KAIRUKI UNIVERSITY

SCHOOL OF MEDICINE

DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY

POSTGRADUATE RESEARCH DISSERTATION REPORT

TITLE: RECURRENT PELVIC INFLAMMATORY DISEASE, RISK FACTORS, AETIOLOGY AND ANTIBIOTIC SENSITIVITY IN WOMEN OF REPRODUCTIVE AGE ATTENDING AMANA REGIONAL REFERRAL HOSPITAL.

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A DISSERTATION REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE IN OBSTETRICS AND GYNAECOLOGY.

JULY 2025

CERTIFICATION

It is hereby certified that the undersigned have read and hereby recommended the acceptance by Kairuki University, of a dissertation proposal report titled: "RECURRENT PELVIC INFLAMMATORY DISEASE, RISK FACTORS, AETIOLOGY AND ANTIBIOTIC SENSITIVITY IN WOMEN OF REPRODUCTIVE AGE ATTENDING AMANA REGIONAL REFERRAL HOSPITAL" in the partial fulfillment of requirements for the degree of Master of Medicine in OBSTETRICS AND GYNAECOLOGY.

SUPERVISORS

DR. MONICA CHIDUO Signature: _____

Date: 20/10/2025

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Date: 20/10/2025

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DEDICATION

I dedicate the work to my family members.

ABSTRACT

Introduction: In Sub Saharan Africa, recurrent Pelvic Inflammatory Disease remains a major public health challenge, accounting for a significant proportion of reproductive tract infection. However, data on its burden and determinants remain incomplete in many settings.

Objectives: To assess the risk factors, aetiology and antibiotic sensitivity patterns of recurrent PID in women of reproductive age 15 to 49 years attending Amana Hospital.

Methods: This hospital-based cross-sectional study was conducted from February to April 2025. Data was collected using structured questionnaires with socio-demographic and reproductive factors, clinical examinations, and high vaginal swabs for microbiological analysis. Data were analyzed using SPSS version 20 with descriptive statistics and logistic regression analyses to identify risk factors, bacterial isolates and antibiotic sensitivity patterns.

Results: A total of 165 women of reproductive age were recruited. The majority of participants were aged between 21 and 25 years (80, 48.5%). Nearly half reported a history of STIs; 120 (72.7%) had a new sexual partner, and 113 (68.5%) reported multiple sexual partners. Seven bacterial species were identified, with *N. gonorrhoea* (31, 22.3%), *C. trachomatis* (24, 17.3%), *E. coli* (23, 16.5%), and *S. aureus* (23, 16.5%) being most common. High susceptibility was observed to ceftriaxone, azithromycin, and clarithromycin across isolates. Recurrent PID prevalence was 6.1%. Recurrent PID was significantly associated with several factors in the multivariable analysis. Women aged 15–24 years were 3.7 times more likely to develop recurrent PID when compared to older women (AOR = 3.7; 95% CI: 1.92–7.14; p = 0.030). A previous history of STIs was also a strong predictor

(A.O.R = 3.5; 95% CI: 1.71–7.26; p = 0.001). The risk was 3.5 times among women with more than one sexual partner (AOR = 3.5; 95% CI: 1.53–7.83; p = 0.001).

Conclusion: Recurrent PID was significantly associated with prior history of STIs, younger age and high-risk sexual behaviors. *Neisseria gonorrhoeae* and *C. trachomatis* as the main bacterial causes of recurrent PID among women at Amana Regional Referral Hospital, with *E. coli* and *S. aureus* also isolated. Antimicrobial testing showed high effectiveness of ceftriaxone, azithromycin, and clarithromycin, but notable resistance to penicillin.

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ABBREVIATIONS AND ACRONYMS

ASR	Age Standardized Rates
BTL	Bilateral tubal ligation
CDC	United States Centers for Disease Control and Prevention
DC	Dilation and Curettage
ENT	Ear Nose and Throat
EP	Ectopic pregnancy
FP	Family Planning
GDS	Genital Discharge Syndrome
GOPD	Gynaecology Outpatient Department
GUD	Genital Ulcer Disease
HIV	Human Immunodeficiency Virus
HISG	Health Information System Guidelines
HOD	Head of department
HPV	Human papillomavirus
IREC	Institute of Research Ethics Committee

IUD	Intra Uterine Device
KU	Kairuki University
LAP	Lower Abdominal Pain
MOI	Medical Officer in Charge
NGO	Non-Governmental Organization
NHANES	National Health and Nutrition Education Survey
OBGY	Obstetrics and Gynaecology
ORG	Organization
PAC	Post Abortion Care
PEACH	Pelvic Inflammatory Disease Evaluation and Clinical Health
PID	Pelvic inflammatory disease
RTIs	Reproductive Tract Infections
SNPs	Single-Nucleoside Polymorphisms
STG	Standard Treatment Guideline
US	United States
WHO	World Health Organization

DEFINITION OF TERMS

Pelvic Inflammatory Disease (PID) – defined as a polymicrobial infection of the upper genital tract, involving any or all of the uterus, fallopian tubes, and ovaries; often accompanied by involving of the neighboring pelvic organs.

Recurrent PID - is typically defined as having two or more episodes of PID within a certain timeframe, often within a year.

Risk factors - are characteristics at the biological, psychological, family, community, or cultural level that precede and are associated with a higher likelihood of positive outcomes.

Bacteria - are tiny, single cell living organisms found in and around the body and are beneficial, but some are opportunistic and cause infections.

Antibacterial - a substance that kills bacteria or stops them from growing and causing disease.

Sensitivity - the capacity of an organism or sense organ to respond to stimulation and irritability.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The female genital tract is composed of upper and lower genital organs supported in the pelvis by ligaments. The upper female genitalia may be affected by ascending infection, either from STI or vaginal flora, or occasionally from secondary infections from gastrointestinal (GIT) sources or sometimes locally from the uterine infection following delivery or abortions or trans-cervical medical procedures (1).

Common etiologic agents include STIs like *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, other microorganisms include *Mycoplasma genitalium*, *Ureaplasma urealyticum*, *Escherichia coli*, and *Group B Streptococcus*. Other new strains include *Staphylococcus species*, *Proteus species*, which may be precipitated by douching or vaginal cleaning using fingers. Several factors predispose individuals to recurrent PID, they include multiple and/or untreated sexual partners, unprotected sex, young age, history of prior PID, Intrauterine contraceptive devices (IUDs), abortions, instrumental evacuation, and socioeconomic factors. Antibiotic resistance is a growing concern in PID treatment, particularly as infections caused by common pathogens like Chlamydia and Gonorrhea become harder to treat (2,3).

The prevalence of recurrent PID in Africa is high, particularly in Sub-Saharan countries, though specific data is lacking due to factors like underdiagnoses and subclinical cases. High rates are linked to socio-economic factors like poverty, limited access to healthcare, lower levels of education, and inadequate STI prevention. PID in resource-

limited countries, hospital admission rates, accounts for 17 to 40 percent of gynecologic admissions in Sub-Saharan Africa, 15 to 37 percent in Southeast Asia, and 3 to 10 percent in India (4,5,6). There is still increasing cases of recurrent PID, even from the health information system anecdotal reports of major hospitals in Dar es Salaam like Amana Hospital have a monthly average of 160 patients diagnosed with PID. Basically, this can be contributed by factors which create a gap in research. This research identify the risk factors for recurrent PID, but also give data on the commonest bacteria etiology, ant bacteria susceptibility patterns and perpetuate in improving the treatment outcome.

1.2 Problem statement

The prevalence of PID in developed countries has been decreasing in the early 2000s, but subsequent evidence suggests potentially increasing in prevalence trends. According to Centers for Disease Control and Prevention (CDC), globally around 4 percent of females aged 18 to 44 years reported to have PID; it accounts for approximately 90,000 outpatient (OPD) visits every year (7). In Europe, 33 out of 133 women have recurrent PID, recurrence rate was 4.8 percent which is lower than the 20–25 percent rate usually reported in the literature. Women with recurrent PID had higher rate of previous pelvic surgeries and intrauterine devices (IUD) in place (8).

In Sub-Saharan Africa, about 70 percent of hospital admissions resulted from reproductive tract infections (RTIs), with PID leading the others, this figure is 34% in Asia and 31% in other developed countries. It has been shown that 10-20% of lower RTIs ascend into the upper genital tract and this smaller percentage will develop PID

chronic complications (9). Specific data on the prevalence of recurrent PID in Tanzania is limited, but high rates of sexually transmitted infections (STIs), which are a primary cause of PID, suggest a significant problem. Studies in similar groups in Mbeya, Moshi, and Mwanza regions, Tanzania, reported prevalence of 6–13% for *C. trachomatis*, 4–22% for *N. gonorrhoeae*, 12–24% for *T. vaginalis*, and 8–24% for active infection with *T. pallidum*. In summary, the study reported a rise in prevalence of STIs in six regions of Tanzania increasing risks for ascending infection to cause PID despite the existence of standard treatment guidelines (STGs) (6,10).

Antimicrobial resistance is also increasing due to irrational use of antibiotics, leading to pathogens that are difficult to treat and hence resulting to recurrent PID. About 25% patients with recurrent PID suffer chronic pelvic pain due to adhesions. Impaired fertility affects 10-50% of females and is usually due to scarring and adhesions of the fallopian tubes. The rates of infertility usually increase with the number of infection episodes. The final problem is an ectopic pregnancy which may occur in 15-60% of women and is usually due to damage to the fallopian tubes (10,11).

1.3 Objectives

1.3.1 Broad objective

To assess the risk factors, etiology and anti-bacterial sensitivity patterns of recurrent PID in women of reproductive age 15 to 49 years attending Amana Regional Referral Hospital from February to April 2025.

1.3.2 Specific objectives

i. To identify the most common bacterial etiology of recurrent PID in reproductive age women.
ii. To establish the antimicrobial sensitivity patterns of recurrent PID in women of reproductive age.
iii. To determine factors associated with recurrent PID among reproductive age women.

1.4 Rationale of the study

This study helps evaluate risk factors associated with recurrent PID, identify the commonest bacterial etiologies and establish antibiotic susceptibility patterns. Medical practitioners are enriched with findings from this research and improve on evaluation and management of recurrent PID and hence contribute to the satisfaction of treatment to our patients, preventing them from serious complications of the disease such as peritonitis, ectopic pregnancy and infertility. The public health sector, private stake holders and policy makers are also enriched with the findings from this research and may trigger clinical trial research to further evaluate the standard treatment guideline for PID.

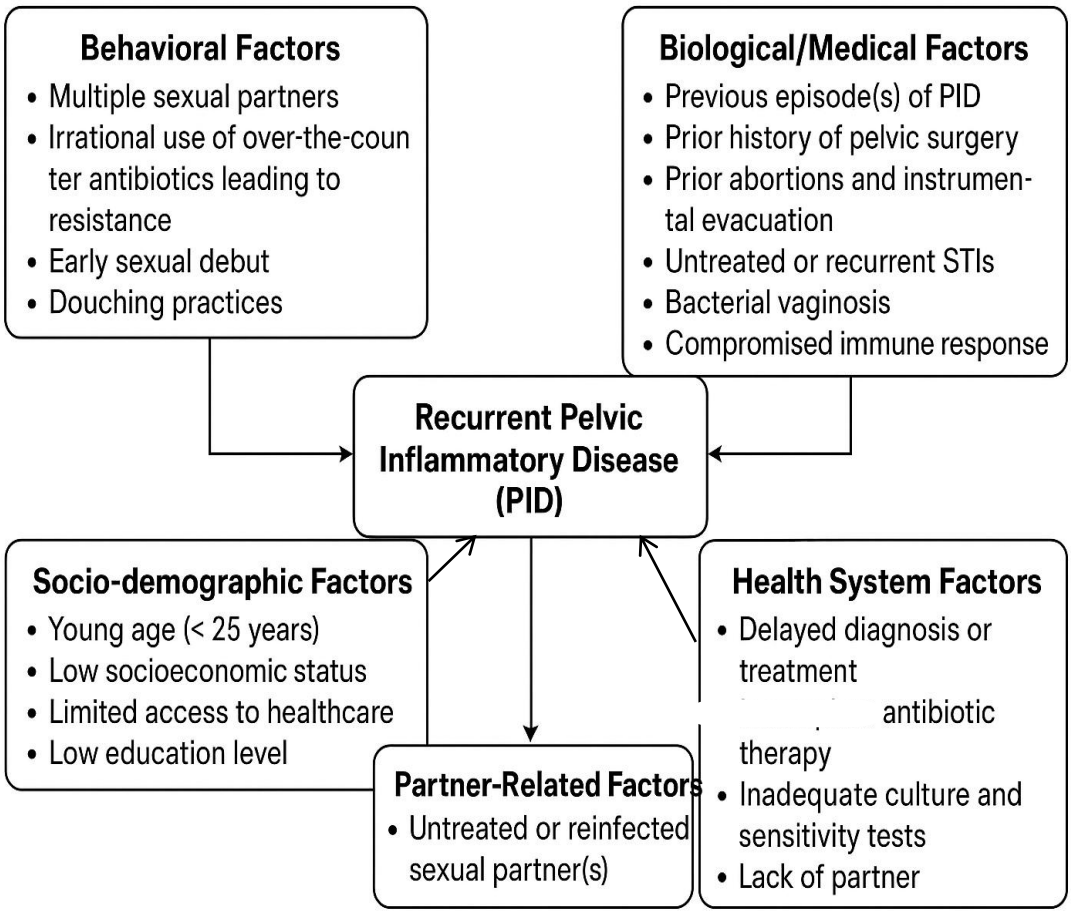
1.5 Research questions

i. What are the most common bacterial etiologies of recurrent PID in women of reproductive age attending Amana Hospital?
ii. What are the antibiotic susceptibility patterns of recurrent PID in women of reproductive age attending Amana Hospital?

iii. What are the risk factors associated with recurrent PID in women of reproductive age attending Amana Hospital?

1.6 Conceptual framework

A diagram illustrating the interrelation etiological factors causing recurrent PID.



The etiology of recurrent PID is primarily related to infections that ascend from the vagina into the upper genital tract (the uterus, fallopian tubes, and ovaries). Risk factors associated include past history of STIs, previous history of PID, post-surgical or post-abortion infections. Multiple and/or untreated sexual partners, unprotected sex (no barrier method like condom), young age and early age sexual activity, lower

socioeconomic factors, low education level and limited access to health care. Antibiotic resistance is a growing concern in recurrent PID treatment; syndromic treatment, overuse and misuse of antibiotics in treating initial infections, especially without proper diagnosis or culture and sensitivity tests, contribute to the development of antibiotic resistance and recurrent PID.

CHAPTER TWO

2.0 LITERATURE REVIEW

Pelvic Inflammatory Disease (PID) refers to a polymicrobial infection of the upper genital tract, involving any or all of the uterus, fallopian tubes, and ovaries; this is often accompanied by involvement of the neighboring pelvic organs (1,12). Recurrent PID is typically defined as having two or more episodes of PID within a certain timeframe, often within a year. Recurrent PID can lead to chronic pelvic pain, endometritis, salpingitis, oophoritis, peritonitis, perihepatitis, and/or tubo-ovarian abscess, infertility, ectopic pregnancies and other complications like emotional and psychological effects (13).

United States of America statistics, among 1,171 sexually experienced reproductive-aged women in 2013-2014 National Health and Nutrition Education Survey (NHANES), the prevalence of self-reported lifetime PID was 4.4%. Approximately 2.5 million women aged 18–44 nationwide have received a diagnosis of PID in their lifetime (95% CI = 1.8–3.2 million). The CDC has estimated that more than 1 million women experience an episode of PID every year. The disease leads to approximately 2.5 million hospital visits and 125,000-150,000 hospitalizations yearly (7,14).

Pelvic Inflammatory Disease continues to impose a measurable burden in Sub Saharan Africa (SSA). Global estimates indicate the highest age standardized prevalence rates in Western SSA (~116 per 100,000) and Central SSA (~83 per 100,000), with modest declines since 1990 but persistently elevated levels compared with many other regions. In Tanzania, more recent clinical based evidence from Dodoma (women seeking infertility care) found 31.5% had a clinical PID diagnosis, and PID was associated with

nearly double the prevalence of tubal factor infertility. Related Tanzanian studies also document high prevalence of curable sexually transmitted and reproductive tract infections among pregnant women and other at risk groups, reinforcing ongoing transmission dynamics that sustain PID risk (4,6,15).

2.1 Pathogenesis of PID

Most cases of PID are presumed to occur in two stages. The first stage is the acquisition of a vaginal or cervical infection. In 85% of cases this infection is often sexually transmitted and may be asymptomatic. The second stage involves direct ascent of microorganisms from the vagina or cervix to the upper sterile genitalia, causing inflammation of these structures.

The mechanism by which microorganisms ascend from the lower genital tract is unclear. Study has suggested multiple factors may be involved. The cervical mucus provides a functional barrier on ascending microorganisms, the efficacy the barrier may be defected by inflamed vagina and by hormonal changes in ovulation and menstruation. When the barrier is compromised, vaginal bacteria access the upper genitalia, and adjacent pelvic organs like urinary bladder, ureters and rectum. In addition, antibiotic treatment of STIs can disrupt the balance of endogenous flora in the lower genital tract, causing normally nonpathogenic organisms to overgrow and ascend. The opened cervix during menstruation, along with retrograde menstrual flow, may facilitate ascent of microorganisms (16).

Sexual intercourse may contribute to the ascent of infections through rhythmic uterine contractions during orgasm. Bacteria may also be carried along with sperms into the uterus and fallopian tubes. Inflammation extends to uninfected parametrial structures,

including the bowel via spillage of purulent materials from the fallopian tubes or via lymphatic spread beyond the pelvis to produce acute peritonitis and acute perihepatitis. (PID). The reasons why lower genital tract bacteria cause PID in some females but not others is not fully understood but may relate to genetic variations in immune response, estrogen levels affecting the viscosity of cervical mucus, and the bacterial load of potential pathogens (17).

2.2 Microbiology in PID (Etiology)

Neisseria gonorrhoeae and *Chlamydia trachomatis* are commonly identified pathogens in pelvic inflammatory disease (PID) among sexually active pre-menopausal females. Literature is reporting that PID is a poly microbial infection of the female upper genitalia. Less likely *Mycoplasma genitalium* is a cause in the pre-menopausal group while *E. coli* and colonic anaerobes may be responsible for the rare cases of PID seen in post-menopausal females. Very rare pathogens identified include *Mycobacterium tuberculosis*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, and the agents of actinomycosis. Also, *Gardnerella vaginalis*, *Mycoplasma hominis*, *Ureaplasma urealyticum*, *Herpes simplex virus 2 (HSV-2)*, *Trichomonas vaginalis*, *Cytomegalovirus (CMV)*, *Streptococcus agalactiae*, *Enterococcus*, *Peptococcus species* and Anaerobes (18).

Cultures of specimens collected during laparoscopy have shown that PID is a polymicrobial infection in as many as 30-40% of cases. Polymicrobial PID may begin as an isolated infection with STI such as *N. gonorrhoeae and C. trachomatis*, which causes inflammation of the upper genital tract that facilitates the involvement of other pathogens (anaerobes, facultative anaerobes, and other bacteria). However, in some

cases, the precise microbial etiology of PID is unknown and this has created a gap for further evaluation of etiology of PID especially with rising of recurrent PID (19)

2.3 Antibacterial agents for PID

According to CDC, females with PID are treated in OPD settings. Indications for hospitalization and parenteral antibiotics (20) include:

- Severe illness, fever ≥38.5**°**C, nausea and vomiting.
- Pelvic abscess (including tubo-ovarian abscess)
- The need for invasive diagnostic evaluation for alternate etiology (eg, appendicitis or ovarian torsion) or surgical interventions for suspected ruptured tubo-ovarian abscess
- Unable to take oral medications
- Pregnancy related conditions
- No response or tolerance to oral medications
- Non-adherence to therapy.

United States Centers for Disease Control and Prevention (CDC) regimens for hospitalized patients with PID:

- Ceftriaxone injection (1 gram intravenously every 24 hours) plus doxycycline (100 mg orally or intravenously every 12 hours) plus metronidazole (500 mg orally or intravenously every 12 hours)
- Cefoxitin injection (2 grams intravenously every six hours) plus doxycycline (100 mg orally or intravenously every 12 hours)
- Cefotetan injection (2 gram intravenously every 12 hours) plus doxycycline (100 mg orally or intravenously every 12 hours)

Transition to oral therapy - Patients can usually be transitioned from parenteral to oral therapy after 24 to 48 hours of sustained clinical improvement, as reflected by resolution of fever, nausea, vomiting, and severe abdominal pain, if initially present.

Outpatient therapy for PID - A single injection, intramuscular (IM) dose of a long-acting cephalosporin plus Doxycycline (100 mg orally twice daily for 14 days), plus Metronidazole (400 mg orally twice daily for 14 days (20).

Intolerance to Doxycycline, Azithromycin (500 mg for one to two days followed by 250 mg once daily to complete a 14-day course) is an alternative.

For those who cannot tolerate Metronidazole, Clindamycin 450 mg orally every six hours daily to complete a 14-day course is an alternative (20).

These regimens have been used for years; this research will establish the treatment of recurrent PID by its etiologic agent rather than the syndromic approach.

2.4 Risk factors for PID

Sex - unprotected coitus is the primary risk factor for PID. Abstinent females are not at risk for PID, and females with longstanding monogamous relationships rarely develop PID. On the other hand, females with multiple sexual partners are at the highest risk (21).

STI in the partner - Approximately one third of males with gonococci or chlamydial urethritis are asymptomatic. Having a symptomatic (dysuria, urethral discharge) male partner may increase a female's risk of PID, most likely because of the associated increase in bacterial load (22).

Age - PID occurs more among those 15 to 25 years of age; the incidence in females older than the age of 35 years is only one-seventh that in younger females. *Chlamydia*

trachomatis and *N. gonorrhoeae* are less likely to be identified in post-menopausal women, in whom the risk of PID is very low. In such females, it is important to consider alternate diagnoses including ovarian cancer, fibroids, diverticulitis, and colorectal cancer (23).

Previous PID - Approximately 1 in 4 females with PID will suffer recurrence. In one study, a previous episode of PID increased the risk for subsequent episodes by a factor of 2.3. However, these data must be used cautiously in practice, since PID is associated with an increased risk of subsequent chronic pelvic pain in general, even in the absence of an identifiable new infection (10,11,24).

Contraceptive methods - Consistent and correct use of condoms offers a significant reduction of risk. However, most females and their partners do not consistently use condoms (25).

Oral contraceptives – They have a complex interaction with PID. Several studies have shown that OC use nearly doubles the prevalence of both chlamydia and gonococci infection of the cervix. However, OC use has traditionally been associated with a 50% reduction in PID (25).

Intrauterine devices - Modern intrauterine devices (IUDs) cause little, if any, increased risk for PID. The risk of PID is primarily limited to the first three weeks after insertion and is associated with the physical introduction of the device. Still no clear data if IUCD contribute to recurrent PID, and if it should be removed if clinical improvement is delayed beyond a few days (26).

Tubal ligation - may protect the distal oviducts from involvement, but the clinical syndrome of PID is otherwise unaffected. Bilateral tubal ligation (BTL) has not been

found to provide protection against PID. However, patients with BTL may have delayed or milder forms of PID (27).

Pregnancy-related factors - PID rarely occurs in pregnancy; however, chorioamnionitis can occur in the first 12 weeks of gestation, before the mucous plug solidifies and seals off the uterus from ascending bacteria. Fetal loss may result (28). This research will evaluate pregnancy, pregnancy loss and delivery as risk factors for recurrent PID.

Genetic factors - Genetically mediated variation in immune response plays an important role in susceptibility to PID. Variants in the genes that regulate toll-like receptors (TLRs), an important component in the innate immune system, have been associated with an increased progression of C trachomatis infection to PID.

2.5 Predictors and disease recurrence in PID

Signs and symptoms associated with acute PID (e.g. pelvic pain, endocervical discharge, and endometritis) are poor predictors of the eventual development of chronic sequelae. Furthermore, clinical and/or microbiological cure of acute disease does not preclude development of long-term complications (e.g. chronic pain, infertility, ectopic pregnancy). Therefore, clinicians should not assume that patients with a complete recovery from PID have avoided the increased risk of long-term complications (29).

Patients with history of PID are also at increased risk of recurrence. In a secondary analysis of over 800 patients with mild to moderate PID from the Pelvic Inflammatory Disease Evaluation and Clinical Health (PEACH) randomized trial, recurrent PID at 35 and 84 months occurred by 15 and 21 percent of patients respectively. Adolescents

compared with adults were 50 percent more likely to experience a recurrence and had shorter times to recurrence (30).

Limitations of past study include that recurrent PID was self-reported (although verified with medical records when available) and most patients in those study were uninsured or had public insurances which were not fully covering the diagnostic and treatment costs; and other populations may have different rates of recurrence (8,31). This research will aim at improving the diagnosis and treating the etiology of recurrent PID and hence reducing the recurrence of the disease.

2.6 Patient counseling on treatment and prevention of recurrence PID

Prevention is better than cure, this study will also optimize prevention measures after evaluation of the risk factors, the commonest bacteria etiologic agent and the ant bacteria sensitivity patterns. Some of the preventive measures of recurrent PID to be taken into consideration include.

Medication adherence - Compliance with a long course of empirical oral antibiotics can be problematic. Patients should be educated about the importance of medication adherence and clinical outcomes.

Sexual activity - Females with PID should be counseled to refrain from sexual activity until they have completed therapy, their symptoms have resolved, and sex partners have been evaluated and/or treated for potential sexually transmitted infections. Patients whose male partners consistently use condoms are less likely to acquire sexually transmitted infections (STIs) and less likely to develop recurrent PID or infertility.

Screening and prevention of STIs - All patients diagnosed with acute PID should be screened for other important STIs, including HIV and syphilis. Further evaluation for indications for vaccinations to prevent other STIs, including *Human papillomavirus* vaccination for those within the appropriate age range if they have not previously been vaccinated.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

It was a hospital based cross-sectional study design aimed to assess the family-social, behavioral and demographic risk factors, bacterial etiology and antibiotic susceptibility patterns of recurrent PID in women of reproductive age of 15 – 49 years attending Amana Hospital Gynaecology Clinic from February to April 2025. Study participants were evaluated for the disease recurrence by using the inclusion and exclusion criteria check list.

3.2 Study setting

The study was carried out at Gynaecology Outpatient Clinic (GOPD) at Amana Hospital in Ilala district, Dar es Salaam Tanzania. Amana Hospital is a public health service delivery company that provides healthcare services to the general public, government agencies, international agencies, NGO's, insurance companies, self-insured employees, and uninsured individuals. The hospital offers referral medical services in addition to normal healthcare and preventive health checks for both in and outpatients.

The hospital has departments including Surgery, Internal Medicine, Obstetrics and Gynaecology, Paediatrics, Ophthalmology, ENT, Dental, Psychiatry, Dermatology, Urology, Physiotherapy, and Orthopedics with both outpatient and inpatient services. The hospital operates with a bed capacity of 270, while the outpatient department (OPD) provides services to approximately 300 patients a day. Amana Hospital Health Information System Guidelines (HISG) reports from January to March 2024, show an

average number of patients attending Gynaecology OPD clinic per month with diagnosis of PID is 160. The hospital has a 24-hour specialized service including those necessary for carrying out this research, investigations such as HVS for gram staining, culture and sensitivity together with Ultrasound services are provided.

3.3 Target population

This comprised of all women of reproductive age attending Amana Hospital.

3.4 Study population

This comprised of women of reproductive age 15 to 49 years, who attended Amana Hospital at Gynecology OPD clinic with previous two or more episodes of PID per year from their past medical records.

3.5 Sample size determination

The Kish and Leslie formula shown below was used to determine the minimum sample size:

$$N = Z^2 \times (1-P) \times P/I^2 \quad \text{or} \quad N = Z^2 \times P\,(1-P)/I^2 \quad \text{or} \quad N = \frac{Z^2\,P\,(1-P)}{I^2}$$

N = Number of minimum sample size desired.

Z = Number of standard deviations the given data is above or below the mean and is also a conversion of confidence level for the true proportion being within the study's range. At 95% confidence level, Z=1.96.

P= Shows the proportion estimated for the study expressed in decimal form, e.g. 11% of women of reproductive age suffer recurrent PID then P = 0.11

(It is estimated that 11% of reproductive age women have had more than one episode of PID; Reported by Themeli et al in 2023 (32).

I= Signifies how accurate the study is to be by setting a maximum room for tolerable error to be allowed, is 5%, then I= 0.05

$$\frac{1.96^2 \times 0.11\ (1 - 0.11)}{0.05^2}$$

N = 150 (Plus 10% non-responsive rate during data collection)**.**

The minimum sample size desired was 165.

3.6 Inclusion and exclusion criteria

Inclusion criteria

- Reproductive age between 15 to 49 years.
- A prior history of PID of two or more episodes per year as evidenced from the past medical records.
- Women, who were willing to participate in the study and provide samples for the diagnosis of pelvic inflammatory diseases.
- Women who complained of LAP, or contact pelvic pain or coital pain, or abnormal per vaginal discharges.
- Consented women.

Exclusion criteria

- Known pregnant women at any trimester.
- Known HIV/AIDS, these were prone to multiple infections due to the low immunity status, may influence thriving of the microorganisms, and may show false positive results in contrast with immune competent individuals.
- Women who were on active antibiotic therapy for the past one week before the study for other conditions may influence aetiologic agent.

3.7 Variables

3.7.1 Dependent variables include.

Recurrent PID and its outcome.

3.7.2 Independent variables include.

Demographic data such as age, occupation, marital status, level of education, social-economic information as well other risk factors for recurrent PID in the reproductive and medical history, together with physical examination findings.

3.8 Sampling technique

From the selected study site, women of reproductive age 15 to 49 years attending Gynecology OPD department were randomly screened by using the inclusion and exclusion criteria check list until the desired number of 165 study participants was reached during the 3 months of research period, whereby 55 study participants were enrolled at each month, however there were 20 working days each month with exclusion of weekends and public holidays, hence the average number of study participant enrolled per day was 3. The selected participant identity numbers were

recorded with respect to their participation numbers for the purpose of follow up and to avoid double participation.

3.9 Study instruments

Screening check lists with both inclusion and exclusion criteria were used. Questionnaires with both open and closed-end questions were used. The questionnaires were both Swahili and English languages. The questionnaires were numbered by the researcher for the purpose of serial arrangements and ensured no questionnaires were missing or lost.

The questionnaires had the following sections:

1. Socio-demographic and economic data such as age, residence, employment status, education level, and marital status.

2. Risk factors for PID such as age of menarche, age of sexual debut, sexual behavior, number of lifetime coital partners, contraceptives use such as condom use, alcohol use, and new sexual partner in the past one year.

3. Past reproductive health and medical history of recurrent PID such as history of two or more episodes of PID per year from the medical records. Features suggestive of reproductive tract infection (PID) such as abnormal vaginal discharge, vaginal itch, dyspareunia and lower abdominal pain were included. The treatment regime of PID offered drug adherence and outcome of treatment.

4. Physical examinations, with per abdominal as well as pelvic examination findings

5. Laboratory test results of Cervical/High Vaginal swab for gram staining, Culture and Sensitivity and Sonographic findings of PID were also included.

3.10 Data collection

The principal investigator (PI) and the staff involved in the study had two days training, involving introduction to the topic of study including the objectives of the study, elaboration on the methodology used, familiarizing with the study instruments used and achieving capacity building on data collection and teamwork.

The principal investigator (PI) and other 4 trained personnel, included a gynecologist, an assistant nursing officer, a laboratory scientist and a sonographer were responsible for patient enrollment and data collection. From the selected study site, women of reproductive age 15 to 49 years were randomly screened by using the inclusion and exclusion criteria check list while they were attending gynecological consultations. A person who met the criteria was approached by the PI to take part in the study. A secure room was allocated; each study participant had a brief introduction to the topic of study from the PI and was instructed on how the whole research process was to be carried out. After the consenting process, consent forms were then signed by the study participants, and they were assured that the information they provided was confidential and used only for the purpose of the study.

The following is more detailed information on how each step of data collection was performed to each individual study participant.

Medical and Gynaecologic history taking

Participants were interviewed by the gynaecologist and the PI by using the pretested structured questionnaires in Swahili language and for those wishing to be done in English was also available. The questionnaire had medical and gynecological questions

and other sections as described in the study instrument, which were asked, and the study participants responded accordingly and the PI filled in respectively.

Physical examination

After the initial interview, the gynaecologist assisted by the PI, placed each participant with symptoms suggestive of PID in supine position on the examination bed and exposing the abdomen, per abdominal examination was done. The gynaecologist and PI proceeded with exposure of the genitalia in lithotomy position, aseptic measures were considered; sterile gloves worn, vulva cleaning done with normal saline soaked 3 swabs technique. A sterile speculum examination was done by inserting a lubricated medium size sterile Cusco speculum to visualize the cervix and vaginal walls for abnormal discharge. High vaginal and endocervical samples were collected using Dacron tipped sterile swabs and were preserved in Amies transport medium. Bimanual digital vaginal examination was finally done according to standard clinical practices and the findings recorded on the questionnaire. Minimal pain and discomfort during the physical examination were anticipated and participants were counselled about it and covered with ant pain. The assistant nursing officer transported samples in a cool box (2–8°C) to the Amana hospital laboratory within 30 minutes.

At laboratory

The laboratory scientist performed the following.

i. Wet Preparation Analysis

Samples obtained from both the endocervical canal and posterior fornix; each sample was individually mixed with sterile normal saline by the laboratory scientist. A small

portion of each mixture was then placed separately on a clean glass slide and examined under a light microscope using a 40×10 objective lens for the presence of *Trichomonas vaginalis*, identified by motile flagellated trophozoites. Clue cells, leucocytes suggestive of bacterial vaginosis (BV). To detect *Gardnerella vaginalis*, a Whiff test was performed by adding a drop of 10% potassium hydroxide (KOH) to the sample. A positive result was indicated by the release of a characteristic fishy odor, suggestive of bacterial vaginosis (33).

ii. Gram stain analysis

Each participant slides undergone preparations which involved fixation, staining, and examination, under oil immersion at x100 objectives to detect: Granulocytes, clue cells, gram-positive bacteria.

Differentiation of gram-positive (purple) and gram-negative (pink) bacteria was done.

Streptococcus agalactiae, also known as *Group B Streptococcus* (GBS), is a gram-positive coccus (spherical bacteria) in chains or pairs when observed under a microscope after a gram stain.

Gram-negative intracellular diplococci and polymorphonuclear leukocytes were characteristic features for *N. gonorrhea*.

iii. Culture process

Media Used: MacConkey agar, Mannitol salt agar, Thayer Martin agar, Sheep blood agar plates.

Incubation:

Aerobic (24–72 hours at 37°C) and carbon dioxide environments.

Bacteria Identification

Phenotypic and biochemical methods: catalase, coagulase, oxidase tests were performed.

Mac Conkey agar was done to isolate Enterobacteria such as E. *coli* and *Proteus Spp*. Growth of E. *coli*, which ferments lactose, appears red/pink on the agar, a gram-negative, straight, rod-shaped, non-sporing, non-acid fast, and bacilli that exist in single and pairs. Proteus a gram-negative, rod-shaped, and facultatively anaerobic, are lactose negative and it doesn't swarm so it forms smooth, pale or colourless colonies (33).

Mannitol salt agar was done to isolate Staphylococcus species. *Staphylococcus aureus* is a round, convex, and 1-4 mm in diameter with a sharp border produces yellow colonies with yellow zones, because it fermented mannitol, an acidic byproduct was formed that causes the phenol red in the agar to turn yellow. Whereas other coagulase-negative *Staphylococci cons* produce small pink or red colonies with no colour change to the medium (33).

Neisseria gonorrhoeae, swab immediately inoculated onto a selective agar medium, Thayer-Martin agar supplemented with specific antibiotics and growth factors and incubate it at 35-37°C in a humidified 5% carbon dioxide (CO2) environment for 48 hours; Oxidase-positive, meaning it turned a purple colour when tested with Kovac's reagent.

Streptococcus agalactiae (GBS), after incubation onto a sheep blood agar plate. GBS colonies cause beta-hemolysis. A positive CAMP test confirms the identification.

iv. Rapid antigen test

Chlamydia Rapid Test Cassette (Swab/Urine) were performed on high vaginal swab (HVS) specimens to detect *Chlamydia trachomatis* infection. It used antibodies specific to Chlamydia antigen coated on the test line region of the cassette. A colored line in the test line region indicated a positive result. A positive test result meant the participant had been infected with chlamydia while a negative test result meant a person had no chlamydia infection and was evidenced by no coloured line.

v. Antimicrobial susceptibility

The Kirby-Bauer disc diffusion method was applied. It involved placing antibiotic-impregnated filter paper discs on an agar plate inoculated with the microorganism of interest. The antibiotic diffused into the agar, and if the microorganism is susceptible, a clear zone of inhibition formed around the disc. The diameter of this zone indicated the level of susceptibility (susceptible, intermediate, or resistant).

Antibiotic disc:

Gram Positive: Tetracycline, Ceftriaxone, Ciprofloxacin, Erythromycin, Clindamycin, Doxycycline

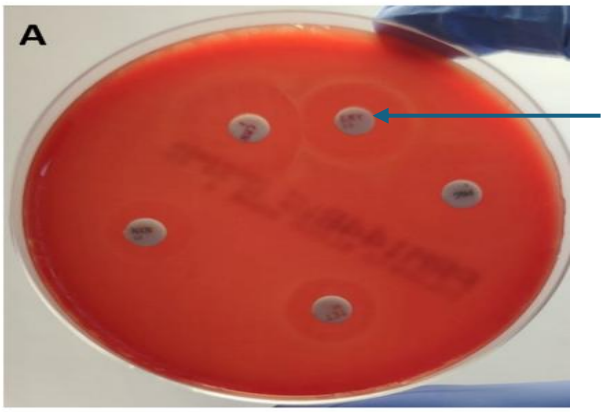
Gram-negative: Gentamycin, Azithromycin, Cefixime, Metronidazole etc.

Incubation

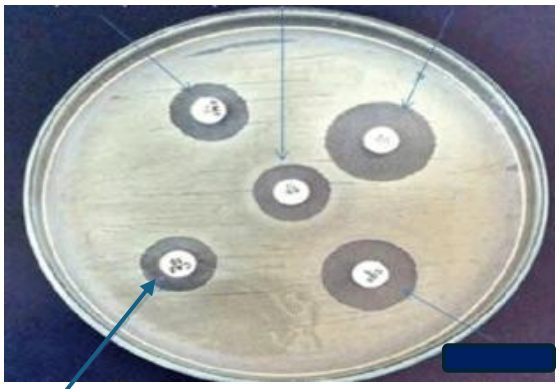
Aerobic incubation at 37°C for 24–48 hours.

Evaluation

Zone diameters were measured and compared with Clinical and Laboratory Standards Institute 2024 (CLSI) guidelines. The larger the zone, the more effective the antibiotic, a short zone indicated the bacteria was resistant to the antibiotic.



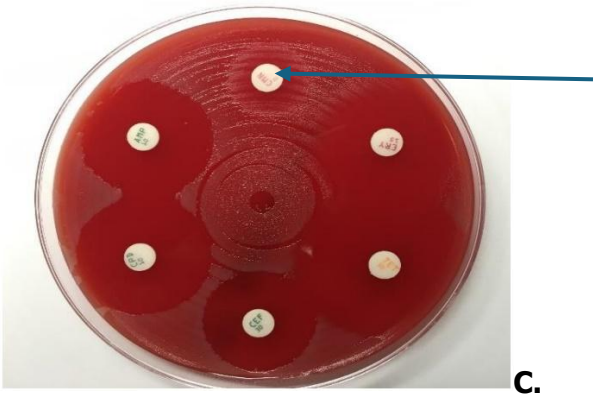
Example A*; Streptococcus agalactiae* (GBS), after incubation onto a sheep blood agar plate, cause beta-hemolysis, which appears as a narrow, clear zone of complete red blood cell lysis around the colony as shown by the arrow, showing zones of inhibitions to all tested antibiotics as per CLSI guideline.



B.

Penicillin

Example B. *Staphylococcus aureus* is round, convex, and 1-4 mm in diameter with a sharp border produces yellow colonies with yellow zones, showing partial resistance to penicillin and sensitivity to other antibiotics tested as per CLSI guideline.



C.

Example C. Neisseria gonorrhea showing complete resistance to Penicillin as shown by the arrow but intermediate activity and full sensitivity to other antibiotics tested according as per CLSI guideline.

Radiology

Sonographic findings of PID such as free fluid collection in pouch of Douglas, salpingitis, oophoritis, ovarian cyst, endometritis, appendicitis, abdominal and other pelvic masses, were recorded from the transabdominal-pelvic ultrasound done by the same qualified and experienced sonographer by using a convex probe from an ultrasound machine named Sona Acer R7.

Each participant in a secure room was laid in supine position with exposure of the lower abdomen and pelvis, ultrasound gel applied to the area of study. The transducer (probe) was pressed against the skin and moved around over the area being studied. The probe sent out sound waves, frequency range 3.5 to 5 MHz which went through the gel and reflect off body structures. A computer received these waves and used them to create a picture. The sonographer saw the pictures on a monitor and interpreted them to give out the final report.

3.11 Data analysis

The collected data was coded and cleaned, then entered by double data entry on Microsoft excel sheet, then later analyzed using Statistical Package for Social Science (SPSS) version 20 program on a personal computer secured by strong password and the results were presented in tables. Independent variables such as demographic data such as age, occupation, marital status, level of education, social-economic information; reproductive and medical history inclusive of risk factors for recurrent PID; physical examination findings were evaluated by descriptive statistics (mean, mode and

standard deviation) for continuous variables, while frequencies and percentages were used for categorical variables.

The independent effect of each factor was determined using logistic regression analysis. Each independent variable was subjected to univariate analysis where it described the associations with recurrence of PID. For significance factors p-value of < 0.05 or equal was suggestive of an association; the multivariate logistic regression was used to determine the risk factors associated with recurrent of PID.

Dependent variables such as bacteria isolates, testing methods, antimicrobial agents used, and zone of inhibition (antimicrobial susceptibility) were analyzed by multivariate multiple regression. A positive culture results for a participant with previous two or more episodes of PID in one year from her past medical records entails recurrent PID and it was supported by positive features of PID on ultrasound results. Few participants with negative culture results were suggestive they did not have recurrent PID and they were linked to further medical evaluation.

3.12 Ethical considerations

Permission was requested by the relevant authorities such as the Kairuki University (KU), Institutional Research Ethics Committee (IREC), the District Medical Officer of Ilala municipal, and the Medical Officer In charge of Amana Regional Hospital where the study took place. Consent forms were also signed by the study participants and confidentiality was ensured; treatment of recurrent PID was given to the participants according to the etiology based on the findings of the individual culture and sensitivity results through cost sharing efforts and patient health insurance support.

3.13 Dissemination of final results and report.

The report has been disseminated to the Obstetrics and Gynecology department at Kairuki University (KU), as fulfillment of the postgraduate degree. The report will also be available at KU repository, a copy to Amana hospital and manuscript prepared for publication.

CHAPTER FOUR

4.0 RESULTS

4.1 Socio-demographic factors of women of reproductive age with recurrent PID attending Amana Regional Referral Hospital

Table 1: Socio-demographic factors of women of reproductive age with recurrent PID attending Amana Regional Referral Hospital

Variable	Frequency	Percentage
Age group (years)		
15-20	16	9.7
21-25	80	48.5
26-30	31	18.8
31-35	14	8.5
36+	24	14.5
Marital status		
Single	8	4.8
Cohabiting	133	80.6
Married - Monogamy	22	13.3
Married - Polygamy	2	1.2
Education level		
Primary	20	12.1
Secondary	116	70.3
University	29	17.6
Occupation		
Employed	19	11.5
Self-employed	146	88.5
Residence		
Urban	107	64.8

Rural	58	35.2
Parity		
0	21	12.7
1	55	33.3
2	50	30.3
3	23	13.9
4+	16	9.7

A total population of women attended at the gynaecological clinic during the study period was 556. A total of 165 women of reproductive age attending Amana Regional Referral Hospital were recruited for the study. The majority of participants were aged between 21 and 25 years (80, 48.5%). Those who were cohabiting accounted to 133 (80.6%). Additionally, more than three-quarters of the participants had attained secondary education or higher, Table 1.

4.2 Clinical characteristics of women of reproductive age with recurrent PID attending Amana Hospital

Table 2: Clinical characteristics of women of reproductive age with recurrent PID attending Amana Regional Referral Hospital.

Variable	Frequency	Percentage (%)
A. Risk factors for recurrent PID		
Age (years) at menarche		
≤11	2	1.2
12+	163	98.8
Age of sexual debut		
>15	165	100

Number of lifetime sexual partners		
1	52	31.5
2+	113	68.5
History of a new sexual partner		
Yes	120	72.7
No	45	27.3
History of STI in the past one year		
Yes	76	46.1
No	89	53.9
History of UTI in the past one year		
Yes	81	49.1
No	84	50.9
Regular condom use		
Yes	82	49.7
No	83	50.3
History of IUCD use		
Yes	94	57
No	71	43
History of combined contraceptives pills (COC)		
Yes	87	52.7
No	78	47.3
History of alcohol use in the past one year		
Yes	120	72.7
No	45	27.3
History of instrumental evacuation in the past one year		
Yes	46	27.9
No	119	72.1

History of spontaneous vaginal delivery in the past one year		
Yes	80	48.5
No	85	51.5
History of major surgery		
Yes	26	15.8
No	139	84.2
B. Past medical history		
Aware of PID		
Yes	147	89.1
No	18	10.9
Age at first PID episode		
15-24	163	98.8
25+	2	1.2
Number of PID episodes		
1	78	47.3
2+	87	52.7
History of admission due to PID		
0	98	59.4
1	43	26.1
2+	24	13.5
Completed 14 days course of treatment		
Yes	56	33.9
No	109	66.1
C. Signs and symptoms of recurrent PID		
History of Lower Abdominal Pain		
Yes	165	100
No	0	0

History of Coital Pain		
Yes	110	66.7
No	55	33.3
History of Coital Bleeding		
Yes	78	47.3
No	87	52.7
Abnormal PV discharge		
Yes	165	100
No	0	0
History of Dysuria		
Yes	117	70.9
No	48	29.1
History of Fever		
Yes	59	35.8
No	106	64.2
Abdominal Tenderness		
Yes	117	70.9
No	48	29.1
Rebound – Tenderness		
Yes	24	14.5
No	141	85.5
Cervical-Tenderness		
Yes	103	62..4
No	62	37.6
Uterine-Tenderness		
Yes	64	38.8
No	101	61.2

Adnexa – Tenderness		
Yes	84	50.9
No	81	49.1
PV Discharge - Speculum		
Yes	113	68.5
No	52	31.5
Ultrasound features		
Pouch of Douglas fluid	140	84.8
Hydrosalpinx	11	6.7
Salpingitis	14	8.5

The majority of women experienced their first episode of PID between the ages of 15 and 24. Similarly, more than a half had at least two or more episodes of PID (87, 52.7%). Likewise, nearly half of the participants reported a history of STI, 76 (46.1%). A new sexual partner was noted in 120 (72.7%) of the participants, and 113 (68.5%) reported having had more than one sexual partner. History of UTI 127 (77.0%) and not completing 14 days empirical therapy for PID were also reported among the participants 109 (66.1%). The commonly ultrasound feature noted among the participants was free fluid in the pouch of Douglas 140 (84.8%), Table 2.

4.3 Bacterial isolates among women with recurrent PID

Table 3: Most common bacterial identified in women with recurrent PID attending Amana Regional Referral Hospital

Isolate	Frequency	Percentage (%)
Neisseria gonorrhea	31	22.3
Chlamydia trachomatis	24	17.3
E. coli	23	16.5
Staphylococcus aureus	23	16.5
Coagulase Negative Staphylococcus	20	14.4
Streptococcus agalactiae	10	7.2
Proteus mirabilis	8	5.8

A total of seven bacterial species were identified from women with PID. The most common isolate was N. *gonorrhea* 31(22.3%), followed by *Chlamydia trachomatis* 24(17.3%), then E. *coli* and S. *aureus* each 23(16.5%), Table 3.

4.4 Antibiotic susceptibility patterns

Table 4: Antibiotic susceptibility patterns of the organisms isolated

	Antibiotic susceptibilty patterns, n(%)													
Organism	**CRO**	**AZM**	**CIP**	**PEN**	**VAN**	**E**	**CLR**	**TET**	**DOX**	**CLI**	**AMP**	**GN**	**AMC**	**MEM**
CoNS Staphylococcus (20)														
S		20(100)		10(50)	20(100)	20(100)	20(100)	20(100)	20(100)	20(100)				
I		0		0	0	0	0	0	0	0				
R		0		10(50)	0	0	0	0	0	0				
E. coli (23)														
S	23(100)	23(100)	23(100)	0		23(100)	23(100)	23(100)			0	0	23(100)	23(100)
I	0	0	0	0		0	0	0			23(100)	23(100)	0	0
R	0	0	0	20(100)		0	0	0			0	0	0	0
N. gonorrhoeae (31)														
S	31(100)	31(100)	0	0				0						
I	0	0	31(100)	0				31(100)						
R	0	0	0	31(100)				0						
P. mirabilis (8)														
S	8(100)	8(100)	8(100)	0		8(100)	8(100)	8(100)			0	0	8(100)	8(100)
I	0	0	0	0		0	0	0			8(100)	8(100)	0	0
R	0	0	0	8(100)		0	0	0			0	0	0	0
S. aureus (23)														
S		23(100)		14(61)	23(100)	23(100)	23(100)	23(100)	23(100)	23(100)				
I		0		0	0	0	0	0	0	0				
R		0		9(39)	0	0	0	0	0	0				
S. Agalactiae (10)														
S	10(100)	10(100)	10(100)	10(100)	10(100)	10(100)	10(100)	0			0			
I	0	0	0	0	0	0	0	10(100)			10(100)			
R	0	0	0	0	0	0	0	0			0			

***CRO-Ceftriaxone, AZM-Azithromycin, CIP-Ciprofloxacin, PEN-Penicillin, VAN-Vancomycin, E-Erythromycin, CLR-Clarinthromycin, TET- Tetracycline, DOX-Doxyclyine, CLI-Clindamycin, AMP-Ampicilin, GN-Gentamycin, AMC- Amoxyclav, MEM-Meropenem. S – Sensitive I – Intermediate R – Resistance.*

The bacterial species isolated from HVS specimens were tested against commonly used antibiotics. High susceptibility was observed for ceftriaxone, azithromycin, and clarithromycin, with N. *gonorrhoea* 31(100%), and E. *coli* 23(100%) all showing full sensitivity. Vancomycin, doxycycline, and clindamycin also demonstrated excellent effectiveness, particularly against Gram-positive organisms such as *Staphylococcus aureus* 23(100%) and coagulase-negative Staphylococcus (CoNS) 20(100%). In contrast, penicillin showed reduced effectiveness, with lower susceptibility in S. *aureus* 9(39%) and S. *CoNS* 10(50%). Notably, ciprofloxacin was susceptible against *E. coli* 23(100%) and intermediate activity against N. *gonorrhoea* 31(100%). Furthermore, P.

mirabilis 8(100%) and S. *agalactiae* 10(100%) exhibited full susceptibility to the majority of antibiotics tested, Table 4.

4.5 Factors associated with recurrent PID among women of reproductive age

Table 5: Factors associated with recurrent PID among women of reproductive age attending Amana Hospital.

	Recurrent PID							
Variable	**Yes**	**No**	**COR**	**95% CI**	**P-value**	**AOR**	**95% CI**	**P-value**
Age (years) of the participant								
15-24	58	26	4.0	2.09-7.65	0.002	3.7	1.92-7.14	0.030
25+	29	52	Ref					
Marital status								
Married	82	75	0.7	0.15-2.84	0.570	-	-	-
Single	5	3	Ref					
Education level								
More than secondary	76	69	0.9	0.35-2.31	0.828	-	-	-
Less than secondary	11	9	Ref					
Occupation								
Employed	9	10	0.8	0.30-2.04	0.619	-	-	-

	Recurrent PID							
Variable	**Yes**	**No**	**COR**	**95% CI**	**P-value**	**AOR**	**95% CI**	**P-value**
Self-employed	78	68	Ref					
Residence								
Urban	57	50	1.1	0.56-2.02	0.849	-	-	-
Rural	30	28	Ref					
Parity								
2+	46	43	0.9	0.49-1.69	0.772	-	-	-
1	41	35	Ref					
Age at first PID episode								
25+	1	1	0.895	0.06-14.56	1.000	-	-	-
15-24	86	77	Ref					
History of STIs								
Yes	53	23	3.7	1.95-7.14	0.001	3.5	1.71-7.26	0.001
No	34	55	Ref					
Use of contraceptives (COC)								
Yes	45	42	0.9	0.49-1.69	0.785	-	-	-
No	42	36	Ref					
Condom use								
No	58	25	4.2	2.21-	0.001	2.7	1.81-	0.024

	Recurrent PID							
Variable	**Yes**	**No**	**COR**	**95% CI**	**P-value**	**AOR**	**95% CI**	**P-value**
				8.15			7.78	
Yes	29	53	Ref					
Number of sexual partners								
2+	73	40	4.9	2.40-10.22	0.001	3.5	1.53-7.83	0.013
1	14	38	Ref					
Age (years) at menarche								
12+	86	77	1.1	0.07-18.16	0.938	-	-	-
11	1	1	Ref					
New sexual partner								
Yes	75	45	4.6	2.15-9.77	0.001	2.6	1.11-6.28	0.028
No	12	33	Ref					
Urinary Tract Infection								
Yes	69	18	1.3	0.64-2.73	0.451	-	-	-
No	58	20	Ref					
Aware of PID								
Yes	67	60	1.0	0.49-2.08	0.989	-	-	-
No	20	18	Ref					

**COR – Crude Odds Ratio, CI- Confidence Interval, , AOR – Adjusted Odds Ratio*

In the univariate analysis, five variables were found to be associated with recurrent PID and were therefore included in the multivariable analysis based on a p-value threshold of < 0.2. These variables included age of the participant (COR 4.0, 95% CI: 2.09-7.65, p = 0.002), history of STIs (COR 3.7, 95% CI: 1.95-7.14, p = 0.001), not using condom (COR 4.2, 95% CI: 2.21-8.15 p = 0.001), having more than one sexual partner (COR 4.9, 95% CI: 2.40-10.22, p = 0.001), and having a new sexual partner (COR 4.6, 95% CI: 2.40-10.22, p = 0.001).

In the multivariable analysis, all the five factors remained significantly associated with recurrent PID. Women aged 15–24 years were 3.7 time more likely to have PID compared to those aged 25 and above (AOR = 3.7, 95% CI: 1.92–7.14, p = 0.030). Additionally, women with a history of STIs were 3.5 times more likely to get a recurrent PID than those who did have such history (AOR 3.5, 95% CI: 1.71-7.26, p = 0.001). Similarly, those who had more than one sexual partner were x3.5 more likely to get a recurrent PID (AOR 3.5, 95% CI: 1.53-7.83, p = 0.001). Likewise, those who had a new sexual partner were 2.6 times more likely to get recurrent PID (AOR 2.6, 95% CI: 1.11-6.28, p = 0.001). Lastly, women who reported not using condoms were 2.7 times more likely to have recurrent PID compared to those who did use condoms (AOR 2.7, 95% CI: 1.81-7.78, p = 0.024), Table 5.

CHAPTER FIVE

5.0 Discussion

5.1 Emerging Clinical Patterns

The clinical characteristics observed in this study align with established knowledge that PID predominantly affects sexually active young women, with early onset often leading to recurrent episodes and increased risk of long-term complications such as infertility and chronic pelvic pain. A study by Baruti et al. (2022) conducted at Kampala International University Teaching Hospital in Uganda reported a high prevalence of PID among young women, with significant associations to factors such as multiple sexual partners and previous PID episodes (34). These findings are consistent with our results, indicating that young women in African settings remain at higher risk for recurrent PID.

In African clinical settings, abdominal pain and abnormal vaginal discharge consistently emerge as the most common symptoms among women presenting with PID. For instance, Oyedum et al. (2021, Nigeria), in a study of 720 PID patients, found that anatomical and reproductive tract sequelae such as tubal blockage and cervicitis were highly prevalent and commonly associated with presentations of abdominal pain and discharge. These findings corroborate the presentation patterns observed in our study and reinforce the need for clinicians in African healthcare settings to prioritize these symptoms for timely and accurate PID diagnosis. These findings closely mirror our results, reinforcing that such symptoms remain the hallmark of PID diagnosis in African settings (35).

Furthermore in this study, urinary symptoms frequently coexisted with pelvic inflammatory disease (PID), complicating diagnosis. Almost 49.1% of women with recurrent PID had a prior history of UTI from their past medical records, which aligns with our findings and highlights the overlap between urinary and pelvic conditions in African settings (35). Similarly, Assiri et al. (2024) in Saudi Arabia reported that women with PID often presented with urinary frequency and dysuria, leading to misdiagnosis as UTI (36). These findings underscore the need for careful differential diagnosis in healthcare facilities to avoid mismanagement of PID cases presenting with urinary symptoms.

Sexual behavior patterns in this study, including multiple sexual partners and inconsistent condom use, are well recognized risk factors for STI acquisition and, by extension, for PID acquisition and recurrence. This aligns with findings by Masanja et al (2021) in Uganda: nationally representative Demographic and Health Surveys (2006–2016) showed that female youth with two or more lifetime sexual partners had significantly higher odds of reporting STIs (indicative of PID risk in many cases) (36). These regional findings underscore the role of high risk sexual behavior in sustaining the PID burden in sub Saharan Africa.

In this study, use of IUCDs was common. Masatu et al. (2022, Tanzania) observed that sexually transmitted infections were frequent among women opting for IUCDs, with symptoms such as dysuria and a history of prior infections being important predictors (37). This supports our caution that without proper screening, IUCD insertion may predispose women to pelvic inflammatory disease. In Uganda, Baturi et al (2022) found

that the previous use of contraceptives specifically the use of IUD, were all significantly associated with PID. Further reinforcing this, global data analyzed by Myo et al (2023), including African settings, showed that the risk of PID was mainly concentrated shortly after insertion of IUD and then declined over time (34,38). Variations across studies likely reflect differences in infection prevalence, screening protocols, and clinical practices during insertion. These findings collectively emphasize that while IUCDs pose minimal inherent risk for pelvic inflammatory disease, proper infection screening and safe insertion practices remain essential, particularly in high-prevalence African settings.

Awareness of PID varied among participants, with notable gaps observed. Similar trends were reported in Nigeria by Ogolodom et al. (2023), where the majority of women attending reproductive health clinics had suboptimal awareness since they did not know the mode of transmission and ill effects of PID (39). By contrast, Uahomo (2023) in Nigeria found that awareness levels were considerably higher, likely due to targeted sexual health education and stronger community awareness programs in that region (40). These discrepancies may be explained by variations in health promotion policies and health literacy levels across African countries. Together, these findings reinforce the importance of integrated sexual health interventions, timely diagnosis, and comprehensive treatment strategies to reduce PID burden and prevent complications.

5.2 Bacterial Etiology of Recurrent PID

This study identified N. *gonorrhoea* and C. *trachomatis* as the predominant bacterial pathogens isolated from women experiencing recurrent PID at Amana Regional Referral Hospital. These findings corroborate the well-established role of these sexually transmitted pathogens as leading causes of PID worldwide, particularly in low- and middle-income countries where STI prevalence remains high. The prominence of N. *gonorrhoea* and C. *trachomatis* underscores their importance in PID pathogenesis, as these organisms have the ability to ascend from the lower genital tract to the upper reproductive organs, triggering inflammation and tissue damage (41).

Moreover, the detection of E. *coli* and S. *aureus* highlights the polymicrobial nature of PID, consistent with existing literature indicating that a mixture of aerobic and anaerobic bacteria from the vaginal and gastrointestinal flora often contribute to PID, particularly in recurrent infections. Kaambo *et al* (2018) argue that the presence of these organisms may reflect factors such as alterations in the vaginal micro biome, frequent antibiotic exposure, or breaches in mucosal barriers facilitating opportunistic infections (42).

When comparing our findings to studies from high-income countries, where anaerobic bacteria and emerging pathogens such as *M. genitalium* are frequently reported as important etiologic agents, the differences may be largely attributable to diagnostic limitations in resource-limited settings. In many sub-Saharan African healthcare facilities, routine molecular diagnostics for fastidious or anaerobic organisms are not available, potentially leading to underestimation of their prevalence. Additionally,

differences in sexual behavior, antibiotic exposure, and healthcare access likely influence pathogen distribution across populations (43).

5.3 Antimicrobial Sensitivity Patterns

The antimicrobial susceptibility patterns observed in this study provide important insights for the empirical management of recurrent PID in this population. The uniform susceptibility of *C. trachomatis*, *N. gonorrhoeae*, and *E. coli* to ceftriaxone, azithromycin, and clarithromycin is reassuring and aligns with the current WHO recommendations for the treatment of PID and STIs. Ceftriaxone's efficacy against *N. gonorrhoea* is particularly critical given the rising global concern over gonococcal antimicrobial resistance. Notably, ciprofloxacin maintained sensitivity activity against *E. coli* and intermediated activity against N. *gonorrhoea* (44).

Gram-positive organisms such as *S. aureus* and coagulase-negative staphylococci demonstrated high susceptibility to vancomycin, doxycycline, and clindamycin, mirroring susceptibility profiles reported in other East African settings (45). Lade *et al* (2023) warns that the reduced effectiveness of penicillin against these organisms evidenced by low susceptibility rates reflects global increases in β-lactamase production and methicillin resistance, which limit penicillin's utility in treating staphylococcal infections (46). This finding further underscores the need for local susceptibility testing to guide empirical antibiotic choices and avoid therapeutic failures.

Differences in antimicrobial resistance patterns between this setting and developed countries may be influenced by disparities in healthcare infrastructure, antibiotic availability, prescription oversight, and public health interventions targeting antibiotic

misuse (47). The absence of detected resistance in *Proteus mirabilis* and *Streptococcus agalactiae* isolates suggests that these pathogens may currently be less exposed to selective antibiotic pressure in this population, although continuous monitoring is warranted.

5.4 Factors Associated with Recurrent PID

The multivariable analysis identified several key factors significantly associated with recurrent PID: younger age, a history of STIs, no condom use, having multiple sexual partners, and having a new sexual partner. These findings are supported by a wealth of epidemiological evidence linking these factors to increased risk of PID recurrence and complications.

This study found that younger women were more likely to experience PID compared to older women, a finding that is consistent with previous research across various settings. Younger women, particularly those in their late teens and early twenties, are known to be biologically more susceptible to sexually transmitted infections due to the immaturity of the cervical epithelium, which can facilitate the ascension of pathogens to the upper genital tract (48)**.** In addition to biological vulnerability, behavioral factors such as early sexual debut, multiple sexual partners, and inconsistent condom use further increase the risk of PID in this age group (49)**.** These risk factors are compounded by limited access to reproductive health services and lower levels of health-seeking behavior among younger women.

However, not all studies support a strong age-related difference in PID occurrence**.** For instance, a study done in Tigray, Ethiopia, found no significant age-related variation in

PID prevalence in a population where comprehensive sexual health services were widely available, suggesting that access to preventive care may mitigate age-related disparities (50)**.** The current study's findings reinforce the need for targeted, age-specific sexual and reproductive health interventions that address both the biological and social vulnerabilities of younger women.

A previous history of STIs is a well-known risk factor for recurrent PID, likely because previous infections can cause persistent inflammation and structural damage that facilitate re-infection or reactivation of latent organisms (51). Women with such histories may also engage in higher-risk sexual behaviors or have partners who remain untreated, perpetuating the cycle of infection.

This study found that not using condoms was significantly associated with an increased likelihood of PID. This finding is consistent with numerous studies that have demonstrated the effectiveness of condoms in preventing STIs, which are a major underlying cause of PID (52,53). Regular condom use reduces the transmission of pathogens such as *C. trachomatis* and *N. gonorrhoea*, thereby lowering the risk of ascending infections to the upper genital tract. In contrast, inconsistent or non-use of condoms has been linked to higher rates of both STIs and PID in various populations (54). These findings underscore the importance of promoting consistent condom use as a low-cost and accessible strategy to prevent PID and its associated complications, especially among sexually active women in high-risk settings.

Sexual behavior factors, including multiple sexual partners and having a new sexual partner, were strongly associated with recurrent PID. These behaviors increase

exposure to potentially infected partners and facilitate reinfection, as demonstrated in numerous studies across diverse populations (49,55). Interventions promoting safe sexual practices, condom use, and partner notification are essential components of comprehensive PID prevention strategies.

5.5 Limitation of the study

This study had some limitations. First, being hospital-based and conducted at a single urban referral facility may limit the generalizability of the findings to broader or rural populations. To mitigate this, results were interpreted with caution and contextualized within similar studies from other settings. Second, the cross-sectional design limits the ability to establish causal relationships between identified risk factors and recurrent PID. However, multivariable analysis was used to strengthen the association of findings. Third, self-reported data on sexual behavior and STI history may be subject to recall or social desirability bias. To address this, participants were assured of confidentiality and privacy during interviews. Lastly, due to reliance on conventional culture and wet mount microscopy techniques, the study was unable to test antibiotic sensitivity to *C. trachomatis*, which requires advanced molecular tests and culture methods which are currently unavailable in our local set up. As a result, this pathogen's contribution to PID in the study population could not be fully evaluated.

5.6 Conclusion

Neisseria gonorrhoeae and *C. trachomatis* are the leading bacterial causes of recurrent PID among women of reproductive age, with additional isolates such as *E. coli* and *S. aureus* reflecting the polymicrobial nature of the condition. Antimicrobial sensitivity

testing showed high effectiveness of ceftriaxone, azithromycin, and clarithromycin, while resistance to penicillin was notable. Key factors significantly associated with recurrent PID included a younger age, prior history of STIs, and high-risk sexual behaviors such as having multiple, new sexual partners and inconsistent condom use. Other related factors such as history of UTI and not completing 14 days empirical therapy for PID were also reported among the participants and these may need further research.

5.7 Recommendations

Based on the study findings, it is recommended that.

1. Patients with high risk for recurrent PID need to have screening for *N. gonorrhoeae*, *C. trachomatis*, and other key pathogens like *E. coli* and *Staphylococcus species.*

2. Extensive study on recurrent PID need to be done, the empirical treatment guidelines need to be revised to reflect local resistance patterns. Antibiotic stewardship programs need to be promoted to ensure appropriate prescribing, patient adherence, and limit over the counter antibiotic use.

3. Health education on high risk groups for recurrent PID, promoting safer sexual practices such as consistent condom use, fewer sexual partners, and partner notification is also essential.

CHAPTER SIX

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CHAPTER SEVEN

APPENDICES

Appendix I: INFORMED CONSENT FORM (ENGLISH VERSION)

I, Amani Mdoe Mkwavi, a student at Kairuki University undertaking Master of Medicine in Obstetrics and Gynaecology. I am undertaking research entitled: **Recurrent pelvic inflammatory disease, risk factors, aetiology and antibiotic sensitivity in women of reproductive age, attending Amana hospital.**

Aim of the study

To evaluate risk factors associated with recurrent PID, identify the commonest bacterial etiology and establish antibacterial sensitivity among women of reproductive age 15 to 49 years attending Amana Hospital gynaecological clinic from February to April 2025.

Participant role

When you have agreed to take part in this study, you will be interviewed using a pretested questionnaire and you will respond to the questions asked by the researcher; questions will include your demographic particulars like age, residence, education level and also will include medical review of recurrent PID risk factors. A physical examination of the abdomen, the pelvic region, the vagina and bimanual examination will be done to assess the uterus and adnexa for signs of PID. Final High Vaginal swab will be collected for investigating bacteria etiology and ant-bacterial susceptibility patterns, then a pelvic ultrasound will be done and all information will be captured on the questionnaire.

Confidentiality

The information gathered from you will be confidential and only used for the purpose of the study, no names will be recorded, patient privacy will be ensured during the physical examination.

Benefits

You will get knowledge on recurrent PID, the risk factors associated, bacterial etiology, and ant bacteria susceptibility results and get treated.

Risks

There are no risks anticipated to occur during this study, however if any participant displays any risk will be cared according to the type of risk or injury.

Who will be involved in the study

The research team will involve the principal investigator, a gynaecologist, a nursing assistant officer, a laboratory scientist and a sonographer.

Access to information

By signing this consent form, you allow the research team to use the information obtained, and share it to the research supervisors at Kairuki University, and for the purpose of publishing.

Whom to contact

1. The principal investigator

Dr. Amani Mdoe Mkwavi

Resident in OBGY
Kairuki University
Box 65300
Tel: 0653968610

2. Supervisor

Dr. Monica Chiduo

Head of OBGY Department

Kairuki University

Box 65300

Tel: 0713618847

Consent:

Your consent to participate in this study is entirely voluntary and amenable by signing the consent form. You are free to consent or not and this will not affect the care and management offered to you. You may decide to stop participating in this study at any time for any reason. Thank you for your willingness.

Patient ID no: _____

Signature: _____

Date: _____

Appendix II: INFORMED CONSENT FORM (SWAHILI VERSION)

FOMU YA RIDHAA.

Mimi, Amani Mdoe Mkwavi, ni mwanafunzi katika Chuo Kikuu cha Kairuki ninayesomea shahada ya uzamili ya udaktari bingwa wa magonjwa ya akina mama na afya ya uzazi. Nipo nafanya utafiti wa magonjwa ya kujirudia ya maambukizi kwenye nyonga (Recurrent PID) kwa wanawake kati ya umri wa miaka 15 mpaka 49, ambao wanahudhuria kliniki ya magonjwa ya wanawake katika hospitali ya Rufaa ya Amana katika kipindi cha mwezi wa pili mpaka wa nne mwaka huu 2025.

Lengo la utafiti

Ni kuanisha visababishi au vichochezi vinavyoshinikiza maradhi ya kujirudia ya maambukizi kwenye nyonga (Recurrent PID), kuchunguza bakteria wanaochochea maambukizi ya kwenye nyonga, na kubainisha uwezo au usawa wa dawa za kufua bakteria hao ili kujua kama zinajitosheleza au kuna usugu wa bakteria.

Jukumu la mshiriki

Utakapokubali kuwa mshiriki wa tafiti hii, utaulizwa maswali yalioandaliwa kwenye dodoso maalumu, maswali yatahusu taarifa binafsi kama vile umri, makazi, elimu, na pia yatajumuisha taarifa za nyuma za afya ya uzazi ikiwemo kuugua magonjwa ya nyonga na vichochezi vyake. Mshiriki atafanyiwa huduma ya uchunguzi wa mwili, ikiwemo maeneo ya tumbo, nyonga, na uchunguzi wa ukeni, ikiwemo kuangalia viashiria vya maambukizi ya nyonga kwenye viungo vya uzazi. Sampuli ya majimaji ya uke itakusanywa kwa kutumia kifaa maalumu cha ukusanyaji kisha itapelekwa maabara kwa ajili ya uchunguzi wa bakteria pamoja na usawa wa dawa za kufua bakteria.

Mshiriki atafanyiwa kipimo cha picha ya tumbo au ultrasound ili kubainisha viashiria vya maabukizi ya nyonga.

Usiri

Taarifa zote atakazotoa mshiriki zitakuwa siri kati ya mshiriki na wahusika wa utafiti na zitatumika kwa ajili ya kufanikisha utafiti pekee. Taarifa binafsi kama vile majina halisi ya mshiriki hayatotumika kipindi cha utafiti bali kutakuwa na utambulisho maalamu wa nambari au kanuni kwa ajili ya kutunza usiri. Uchunguzi wa mwili wa mshiriki utafanywa kwa kufuata miongozo ya matibabu na staha itatumika kulinda maeneo yasiyohitajika kwenye uchunghuzi.

Faida

Mshiriki atapata elimu kuhusiana na vichochezi au mambo ya hatari yanayochangia kupata maabukizi ya kujirudia ya kwenye nyonga, ataweza kubaini bakteria msumbufu anayemletea maambukizi kwenye nyonga, na kujua dawa inayoweza kumtibu, kwahio atapata matibabu ipasavyo.

Hatari

Tafiti hii haitarajii hatari yeyote kwa mshiriki, na endapo itatokea kwa bahati mbaya basi ushirikiano utatolewa kubaini chanzo cha hatari na kupata suluhu yake.

Jopo la watafiti

Tafiti hii itahusisha daktari kiongozi wa utafiti, daktari bingwa wa magonjwa ya akina mama na afya ya uzazi, itahusiha afisa muuguzi msaidizi, mwanasayansi wa maabara, pamoja na mwanasonografia.

Upatikanaji na matumizi ya taarifa

Baada ya kusaini hii fomu, utakuwa umetoa kibali cha taarifa hizi zilizokusanywa kuweza kuwasilishwa kwa wasimamizi wa tafiti wa Chuo kikuu cha Kairuki na kwa ajili ya kuchapishwa kwenya majarida maalumu ya afya.

Mawasiliano

Kwa mahitaji ya mawasiliano kwa ajili ya taarifa zaidi au kupata mrejesho

1. Mtafiti kiongozi

Daktari Amani Mdoe Mkwavi
Chuo kikuu cha Kairuki
S.L.P 65300
Simu: 0653968610

2. Msimamizi

Daktari. Monica Chiduo
Mkuu wa idara ya wagonjwa ya wanawake
Chuo kikuu cha Kairuki
S.L.P 65300
Simu: 0713618847

Ridhaa

Ridhaa ya kushiriki utafiti ni kwa hiari yako na unaweza kutenguwa ridhaa muda wowote hata baada ya kusaini. Ridhaa ya kushiriki ni huru na haita athiri upatikanaji wa huduma zako za afya endapo hautoridhia kushiriki tafiti hii na muda wowote unaweza kujiondoa kwenye kushiriki tafiti hii kutokana na sababu zako binafsi. Tunashukuru kwa muda wako na kwa utayari wa kushiriki tafiti hii ili kuongeza tija kwenye sayansi.

Kumbukumbu na: _____
Sahihi: _____
Tarehe: _____

Appendix III: QUESTIONNAIRE (ENGLISH VERSION)

Questionnaire no: _____

INSTRUCTIONS

- Fill in the blanks respectively and correctly
- Choose a letter from the list of options provided in each question
- Describe shortly as required in some questions

A. SOCIO-DEMOGRAPHIC DETAILS

1. Patient ID …….
2. Age……..years (A. 15-20 B. 21-25 C. 26-30 D. 31-35 E. 36 and above*)*
3. Premenopausal……. (A. Yes B. No C. Doesn't know*)*
4. Parity……. (A. null parous B. 1 C. 2 D.3 E. 4 and above*)*
5. Marital status……. (A. Single B. Married C. Cohabiting*)*
6. If married …….. (A. Monogamy B. Polygamy)
7. Education of respondent …… (A. Primary B. Secondary C. University)
8. Occupation of respondent…….(A. Employed B. Housewife C. Unemployed)
9. Residence…….. (A. Urban B. Rural C. City center)

B. RISK FACTORS FOR RECURRENT PID

10. Age of menarche……. (A. 10 – 13 B. 14 – 17 C. 18 and Above)
11. Age of sexual debut…….(A. 13 – 15 B. 16 – 18 C. 19 and Above)
12. Number of lifetime sexual partners…….(A. 1 only B. 2 – 4 C. 5 and Above)
13. History of new sexual partner for the past one year ……. (A. Yes B. No C. Doesn't know)
14. History of STI in the past one year……. (A. Yes B. No C. Doesn't know)
15. History of UTI in the past one year ……. (A. Yes B. No C. Doesn't know)

16. History of contraceptives use such as regular condom use in the past one year …… (A. Yes B. No C. Doesn't know)
17. History of contraceptives use such as IUCD in the past one year ……. (A. Yes B. No C. Doesn't know)
18. History of contraceptives use such as COC in the past one year …….. (A.Yes B. No C. Doesn't know)
19. History of alcohol use in the past one year …….. (A.Yes B. No C. Doesn't know)
20. History of instrumental evacuation in the past one year …….. (A.Yes B. No C. Doesn't know)
21. History of spontaneous vaginal delivery in the past one year……. (A.Yes B. No C. Doesn't know)
22. History of major operation involving the abdomen or pelvis in the past one year …….. (A. Yes B. No C. Doesn't know)

C. PAST MEDICAL HISTORY OF RECURRENT PID

23. Are you aware of PID …… (A. Yes B. No C. Doesn't know)
24. History of being diagnosed with PID for the past one year …… (A. Yes B. No C. Doesn't know)
25. Age of first diagnosed with PID……..(A. 15 – 18 yrs B. 19 – 22 yrs C. 23 - 26 yrs D. 27 yrs and above)
26. History of recurrent diagnosed with PID in one year…… (A.Yes B. No C. Doesn't know)
27. How many times have you being diagnosed with recurrent PID in one year ……... (A. twice B. thrice C. 4 and above)
28. History of being admitted due to recurrent PID for the past one year …… (A.Yes B. No C. Doesn't know)
29. How many times have you being admitted with recurrent PID for past one year……..(A. once only B. twice C. 3 and Above

30. History of finishing the course of 14 days broad spectrum antibiotics for PID as recommended in STG?…… (A.Yes B. No C. Doesn't know)
31. What was the outcome of the treatment regime given, were the signs and symptoms of PID cured? ……..

(A. Yes B. No C. Doesn't know)

D. SIGNS AND SYMPTOMS OF RECURRENT PID

32. Complain of lower abdominal and pelvic pain for the past one year…… (A.Yes B. No C. Doesn't know)
33. Complain of lower abdominal pain that worsen during coitus (coital pain) for the past one year…… (A.Yes B. No C. Doesn't know)
34. Complain of coital bleeding for the past one year …… (A.Yes B. No C. Doesn't know)
35. Complain of abnormal vaginal discharge for the past one year…… (A.Yes B. No C. Doesn't know)
36. Complain of painful micturition for the past one year…… (A.Yes B. No C. Doesn't know)
37. Complain of fever spikes for the past one year…… (A.Yes B. No C. Doesn't know)
38. Abdominal tenderness on palpation, greatest in the lower quadrants ……. (A.Yes B. No C. Doesn't know)
39. Rebound tenderness on deep palpation, greatest in the lower quadrants/hypogastric region …….. (A.Yes B. No C. Doesn't know)
40. Purulent endocervical discharge and/or high vaginal discharge on sterile speculum examination…… (A.Yes B. No C. Doesn't know)
41. Acute cervical motion tenderness on bimanual pelvic examination..... (A.Yes B. No C. Doesn't know)
42. Uterine tenderness on bimanual pelvic examination ……(A.Yes B. No C. Doesn't know)

43. Adnexal tenderness on bimanual pelvic examination ……(A.Yes B. No C. Doesn't know)

E. LABORATORY RESULTS AND SONOGRAPHIC FINDINGS

44. Endocervical/HVS for gram staining positive for microbial organisms…….(A.Yes B. No C. Doesn't know)

45. HVS positive for culture test …….(A.Yes B. No C. Doesn't know)

46. HVS bacteria isolated ……(A. *N. gonorrhoea* B. *C. trachomatis* C. *S. agalactiae* D. *Staphylococci aureus* *E. E.coli* *F. Staphylococci cons* *G. Proteus species)*

47. HVS antibiotic sensitivity findings……. (A. Ceftriaxone B. Gentamycin C. Amoxiclav D. Ciprofloxacin E. Erythromycin F. Doxycillin. G. Azithromycin H. Penicillin I. Vancomycin J. Tetracyclin K.Clindamycin L . Nitrofurantoin M. Meropenem N. Clarithromycin O. Ampicillin)

48. HVS resistance findings……(A. Ceftriaxone B. Gentamycin C. Amoxiclav D. Ciprofloxacin E. Erythromycin F. Doxycillin. G. Azithromycin H. Penicillin I. Vancomycin J. Tetracyclin K.Clindamycin L . Nitrofurantoin M. Meropenem N. Clarithromycin O. Ampicillin)

49. Free fluid in the POD by Ultrasound ……. (A.Yes B. No C. Doesn't know)

50. Other relevant Ultrasound findings……

A. Salpingitis B. Hydrosalpinx C. Endometritis D. Tubo-ovarian abscess)

Appendix IV: QUESTIONNAIRE (SWAHILI VERSION)

HOJAJI

Nambari ya Hojaji…….

Maelekezo:

- Tafadhali jaza dodoso kwa umakini
- Chagua jibu moja kutoka kwenye orodha ya majibu ya kila swali
- Elezea kwa ufupi panapohitajika

A. TAARIFA BINAFSI

1. Namba ya utambulisho…….
2. Umri, miaka……(A. 15-20 B. 21-25 C. 26-30 D. 31-35 E. 36 and above*)*
3. Kipindi cha kabla ya hedhi kukoma……..(A.Ndio B. Hapana C. Sifahamu)
4. Umezaa mara ngapi……..(A. Sijazaa B. 1 C. 2 D.3 E. 4 na kuendelea*)*
5. Mahusiano……(A.Sijaolewa B.Nimeolewa C.Tunaishi pamoja bila kuolewa)
6. Aina ya ndoa……..(A. Mke mmoja B. Wake wenza)
7. Kiwango cha elimu……(A. Elimu ya msingi B. Elimu ya sekondari C.Elimu ya chuo)
8. Kazi……...(A.Nimeajiriwa B. Mama wa nyumbani C.Sijaajiriwa)
9. Makazi…….. (A. Mjini B. Pembezoni mwa mji C. Mjini kati)

B. VICHOCHEZI VYA MAAMBUKIZI KWENYE NYONGA

10. Umri wa kuvunja ungo……..(A. 10 – 13 B. 14 – 17 C. 18 na kuendelea)
11. Umri wa tendo la ndoa la kwanza……..(A. 13 – 15 B. 16 – 18 C. 19 na kuendelea)
12. Idadi ya washirika wa tendo la ndoa……(A. 1 B. 2 – 4 C. 5 na kuendelea)

13. Mshirika mpya wa tendo la ndoa ndani ya mwaka mmoja uliopita? ……..
    (A.Ndio B. Hapana C. Sifahamu)
14. Historia ya kuugua magonjwa ya ngono ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)
15. Historia ya kuugua magonjwa ya mfumo wa mkojo ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)
16. Historia ya kutumia kondomu ndani ya mwaka mmoja uliopita?…….
    (A.Ndio B. Hapana C. Sifahamu)
17. Historia ya kutumia uzazi wa mpango wa kitanzi ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)
18. Historia ya kutumia vidonge vya uzazi wa mpango ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)
19. Historia ya kutumia pombe ndani ya mwaka mmoja uliopita?…….
    (A.Ndio B. Hapana C. Sifahamu)
20. Historia ya kupata huduma ya kusafishwa kwa vifaa kupitia ukeni baada ya mimba kuharibika ndani ya mwaka mmoja uliopita? …….
    (A.Ndio B. Hapana C. Sifahamu)
21. Historia ya kujifungua kwa njia ya kawaida ndani ya mwaka mmoja uliopita?……. (A.Ndio B. Hapana C. Sifahamu)
22. Historia ya kufanyiwa upasuaji mkubwa wa tumbo au nyonga ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)

C. HISTORIA YA AFYA YA MAAMBUKIZI YA NYONGA YA KUJIRUDIARUDIA

23. Unafahamu ugonjwa wa maambukizi kwenye nyonga?…….
    (A.Ndio B. Hapana C. Sifahamu)
24. Umeshawahi kugundulika na ugonjwa wa maambukizi kwenye nyonga?…….(A.Ndio B. Hapana C. Sifahamu)
25. Umri uliogundulika na ugonjwa wa maambukizi kwenye nyonga kwa mara ya kwanza?…….(A. 15 – 18 B. 19 – 22 C. 23 - 26 D. 27 na kuendelea)

26. Umeshawahi kugundulika na ugonjwa wa maambukizi kwenye nyonga ya kujirudia mara kwa mara ndani ya mwaka mmoja uliopita?…….
    (A.Ndio B. Hapana C. Sifahamu)
27. Mara ngapi umeshawahi kugundulika na ugonjwa wa maambukizi kwenye nyonga ya kujirudia ndani ya mwaka mmoja uliopita?…….(A. mara moja B. mara mbili C. mara tatu D. mara 4 na kuendelea)
28. Umeshawahi kulazwa kutokana na ugonjwa wa maambukizi kwenye nyonga ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)
29. Mara ngapi umeshawahi kulazwa kutokana na ugonjwa wa maambukizi kwenye nyonga ndani ya mwaka mmoja uliopita?…….(A. mara moja B. mara mbili C. mara 3 na kuendelea)
30. Je alimaliza matibabu ya dozi ya siku 14 iliyotolewa kwa ajili ya maambukizi kwenye nyonga? …….(A.Ndio B. Hapana C. Sifahamu)
31. Baada ya matibabu uliyopewa……(A.Dalili zilipona B.Dalili hazikutibika C. Sifahamu.)

DALILI ZA MAAMBUKIZI YA NYONGA YA KUJIRUDIARUDIA

32. Unasumbuliwa na maumivu ya tumbo chini ya kitovu ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)
33. Unasumbuliwa na maumivu ya tumbo chini ya kitovu yanayokuwa makali zaidi wakati wa tendo la ndoa ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)
34. Unapata damu wakati wa tendo la ndoa ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)
35. Unapata kutokwa na majimaji yasiyo ya kawaida/uchafu ukeni ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)
36. Unapata maumivu wakati wa kukojoa ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)
37. Unapata homa au mwili kuchemka ndani ya mwaka mmoja uliopita?…….(A.Ndio B. Hapana C. Sifahamu)

38. Maumivu ya tumbo chini ya kitovu wakati uchunguzi?…….
    (A.Ndio B. Hapana C. Sifahamu)
39. Maumivu makali ya tumbo chini ya kitovu yakujirudia wakati wa uchunguzi?…….(A.Ndio B. Hapana C. Sifahamu)
40. Majimaji yasiyo ya kawaida/uchafu ukeni wakati uchunguzi ?…….
    (A.Ndio B. Hapana C. Sifahamu)
41. Maumivu ya shingo ya uzazi, wakati uchunguzi wa fupanyonga wa mikono miwil ?…….(A. Ndio B. Hapana C. Sifahamu)
42. Maumivu ya kifuko cha uzazi wakati uchunguzi wa fupanyonga wa mikono miwil ? ..... (A.Ndio B. Hapana C. Sifahamu)
43. Maumivu ya nyumba za mayai wakati uchunguzi wa fupanyonga wa mikono miwil ?…….((A.Ndio B. Hapana C. Sifahamu)

E. MAJIBU YA VIPIMO

44. Maambukizi ya bakteria kwenye majimaji ya uke kupitia kipimo cha awali cha madoa ya gramu cha majimaji ya uke/uchafu?…….(A.Ndio B. Hapana C. Sifahamu)
45. Maambukizi ya bakteria kwenye majimaji ya uke/uchafu kupitia kipimo cha majimaji ya uke cha kuzindika maabara?…….(A.Ndio B. Hapana C. Sifahamu)
46. Maambukizi ya aina ya bakteria aliyegundulika kwenye majimaji ya uke kupitia kipimo cha majimaji ya uke……(A. N. gonorrhoea B. C. trachomatis C. S.agalactiae D. Staphylococci aureus E. E.coli F. Staphylococcus cons G. Proteus species)
47. Ainisho la dawa za kufua bakteria zilizopendekezwa kwenye kipimo cha majimaji ya uke…… (A. Ceftriaxone B. Gentamycin C. Amoxiclav D. Ciprofloxacin E. Erythromycin F. Doxycillin. G. Azithromycin H. Penicillin I. Vancomycin J. Tetracyclin K.Clindamycin L . Nitrofurantoin M. Meropenem N. Clarithromycin O. Ampicillin)

48. Ainisho la usugu wa dawa za kufua bakteria aliyegundulika kwenye kipimo cha majimaji ya uke……..(A. Ceftriaxone B. Gentamycin C. Amoxiclav D. Ciprofloxacin E. Erythromycin F. Doxycillin. G. Azithromycin H. Penicillin I. Vancomycin J. Tetracyclin K.Clindamycin L . Nitrofurantoin M. Meropenem N. Clarithromycin O. Ampicillin)
49. Majimaji kutuama au kuonekana nyuma ya kifuko cha uzazi kupitia kipimo cha picha ya Ultrasaund?…….(A.Ndio B. Hapana C. Sifahamu)
50. Matokeo mengine yaliyobainika kupitia kipimo cha picha ya Ultrasaundi…….
(A. Mirija kushambuliwa B. Mirija kutuama maji C.Mashambulizi ya kuta za ndani za mfuko wa uzazi D.Usaha kwenye nyumba za mayai)

Appendix V: CHECKLIST

This checklist includes inclusion and exclusion criteria used to screen the target population of women of reproductive age attending gynaecology OPD at Amana Hospital. Those who will fit the below criteria will be included and enrolled in the research.

Inclusion criteria

- All women of reproductive age between 15 to 49 years attending Amana Hospital Gynaecology OPD clinic from February to April, 2025.
- All women with prior history of PID of two or more episodes per year from their past medical records.
- Women willing to participate in the study and provide samples for the diagnosis of pelvic inflammatory diseases.
- Women of reproductive age between 15 to 49 years with complains of LAP, or contact pelvic pain or coital pain, or abnormal per vaginal discharges.
- Consented women.

Exclusion criteria

- Known pregnant women at any trimester.
- Known HIV/AIDS, these are prone to multiple infections due to the low immunity status, may influence thriving of the microorganism, and may show false positive results in contrast with immune competent individuals
- Women on active antibiotic therapy for the past one week for other conditions

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH

AMANA REGIONAL REFERRAL HOSPITAL

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REF. NO. MoHCDGEC/ARRH/R.1/VOL IV/79

Date: 08/05/2025

Director, Postgraduate Studies and
Research Institute,
Kairuki University,
P.O. Box 65300,
DAR ES SALAAM.

Re: PERMISSION FOR DATA COLLECTION

Refer to your letter dated 22th April, 2025 which requested us to allow **Amani Mdoe Mkwavi** to conduct research and collect data in our institution.

We are here to acknowledge your request with the following conditions, that he must submit the results of his research after completion of analysis in order the hospital to make use of data's to solve hospital problems.

Regards.

For:
MEDICAL OFFICER I/C
AMANA REGIONAL REFERRAL HOSPITAL
P. O. Box 25411
DAR ES SALAAM

Dr. Rose Ntambuto
FOR: MEDICAL OFFICER INCHARGE
AMANA REGIONAL REFERRAL HOSPITAL

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Website: www.ku.ac.tz

Ref. No. KU/PT/30.5/573

22nd April 2025

Medical Officer In-charge,
Amana Regional Referral Hospital,
Dar es Salaam.

Re: LETTER OF INTRODUCTION FOR DR. AMANI MDOE MKWAVI (MMed Part II – OBSTETRICS AND GYNAECOLOGY).

The above named is a MMed postgraduate student specialising in Obstetrics and Gynaecology. As part of fulfilling his MMed programme, he plans to undertake a study titled, **"A study on Recurrent Pelvic Inflammatory Disease, Risk Factors, Aetiology and Antibiotic Sensitivity in Women of Reproductive Age 15 to 49 years, attending Amana Hospital".** This study was reviewed and has been granted with an ethics approval No. **KU/IREC/27.10/561** by the KU Institutional Research Ethics Committee that will be valid for one year with effect from 16th April 2025.

This letter serves to introduce **Dr. Amani Mdoe Mkwavi** who will be conducting his study in Dar es Salaam, please accord him with the needed support.

Thank you for your support and cooperation in developing human resources for health in our country.

Regards,

DIRECTOR POSTGRADUATE STUDIES AND RESEARCH INSTITUTE
KAIRUKI UNIVERSITY
P. O. Box 65300, DSM

Professor Columba Mbekenga, PhD
Director Postgraduate Studies & Research Institute

c. c. Dr. Monica Chiduo, Head, Department of Obstetrics and Gynaecology, KU.
c.c. Head, Department of Obstetrics and Gynaecology, ARRH

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Ref. No. KU/IREC/27.10/561 **16 April, 2025**

Dr. Amani Mdoe Mkwavi,
Kairuki University,
70 Chwaku Street,
Mikocheni,
P. O. Box 65300.
Dar es Salaam, Tanzania.

RE: ETHICAL CLEARANCE CERTIFICATE FOR CONDUCTING HEALTH RESEARCH

I am pleased to inform you that the research titled: **A Study on Recurrent Pelvic Inflammatory Disease, Risk Factors, Aetiology and Antibiotic Sensitivity in Women of Reproductive Age 15 to 49 Years, Attending Amana Hospital (Mkwavi, A. M., 2025)** has been granted ethical approval.

This approval is in effect for one year from the above date.

- Any changes in the procedures should be reported to the Institutional Research Ethics Committee.
- Significant changes will require the submission of a revised request for ethical approval.
- You will be required to submit **a study progress report** every six months.

Permission to publish your findings should be sought from the National Institute for Medical Research (NIMR) before submission to a publisher and not concurrently.

CHAIR PERSON

Name: Prof. Frederick Kaijage

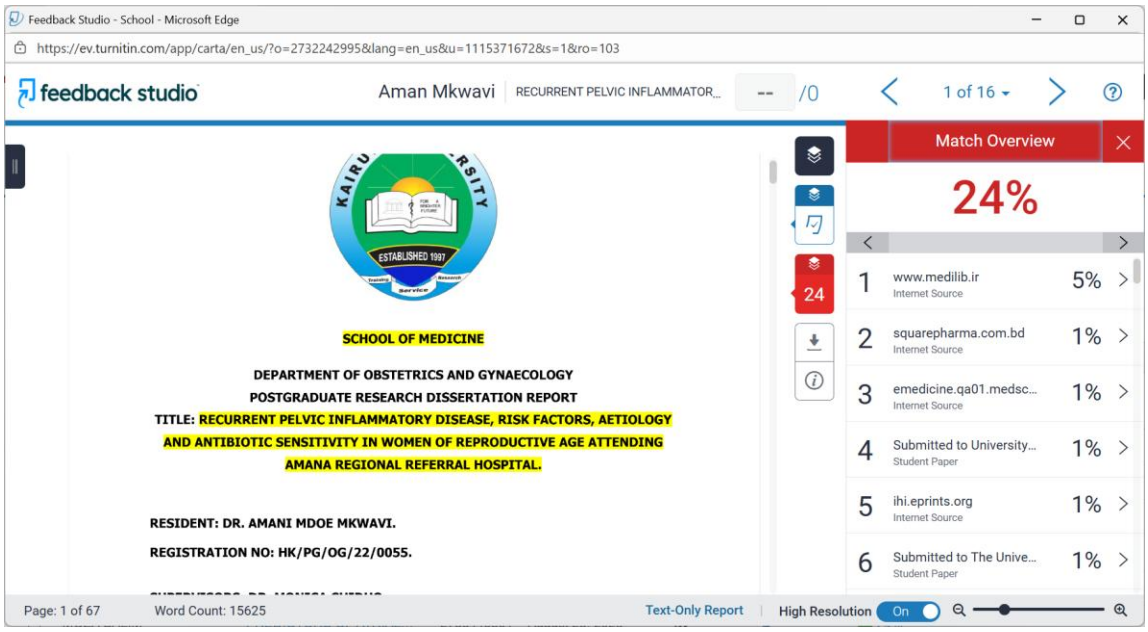
Signature:

SECRETARY

Name: Prof. Columba Mbekenga

Signature:

DIRECTOR POSTGRADUATE STUDIES AND RESEARCH INSTITUTE
KAIRUKI UNIVERSITY
P. O. Box 65300, DSM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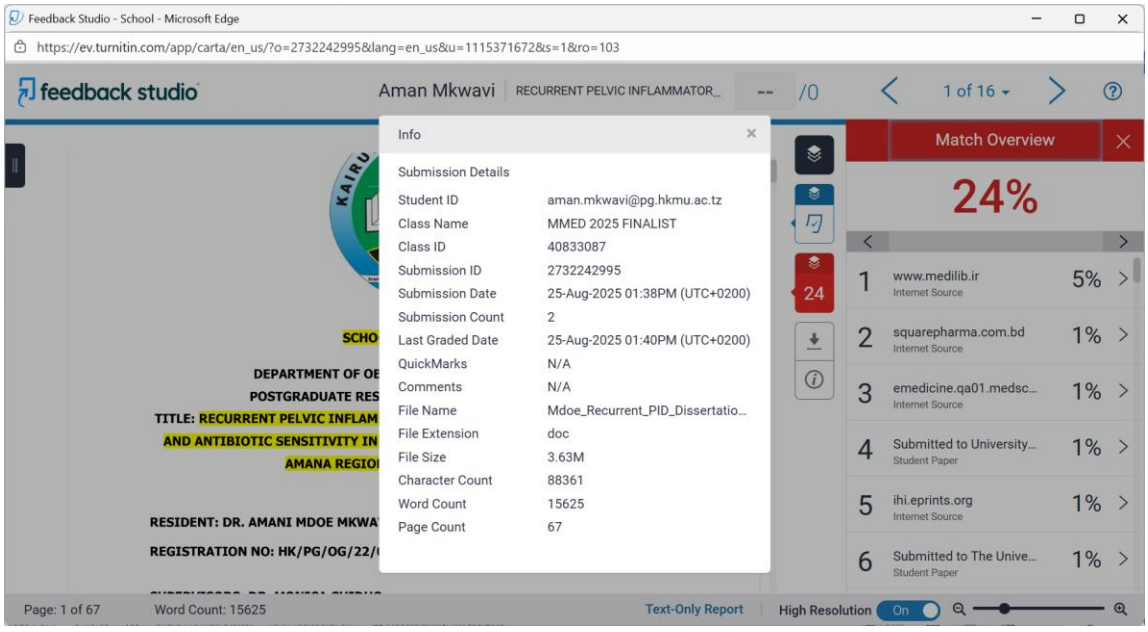
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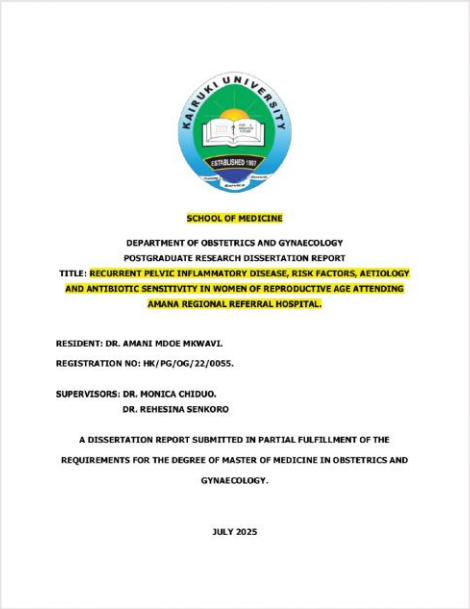

SCHOOL OF MEDICINE

DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY
POSTGRADUATE RESEARCH DISSERTATION REPORT
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RESIDENT: DR. AMANI MDOE MKWAVI.
REGISTRATION NO: HK/PG/OG/22/0055.

SUPERVISORS: DR. MONICA CHIDUO.
DR. REHESINA SENKORO

A DISSERTATION REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE IN OBSTETRICS AND GYNAECOLOGY.

JULY 2025