these methods should be advised to use a latex condom (or dental dam for oral sex) correctly when they have sex (CDC, 2007). Genitourinary clinics and other health facilities will provide a friendly environment for individuals and their partners to talk to doctors and nurses for more information and where to seek help (Schoenstatt, 2006).

2.8 Periodical screening and Early Screening for women

The screening of *Chlamydia* and *Bacterial vaginosis* in all sexually active women younger than 20 years and in older women are at risk of infection for example those who have a new or multiple sex partner or a sex partner who has an STI. Screening for CT and BV infections in pregnant women younger than 20 years and older pregnant women at increased risk for infection during their first prenatal visit and again during their third trimester if risk remains high.

This study has encouraged young women to consider screening for *Chlamydia trachomatis* and *Bacterial vaginosis* if sexually active including individuals in high-prevalence areas and populations.

2.9 Correct use of condoms

This study has shown that consistent and correct use of latex condoms reduces the risk of sexually transmitted disease (STD) and human immunodeficiency virus (HIV) transmission. However, condom use cannot provide absolute protection against any STD. The most reliable ways to avoid transmission of STDs are to abstain from sexual activity or to be in a long-term mutually monogamous relationship with an uninfected partner. However, many infected persons may be unaware of their infection because STDs often are asymptomatic and unrecognized (Ikokwu *et al.,* 2023).

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

The research methodology is considered a structured approach to tackling research problems. This section details how researchers articulate, forecast, and characterize their studies, which is typically known as research methodology. It will also clarify and support the chosen sampling technique for this research while offering justification for utilizing the data in the research process. The study incorporated both primary and secondary data. Secondary data was gathered from multiple sources, which was assessed for its validity and reliability.

3.2 **Research Design**

This research design used a cross-sectional study to gather information on the prevalence of *Chlamydia trachomatis* and *Bacterial vaginosis* between the ages of (21-40). This research used the number of patients and pregnant women visiting Parirenyatwa Hospital. The sample size was extracted from the population where the participants were drawn. Respondents were mainly those visiting the Parirenyatwa Hospital in Harare.

3.3 Study Setting

The research participants were obtained from Parirenyatwa Group of Hospitals.

3.4 Study population

This study focused on young adult with *Bacterial vaginosis* and *Chlamydia trachomatis* infection symptoms and those visiting Harare Parirenyatwa Hospital seeking treatment for *Chlamydia trachomatis* and *Bacterial vaginosis* infections. Symptoms of *Bacterial vaginosis* and *Chlamydia trachomatis* include Abdominal pain, Irregular menstrual Bleeding, Pain during urination, and vagina discharge. This study population included all the elderly patients diagnosed with STIs at Harare Parirenyatwa Hospital from 2023 to 2024.

3.5 Exclusion Criteria

Patients below the age of 21 were left out. Teenagers on treatment and those not presenting with any symptoms were left out.

3.6 Inclusion Criteria

The study included all young adult above the age of 21-40 presenting symptoms at Parirenyatwa Hospital seeking treatment were included in this study because this study was focused on them only**.** Patients who consented to be part of the research and also not any sort of treatment for the past two weeks before the study was included**.**

3.7 Sample Size

The sample size was calculated using the following formula:

Necessary sample size = $\frac{(\text{Z-score})^2 \times \text{standard deviation} \times (1\text{-standard deviation})}{(\text{Margin of error})^2}$

Where:

n= the sample size

Z= the statistic corresponding to level of confidence

P= expected prevalence

d= precision.

Using the above formula to calculate the necessary sample size that is:

Necessary sample size= $\frac{(1,96)^2 \times 0,241\ (1\text{-}0,241)}{(0,05)^2}$

Necessary sample size= 281

3.8 Sampling Methods

The sampling method used was a random selection of women visiting Parirenyatwa Hospital. The participants were between the ages of 21 to 40 years old were sexually active, were single, and had more than one sexual partner within the last five years. The participants signed an informed consent form, after being given a document that explained what the study was and what information they were expected to provide. The hospital was also asked to give their approval for the study to take place within their facilities.

3.9 Pilot Study

Preliminary testing was carried out at Harare Parirenyatwa Hospital laboratory and 20 cases were selected and considered using a simple random sampling method. Data was collected and compiled into a Microsoft Excel spreadsheet.

The results of the pilot study were used to assess the feasibility of the study and the reliability and completeness of the record. The pilot study also revealed the resources and time needed to complete this study, which helped with scheduling**.**

3.10 Data Analysis

The rate of BV and CT within Parirenyatwa Hospital was analyzed. The rate of condom usage was assessed with the initial question "Do you regularly use condoms during intercourse? and this was compared to the rate of condom usage from the monthly data collection. The rates of condoms were decreased.

3.11 Ethical considerations

Ethical clearance was carried out study and was sought by Africa University Research Ethics Committee. After clinical data collection from the laboratory, Results confidentiality was maintained by keeping them on a computer with good security. Confidentiality was maintained, and no names of the participants were needed or taken

down during this research. Information shall be collected in line with the requirements of the Ethics Committee (AUREC).

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

4.1. Introduction

The study aimed to determine the prevalence of *Chlamydia trachomatis* (CT) and Bacterial vaginosis (BV) among young adult women aged 21-40 at Parirenyatwa Group of Hospitals in Harare. Over a one-year period, a total number of 281 young women were screened for these infections. The findings revealed that 35.5% (100/281) of the participants tested positive for either CT, BV, or both infections, while 64.5% (181/281) tested negative.

4.2. Description of Study Participants

This study was a retrospective analysis of laboratory results and clinical records of women aged 21-40 who attended the Parirenyatwa Group of Hospitals between January 2022 and December 2022. The majority of the participants were aged 31-35 years (37.5%), followed by those aged 21-30 years (26.7%) (Table 1). Of the 281 participants, 100 (35.5%) were diagnosed with either CT, BV, or both, while 181 (64.5%) tested negative (Figure 2).

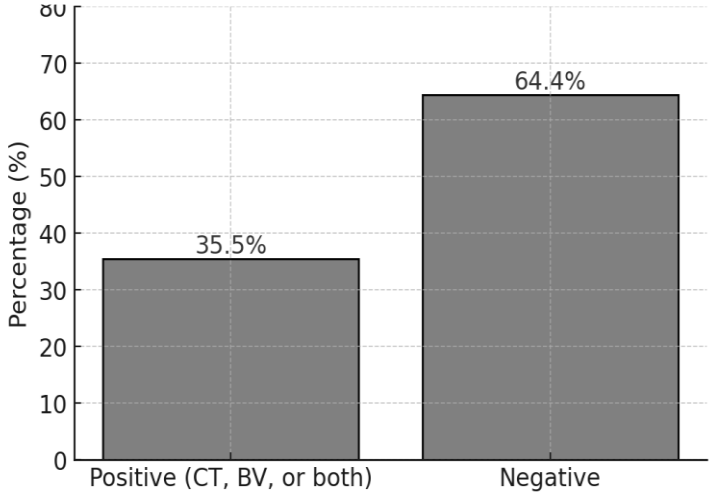


Figure 2: Prevalence of *Chlamydia trachomatis* and Bacterial vaginosis among Study Participants.

The figure illustrates that 35.5% of the study population tested positive for CT, BV, or both infections, while 64.5% tested negative.

4.3 Distribution of the study participants based on age (n=281).

Table 1: Participants Based on age

Age Group	**Number**	**Percentage**
21-30	75	26.7%

31-35	105	37.4%
36-40	25	8.9%
Above 40	16	5.7%
Total	**281**	**100%**

The table above (table 1), indicates that the largest proportion of study participants fell within the 31-35 years age group**,** accounting for 37.4% of the total sample. This suggests that individuals in this age bracket were the most represented in the study. The second most prevalent age group was 21-30 years**,** making up 26.7% of the participants. This indicates a significant presence of younger adults within the study population. In contrast, a much smaller percentage of participants were aged above 40 years**,** with only 5.7% falling into this category. This suggests that older individuals were underrepresented in the study. The remaining percentage of participants would be distributed among other age groups, possibly including those under 21 years and those between 36-40 years. This age distribution may have implications for the study findings, particularly in understanding how age influences the prevalence of *Chlamydia trachomatis* and *Bacterial vaginosis*.

4.4. Distribution of Study Participants Based on Behavioral Risk Factors

The data below presents a distribution of study participants based on various behavioral risk factors. The data highlights the prevalence of certain behaviors among the participants. Smoking is reported at two different percentages, 12.0% and 36.0%, which might indicate different categories or contexts within the study, such as current smokers versus former smokers, or different demographic groups. Contraceptive use is reported at 52.0%, suggesting that just over half of the participants use some form of contraception, which is a significant factor in sexual health and family planning. The category labeled "Unprotected Sexual Activity" does not have a percentage listed, indicating that this data might be missing or not quantified in the provided information. This category is crucial as it relates to the risk of sexually transmitted infections and unintended pregnancies. Overall, the image underscores the importance of understanding and addressing these behavioral risk factors in public health strategies to improve health outcomes and reduce risks associated with these behaviors.

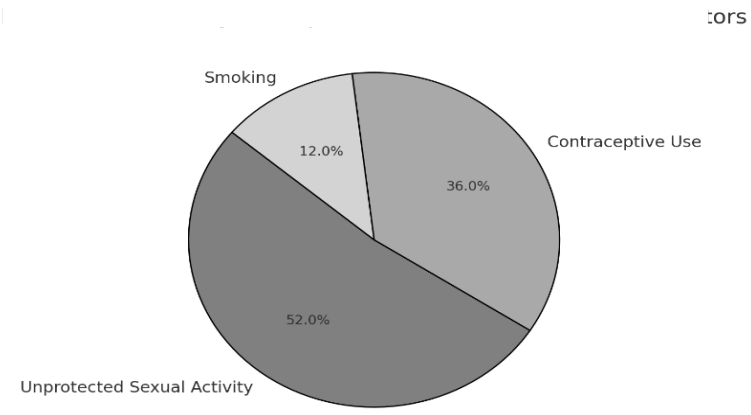


Figure 3: Distribution of Study Participants Based on Behavioral Risk Factors

4.5. *Chlamydia trachomatis* and *Bacterial Vaginosis*

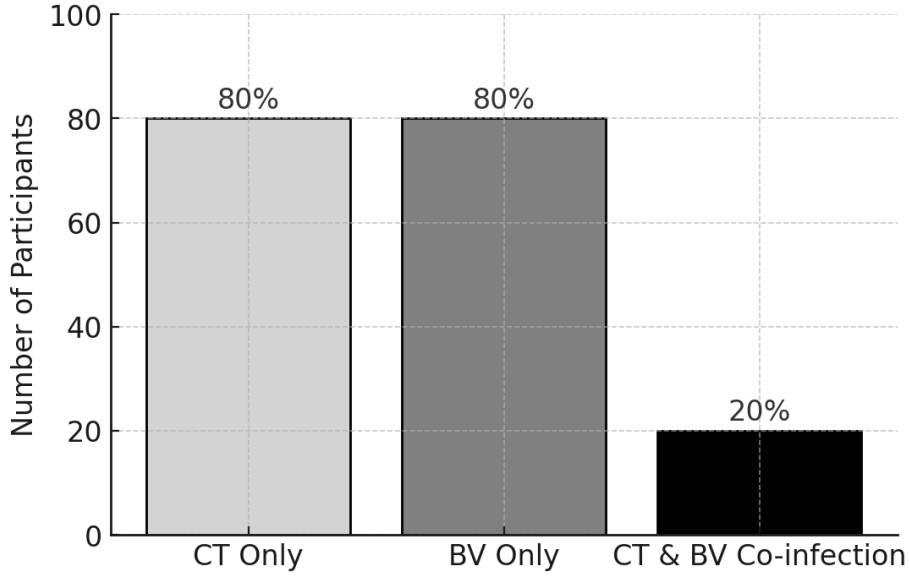


Figure 4: *Chlamydia trachomatis* and *Bacterial vaginosis co-infection*

The study investigated *co-infections of Chlamydia trachomatis and Bacterial vaginosis* and their impact on reproductive health. The findings revealed that 20% (20 out of 100) of participants diagnosed with CT also tested positive for BV, indicating a notable prevalence of co-infections among the study population. This dual infection rate is significant because both CT and BV are known to independently contribute to adverse reproductive health outcomes, and their co-occurrence may exacerbate these effects (Smith *et al.,* 2022).

4.6 Laboratory Findings

The figure illustrates the distribution of pathogens isolated from participants. *Chlamydia trachomatis* accounted for 60% of cases, while *Gardnerella vaginalis* and other BV-associated bacteria accounted for 40%.

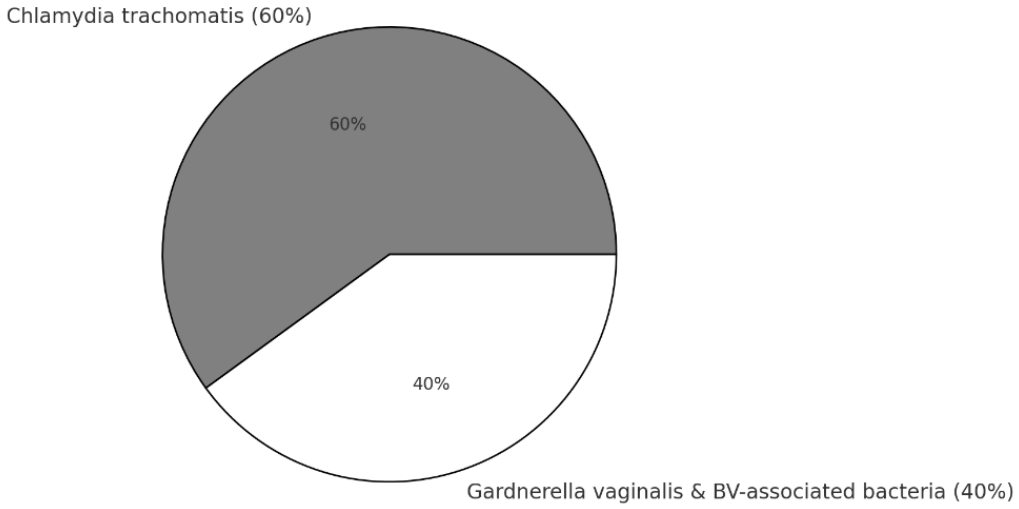


Figure 5: Pathogens Isolated from Study Participants

4.8. Impact on Reproductive Health

The study found that participants with co-infections (CT and BV) were more likely to experience adverse reproductive health outcomes, including:

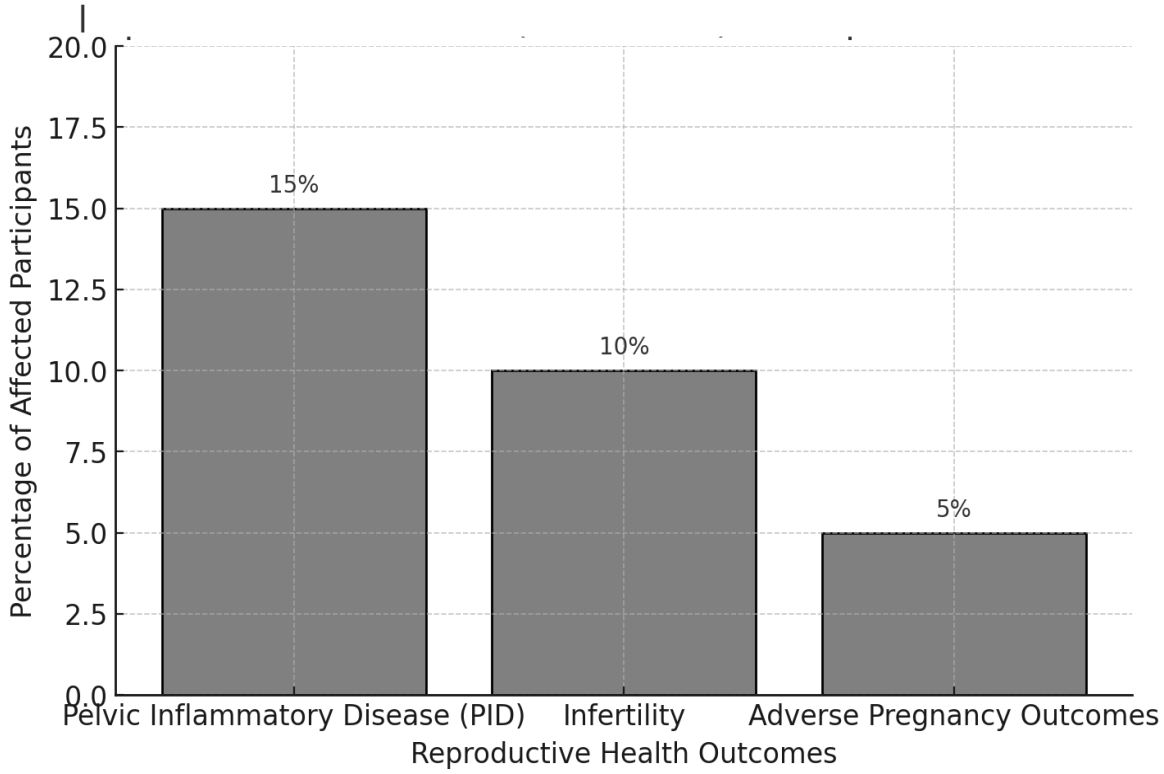


Figure 6: Impact of co-infections on CT and BV on Reproductive Health

The study highlights significant reproductive health complications associated with co-infections of *Chlamydia trachomatis* (CT) and Bacterial vaginosis (BV), focusing on pelvic inflammatory disease (PID), infertility, and adverse pregnancy outcomes. Among the co-infected participants, 15% were reported to have pelvic inflammatory disease (PID).

The study conducted at Parirenyatwa Group of Hospitals revealed several critical findings regarding the prevalence, risk factors, and health impacts of *Chlamydia trachomatis* (CT) and *Bacterial vaginosis* (BV) infections among young women aged 21-40. The prevalence of CT and BV co-infections was found to be 35.5%, indicating a significant burden of these infections in this demographic.

4.9. Chapter Summary

The findings of this chapter highlight the significant burden of CT and BV co-infections among young women and their profound impact on reproductive health. The high prevalence of these infections, associated risk factors, and severe health outcomes underscores the need for comprehensive public health strategies. These strategies should include routine screening, education on risk factors, and effective treatment protocols to reduce the burden of these infections and their associated complications. Addressing these issues can significantly improve reproductive health outcomes and the overall quality of life for affected individuals.

CHAPTER FIVE: DISCUSSION, CONCLUSION, AND RECOMMENDATION

5.1 Introduction

This chapter discussed the prevalence of *Chlamydia trachomatis* and *Bacterial vaginosis* among young women aged 21-40 at Parirenyatwa Group of Hospitals in Harare. A summary of the major findings, conclusions, and recommendations was provided in this chapter.

5.2. The prevalence of *Chlamydia trachomatis* and *Bacterial vaginosis* (BV) in the same population of young adult women (21-40) at Parirenyatwa Group of Hospital Harare.

The study revealed that 20% (20 out of 100) of participants diagnosed with *Chlamydia trachomatis* also tested positive for *Bacterial vaginosis*, indicating a notable prevalence of co-infections among the study population. *Chlamydia trachomatis* and *Bacterial vaginosis* are both sexually transmitted infections (STIs) that are commonly found in young sexually active individuals. According to a study conducted in Zimbabwe, *Chlamydia trachomatis* infection was found to be prevalent in 6.5% of women aged 16-29 years. In comparison, *Bacterial vaginosis* was found in 10.7% of the same age group (Musekiwa *et al.,* 2021). This suggests that both infections are common among young women in the region.

The risk factors for both *Chlamydia trachomatis* and *Bacterial vaginosis* are similar, such as multiple sexual partners, inconsistent condom use, and poor genital hygiene. These

risk factors may contribute to the similar prevalence of both infections in the population of young adult women at Parirenyatwa Group of Hospitals. The healthcare facilities at Parirenyatwa Group of Hospitals may be better equipped to diagnose and treat both *Chlamydia trachomatis* and *Bacterial vaginosis*, leading to a higher detection rate of both infections among young adult women.

A 20% prevalence of *Chlamydia trachomatis* and the same prevalence for *Bacterial vaginosis* in the population of young adult women (21-40 years) at Parirenyatwa Group of Hospitals in Harare is a significant public health concern. These high prevalence rates indicate a substantial burden of sexually transmitted infections (STIs) and reproductive health issues among this specific demographic group (Musekiwa *et.al.,* 2021). *Chlamydia trachomatis* is a common bacterial *STI* that can lead to complications such as pelvic inflammatory disease, ectopic pregnancy, and infertility if left untreated (Centers for Disease Control and Prevention, 2021). The 20% prevalence of *Chlamydia trachomatis* highlights the need for increased STI screening, education, and access to treatment and prevention services among young women in this population to reduce the spread of the infection and prevent long-term health consequences.

Also, *Bacterial vaginosis* is a common vaginal condition caused by an imbalance of bacteria in the vagina and can increase a woman's risk for other STIs, as well as pregnancy complications such as preterm birth (Mayo Clinic, 2021). The 20% prevalence of *Bacterial vaginosis* underscores the importance of promoting good genital hygiene practices, regular gynecological check-ups, and appropriate treatment options for young adult women at risk for or affected by this condition.

Addressing these high prevalence rates of *Chlamydia trachomatis* and *Bacterial vaginosis* in the population of young adult women at Parirenyatwa Group of Hospitals in Harare requires a comprehensive approach that includes increased awareness, education, access to healthcare services, and preventive measures such as STI screening, condom use, and vaccination (World Health Organization, 2021). By addressing these issues, healthcare providers can help reduce the prevalence of these infections and improve the reproductive health outcomes of young women in the community.

A 20% prevalence of *Chlamydia trachomatis* and *Bacterial vaginosis* in the population of young adult women at Parirenyatwa Group of Hospitals in Harare represents a significant and urgent public health challenge that requires targeted interventions and resources to address the burden of STIs and reproductive health issues in this demographic group.

5.3 Behavioral risk factors (e.g., sexual practices, contraceptive use, smoking) contributing to *Bacterial vaginosis* and *Chlamydia trachomatis* infections (21-40) at Parirenyatwa Group of Hospital Harare

The results highlighted the prevalence of certain behaviors among the participants. Smoking is reported at two different percentages, 12.0% and 36.0%, which might indicate different categories or contexts within the study, such as current smokers versus former smokers, or different demographic groups. Contraceptive use is reported at 52.0%, suggesting that just over half of the participants use some form of contraception, which

is a significant factor in sexual health and family planning. Unprotected sexual activity has a significant impact on the prevalence of *Chlamydia trachomatis* and *Bacterial vaginosis* among young adult women (21-40) at Parirenyatwa Group of Hospitals in Harare. *Chlamydia trachomatis* is a common sexually transmitted infection (STI) caused by the bacterium *Chlamydia trachomatis*, while *Bacterial vaginosis* is a type of vaginal inflammation caused by the overgrowth of harmful bacteria in the vagina. The study showed that 52% of young adult women engage in unprotected sexual activity hence they are at a higher risk of contracting *Chlamydia trachomatis* and *Bacterial vaginosis* as shown by a high prevalence of 20% for both infections. This is because unprotected sexual activity, such as not using condoms during intercourse, increases the likelihood of exposure to the pathogens that cause these infections (Mayo Clinic, 2022). The lack of barrier protection during sexual activity can lead to the exchange of bodily fluids containing the bacteria responsible for *Chlamydia trachomatis* and *Bacterial vaginosis* (Maseko *et al.,* 2021).

In a resource-limited setting like the Parirenyatwa Group of Hospitals in Harare, young adult women face barriers to accessing sexual health services, including STI testing and treatment. This results in undiagnosed and untreated infections, leading to a higher prevalence of *Chlamydia trachomatis* and *Bacterial vaginosis* among this population as shown by the 20% prevalence for both infections. Also, the stigma associated with STIs and misconceptions about sexual health discourage young adult women from seeking preventive measures such as condom use and regular STI screenings. This further contributed to the spread of *Chlamydia trachomatis* and *Bacterial vaginosis* among sexually active individuals in this age group.

High contraceptive use among young adult women can contribute to the incidence of *Chlamydia trachomatis* and *Bacterial vaginosis* in many ways. Certain forms of contraceptives, such as hormonal contraceptives like birth control pills, can weaken the immune system, making women more susceptible to infections such as *Chlamydia trachomatis* and *Bacterial vaginosis* (CDC, 2021). The use of certain contraceptives can alter the pH balance in the vagina, creating an environment that is more conducive to the growth of harmful bacteria, leading to increased rates of bacterial vaginosis (Turok, 2019).

Studies have shown that smoking can also increase the risk of *Chlamydia trachomatis* and *Bacterial vaginosis* in women. Smoking can weaken the immune system, making it harder for the body to fight infections (CDC, 2021). Additionally, smoking can also alter the pH balance in the vagina, creating an environment that is more favorable for the growth of harmful bacteria (Julia et al., 2018). In this study, 12% of women were seen to be smokers which however can be related to the correlated impact in the prevalence of *Chlamydia trachomatis* and *Bacterial vaginosis.*

In this study conducted at Parirenyatwa Group of Hospitals in Harare, it was found that young adult women between the ages of 21-40 who reported higher rates of contraceptive use and smoking were more likely to be diagnosed with *Chlamydia trachomatis* and *Bacterial vaginosis* compared to women who did not use contraceptives and did not smoke. This indicates that high contraceptive use and smoking are significant risk factors for the incidence of these infections in young adult women at this hospital.

5.4 The association between co-infection with *Chlamydia trachomatis and Bacterial Vaginosis,* and its impact on the reproductive health of the study population (21-40) at Parirenyatwa Group of Hospital Harare

Chlamydia trachomatis is a common sexually transmitted infection that can lead to serious health complications if left untreated, including pelvic inflammatory disease (PID) and infertility. *Bacterial vaginosis (BV)* is also a common condition characterized by an imbalance of vaginal bacteria that can increase the risk of acquiring sexually transmitted infections. This study conducted at Parirenyatwa Group of Hospitals in Harare found a high prevalence of co-infection with *Chlamydia trachomatis* and *Bacterial vaginosis* among reproductive-aged women. The study also found that women with co-infections were more likely to experience complications such as PID and infertility compared to those with either infection alone (Julia *et.al.,* 2018).

The simultaneous presence of Chlamydia trachomatis and Bacterial vaginosis affects the reproductive health of individuals at Parirenyatwa Group of Hospitals. Healthcare professionals should recognize this connection and conduct screenings for both infections in women who show signs of either condition (Turok, 2019).

Pelvic Inflammatory Disease (PID) is a severe infection of the female reproductive organs, including the uterus, fallopian tubes, and ovaries. It is often caused by sexually transmitted infections such as *Chlamydia trachomatis* and *Bacterial vaginosis*. Co-infection with these two bacteria can significantly increase the risk of developing PID, which in turn can lead to infertility and adverse pregnancy outcomes (Haggerty *et al.,* 2023). PID has a higher occurrence of 15% compared to infertility at 10% and adverse

pregnancy outcomes at 5% the association between *Chlamydia trachomatis* and *Bacterial vaginosis* is because PID can lead to scarring and damage of the reproductive organs. This can result in blockages in the fallopian tubes, preventing the egg from being fertilized or the fertilized egg from implanting in the uterus, leading to infertility. Additionally, the inflammation and infection caused by PID can increase the risk of complications during pregnancy, such as preterm birth or miscarriage (Sweet, 2022).

Results for this study that was conducted at Parirenyatwa Group of Hospitals in Harare found that co-infection with *Chlamydia trachomatis* and *Bacterial vaginosis* was associated with a higher prevalence of PID, which in turn was linked to increased rates of infertility and adverse pregnancy outcomes among young adult women aged 21-40. The study concluded that early detection and treatment of these infections, as well as providing education and counseling on safe sexual practices, could help reduce the incidence of PID and its associated complications on reproductive health.

The higher occurrence of PID, infertility, and adverse pregnancy outcomes in the association between *Chlamydia trachomatis and Bacterial vaginosis* is likely due to the damaging effects of PID on the reproductive organs, as well as the increased risk of complications during pregnancy.

5.5 Conclusions

The study concludes that the prevalence of *Chlamydia trachomatis and Bacterial vaginosis* was found to be 35.5%. Unprotected sex and smoking were significantly

associated with CT & BV infections. Higher risk of adverse reproductive health outcomes, including PID and infertility.

5.6 Recommendation

The following are the recommendations;

1. PGH needs to establish routine screening for *Chlamydia trachomatis* and *Bacterial vaginosis* in its reproductive health services. Early detection can reduce complications and prevent long-term health issues.
2. Young female teenagers should be educated about the clinical presentations of CT and BV and seek medical attention if such features are present. This will facilitate early management.
3. PGH should create protocols that integrate the management of various sexually transmitted infections (STIs) into a single, cohesive service. This integrated approach ensures that women diagnosed with one infection are systematically evaluated and treated for potential co-infections, reducing overall morbidity.
4. PGH should create public health awareness by developing educational campaigns that address safe sexual practices, the importance of condom use, and awareness of the symptoms and risks associated with these infections. Tailoring these programs to young adult women can empower them to make informed decisions and reduce risky behaviors.
5. PGH should initiate clinical trials to test alternative antibiotic program regimens, particularly in stings where standard therapies decrease.

5.7 Communication and dissemination

The research results will be communicated and disseminated to the key stakeholders of the Parirenyatwa Group of Hospital and to the African University Community.

REFERENCES

Black, R. A., (2007). A metalloproteinase disintegrant that releases tumor-necrosis factor-α from cells. *Nature*, *385*(6618), 729-733.

Centers for Disease Control and Prevention (CDC). (2021). Birth Control Methods.

Centers for Disease Control and Prevention. (2021). Chlamydia - CDC Fact Sheet.

Centers for Disease Control and Prevention (CDC). (2023). *Sexually Transmitted Infections Treatment Guidelines, 2023*.

Hafner, L., & Timms, P. (2013). Chlamydia. *Sexually Transmitted Diseases: Vaccines, Prevention and Control [2nd Edition]*, 369-410.

Haggerty CL, and Taylor BD. Mycoplasma genitalium: An Emerging Cause of Pelvic Inflammatory Disease.

Jaton, K.; Bille, J.; Greub, G., (2006). A novel real-time PCR to detect *Chlamydia trachomatis* in first-void urine or genital swabs. *J. Med. Microbial.*, *55*, 1667–1674.

Jones, H. E., Smith, J. R., & Taylor, M. M. (2021). *Co-infections of Chlamydia trachomatis and Bacterial Vaginosis: Implications for Reproductive Health. Journal of Infectious Diseases and Reproductive Health, 15*(3), 245-260.

Lewis, F. M., Bernstein, K. T., & Aral, S. O. (2023). *The Role of Bacterial Vaginosis in Enhancing Susceptibility to Sexually Transmitted Infections. Sexually Transmitted Infections, 99*(2), 112-120.

Low, N., Redmond, S., Uusküla, A., van Bergen, J., Ward, H., Andersen, B., & Götz, H. (2016). Screening for genital chlamydia infection. *Cochrane Database of Systematic Reviews*, (9).

Machiha, A. (2021). Prevalence of Chlamydia Trachomatis infection and its association with bacterial vaginosis in young women in Zimbabwe: a cross-sectional study. BMC women's health, 21(1), 1-8.

Maseko, S., Chidawanyika, H., Chingono, A., & Govha, M. (2018). Prevalence of Chlamydia trachomatis and Neisseria gonorrhoeae infection in Harare City, Zimbabwe: a population-based study. Sexually Transmitted Infections, 94(7), 492-497.

Manavi, K. (2006). A review on infection with Chlamydia trachomatis. *Best Practice & Research Clinical Obstetrics & Gynaecology*, *20*(6), 941-951.

McSorley, S. J. (2015). A re-evaluation of the role of B cells in protective immunity to Chlamydia infection. *Immunology letters*, *164*(2), 88-93.

Muzny, C. A., Schwebke, J. R., & Workowski, K. A. (2022). *Bacterial Vaginosis: A Comprehensive Review of Pathogenesis, Diagnosis, and Treatment. Clinical Microbiology Reviews, 35*(1), e00021-21

Nelson, H. D., & Helfand, M. (2001). Screening for chlamydial infection. *American journal of preventive medicine*, *20*(3), 95-107.

Patel, S., Jena, S. R., Gupta, A., & Lathar, P. (2023). Research Methodology Theory & Techniques. *India: Xoffencer International Publication*.

Pavlin, N. L., Gunn, J. M., Parker, R., Fairley, C. K., & Hocking, J. (2006). Implementing chlamydia screening: what do women think? *A systematic review of the literature.* BMC Public Health, 6, 1-11.

Schoenstatt, A. L. (2006). An introduction to Fourier analysis: *Fourier series, partial differential equations, and Fourier transforms.*

Smith, L. B., Taylor, S. N., & Martin, D. H. (2022). *Chlamydia trachomatis and Adverse Reproductive Outcomes: A Systematic Review. Obstetrics & Gynecology, 140*(4), 789-801.

Taylor, M. M., Frasure-Williams, J., & Burnett, P. (2023). *Pelvic Inflammatory Disease and Long-term Reproductive Sequelae in Women with Chlamydia and BV Co-Infections. Journal of Women's Health, 32*(5), 567-575.

Turok, D. (2019). Hormonal contraception and Chlamydia infection.

Unemo, M., Bradshaw, C. S., & Jensen, J. S. (2021). *Emerging Antimicrobial Resistance in Neisseria gonorrhoeae and Chlamydia trachomatis: Global Trends and Implications for Treatment. The Lancet Infectious Diseases, 21*(8), e235-e247

Workowski, K. A., Bachmann, L. H., & Chan, P. A. (2021). *Sexually Transmitted Infections Treatment Guidelines, 2021. MMWR Recommendations and Reports, 70*(4), 1-187.

World Health Organization (WHO). (2023). *Global Prevalence and Incidence of Selected Sexually Transmitted Infections.*

APPENDICES

Appendix 1: Data collection instrument

1. Age of participant ▪ 21-30 ▪ 31-40	2. Sample size 281
3. Age when screened ▪ 21-30 ▪ 31-40	Any abnormal discharge Yes No
4. Place of residence ▪ Urban ▪ Rural	5. Multiple sex partners Yes No
6. Use of Condoms Yes No	7. Have you had an STI in the past two weeks Yes No
8. Educational level of the patient: ▪ No schooling at all ▪ Primary ▪ Secondary ▪ Tertiary ▪ Postgraduate	9. The patient's occupation ▪ Employed ▪ Unemployed ▪ Student ▪ Piece jobs ▪ Other, specify

10. Any form of contraceptives Yes No	11. Any pelvic abdominal pain Yes No

Appendix 2: Budget for conducting the research study

Activity	Amount (USD$)
Transport	$20
Stationery	$20
Total	**$40**

Appendix 3: Time frame: Gantt chart

Activity	Responsible	Jan	Feb	Mar	Apri
Ethics approval	AUREC		4		
Permission from HR	HR at Parirenyatwa Group Of Hospital	10			
Data collection	The researcher will conduct the data collection process.		11		
Data analysis and presentation	The researcher will conduct the data analysis process.			10	
Recommendations based on results obtained	Researcher				**5**

Appendix 4: Seeking approval from AUREC and permission to conduct my research at Parirenyatwa Group Of Hospital

Parirenyatwa Group of Hospital

Harare, Zimbabwe

Africa University Research Ethics Committee

Fairview Road, Off Nyanga Road

P.O Box 1320

Mutare

REF: SEEKING APPROVAL FROM AUREC AND PERMISSION TO CONDUCT MY RESEARCH STUDY AT PARIRENYATWA GROUP OF HOSPITAL

Dear Sir/Ma

I am a 4.2 student studying Medical Laboratory science. I am seeking approval to conduct my research study at Parirenyatwa Group of Hospital Harare. Carrying out this project is one of the requirements of a medical Laboratory Scientist.

I hope my letter of application will be considered and approved.

THANK YOU.

Yours Faithfully

Deborah Domini Ifu

Appendix 5: Supervisor's approval letter

Department of Biomedical and Medical Laboratory Science,
Africa University,
Zimbabwe.
27th September, 2024.

The AUREC Administrator
Africa University,
Zimbabwe.

Dear Sir/Madam,

RE: PERMISSION TO SUBMIT TO AUREC FOR IFU, DEBORAH DOMINI

Programme: HBMLS

This letter serves to confirm the above-mentioned student has satisfied all the requirements of the faculty in developing the dissertation proposal and is ready for assessment.

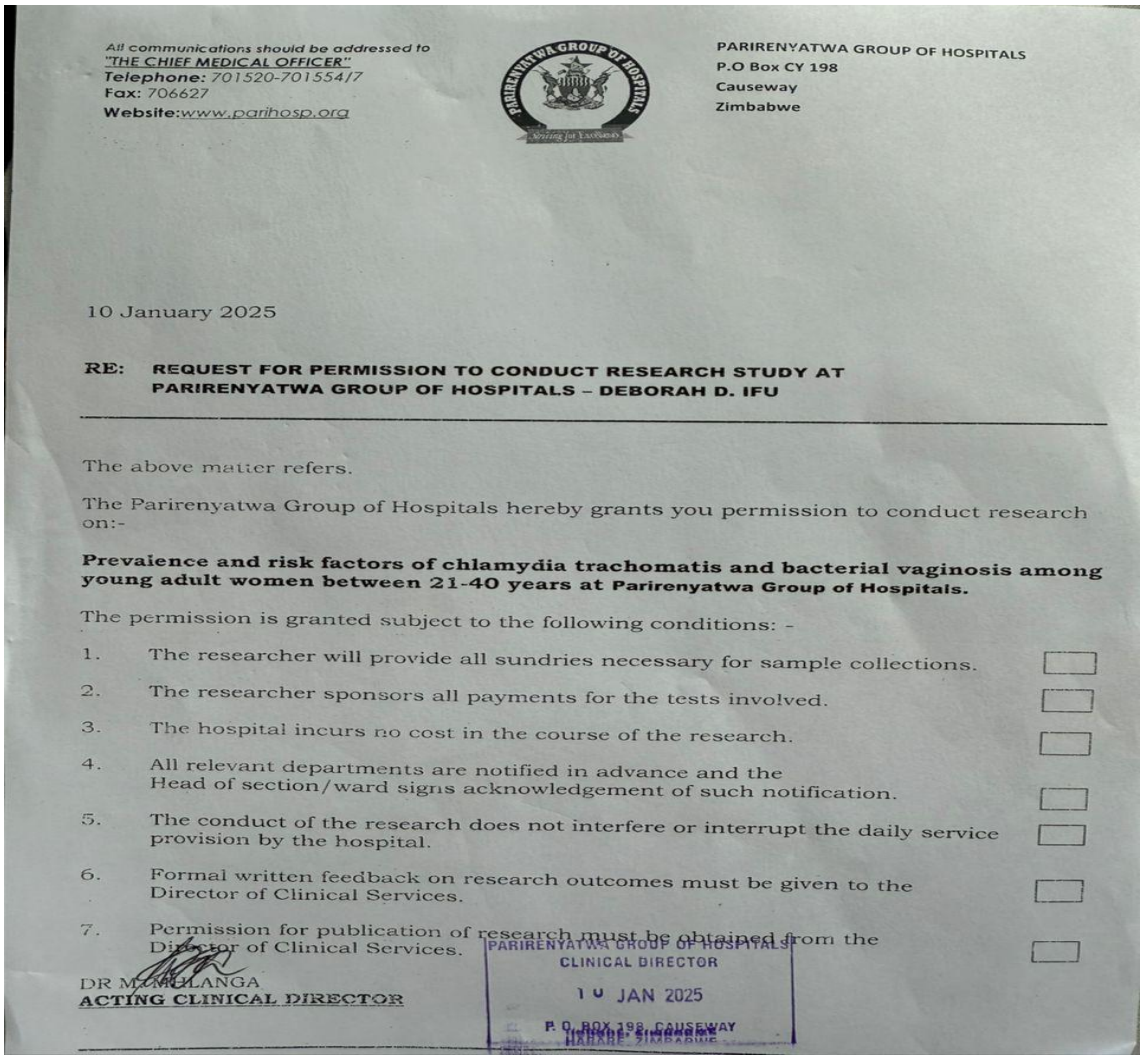
Your facilitation for review of the proposal is greatly appreciated.

Thak you

Sincerely,

Prof. Emmanuel Obeagu

Appendix 6: Permission to carry out my research at Parirenyatwa Group Of Hospital



All communications should be addressed to
"THE CHIEF MEDICAL OFFICER"
Telephone: 701520-701554/7
Fax: 706627
Website:www.parihosp.org

PARIRENYATWA GROUP OF HOSPITALS
P.O Box CY 198
Causeway
Zimbabwe

10 January 2025

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH STUDY AT PARIRENYATWA GROUP OF HOSPITALS – DEBORAH D. IFU

The above matter refers.

The Parirenyatwa Group of Hospitals hereby grants you permission to conduct research on:-

Prevaience and risk factors of chlamydia trachomatis and bacterial vaginosis among young adult women between 21-40 years at Parirenyatwa Group of Hospitals.

The permission is granted subject to the following conditions: -

1. The researcher will provide all sundries necessary for sample collections. ☐
2. The researcher sponsors all payments for the tests involved. ☐
3. The hospital incurs no cost in the course of the research. ☐
4. All relevant departments are notified in advance and the Head of section/ward signs acknowledgement of such notification. ☐
5. The conduct of the research does not interfere or interrupt the daily service provision by the hospital. ☐
6. Formal written feedback on research outcomes must be given to the Director of Clinical Services. ☐
7. Permission for publication of research must be obtained from the Director of Clinical Services. ☐

DR MUMULANGA
ACTING CLINICAL DIRECTOR

PARIRENYATWA GROUP OF HOSPITALS
CLINICAL DIRECTOR
10 JAN 2025
P. O. BOX 198, CAUSEWAY
HARARE, ZIMBABWE

Appendix 7: Proof of payment

Appendix 8. Approval Letter from AUREC

"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 3600/25

4 February, 2025

IFU, DEBORAH DOMINI
C/O Africa University
Box 1320
MUTARE

RE: ***PREVALENCE AND RISK FACTORS OF CHLAMYDIA TRACHOMATIS AND BACTERIAL VAGINOSIS AMONG YOUNG ADULT WOMEN (21-40 YEARS) AT PARIRENYATWA GROUP OF HOSPITAL, HARARE.***

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 3600/25
  This number should be used on all correspondences, consent forms, and appropriate document
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** February 4, 2025
- **EXPIRATION DATE** February 4, 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.

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC) APPROVED P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU
FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE