FACTORS INFLUENCING THE RETENTION OF CLIENTS RECEIVING HIV PRE-EXPOSURE PROPHYLAXIS IN ENGELA DISTRICT, NAMIBIA.

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF REQUIREMENTS

FOR THE DEGREE OF MASTER OF PUBLIC HEALTH

OF

THE UNIVERSITY OF NAMIBIA

BY

KRISTIANA KOSMAS

200711326

APRIL 2023

MAIN SUPERVISOR: DR. ANNA SHILUNGA (UNAM)

Abstract

Human Immunodeficiency Virus (HIV) is one of the epidemics that has affected the world for years now. Namibia remains one of the countries burdened and overstrained by the HIV epidemic. Oral Pre-Exposure Prophylaxis (PrEP) is now included as an additional option for people at substantial risk of HIV infection in the context of a combination HIV prevention package in Namibia. However, the retention rate in PrEP care remains low. This study, therefore, aimed to determine the factors influencing the retention rate of clients receiving PrEP in Engela district, Namibia. The objectives of the study were to determine the retention rate of clients in PrEP care three months after initiation, to identify socio-demographic factors that affected retention in care of clients on PrEP, to describe structural factors affecting retention in care of clients in PrEP, and to determine factors and strategies to improve retention of clients on PrEP in the Engela district, Namibia.

A quantitative cross-sectional design was used for this study. Two hundred and fifty participants for the study were selected using a proportional stratified random sampling method. A self-administered questionnaire was used to collect the data. SPSS version 28 was used to analyse the data. Statistical tests used included Chi-square tests and logistic regression.

The findings from this study showed that the participants' retention rate in PrEP care was 35.6%. Chi-square tests showed associations between retention in PrEP care and sex, relationship status, education, and employment status ($p<0.05$). Age groups 18-25 years, 26-35 years, 36-45 years, and 46-55 years were significantly less likely to be retained in PrEP care compared to age group >55 years. Males were statistically significantly less likely to be retained in PrEP care compared to females. Divorced participants and participants in a relationship were statistically significantly less likely to be retained in PrEP care compared to single participants. The unemployed participants were statistically significantly less likely to be retained in PrEP care compared to the employed. More than three-fifths of the participants agreed or strongly agreed that distance to the healthcare facilities, lack of friendly staff at the healthcare facilities, shortage of staff at the healthcare facilities, and having a supportive partner would strongly influence their retention in PrEP care.

In conclusion, it was therefore recommended that PrEP education be offered to patients and the public at healthcare facilities and other public places, PrEP services are

decentralised, operating hours of healthcare facilities be expanded, healthcare facilities are adequately staffed, and PrEP drugs' availability is improved.

Keywords: HIV prevention methods, PrEP care retention, PrEP adherence, Engela District, Namibia,

List of Acronyms and abbreviations

AIDS – Acquired Immune Deficiency Syndrome

ART – Antiretroviral Therapy

ARVs – Antiretroviral drugs

CDC – Centers for Disease Control and Prevention

FEM-PREP – Preexposure Prophylaxis Trial for HIV Prevention among African Women

FTC – Emtricitabine

HIV – Human Immunodeficiency Virus

iPrEx – Pre-exposure Prophylaxis Initiative Trial

MoHSS – Ministry of Health and Social Services

MSM – Men who have sex with men

NAMPHIA – Namibia Population-based HIV Impact Assessment

PEP – Post Exposure Prophylaxis

PLHIV – People living with HIV

PMTCT – Prevention of Mother-to- Child Transmission

PrEP – Pre-exposure Prophylaxis

PROUD – Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection

STI – Sexually Transmitted Infection

TDF – Tenofovir Disoproxil Fumarate

USA – United States of America

VMMC – Voluntary Medical Male Circumcision

VOICE – Vaginal and Oral Interventions to Control the Epidemic

WHO – World Health Organization

Acknowledgements

Several people helped me throughout my Master of Public Health studies. I want to express my gratitude to the following people and institutions:

- My supervisor, Dr. Anna Shilunga, for guiding me and giving me constructive criticism throughout the study.
- Dr. Enos Moyo, for assisting me with statistically analysing the data.
- My family and friends, for standing by me throughout the journey.
- My kids, Sofia and Kauna, for giving me time to work on the study.
- The Ministry of Health and Social Services, for allowing me to conduct the study at the healthcare facilities.
- The study participants, for agreeing to take part in the study.

Dedication

This Thesis is dedicated to my mother, Liisa Ndafudha Kosmas, my cousin/sister Emmeritha Kosmas and Selma Kosmas, for their immeasurable support throughout my studies.

Declaration

I, Kristiana Kosmas, hereby declare that this study is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution.

Kristiana Kosmas  27/03/2023

…….. ……..

Name of Student **Signature** **Date**

Table of Contents

Abstract ..... **i**

List of Acronyms and abbreviations ..... **iii**

Acknowledgements ..... **iv**

Dedication ..... **v**

Declaration ..... **vi**

Table of Contents ..... **vii**

List of Figures ..... **xi**

List of Tables ..... **xii**

Chapter One: Introduction and Background **1**

1.1 Introduction 1

1.2 Background 2

1.3 Statement of the problem 4

1.4 Purpose of the study 4

1.5 Research questions 4

1.6 Study objectives 4

1.7 Significance of the study 5

1.8 Limitations of the study 5

1.9 Delimitation of the study 5

1.10 Chapter summary 5

Chapter Two: Literature Review **7**

2.1 Introduction 7

2.2 HIV Prevention Methods 7

2.3 Pre-Exposure prophylaxis 9

2.4 PrEP administration in Namibia 12

2.5 Implementation of PrEP programs 13

2.6 Retention in PrEP care 16
2.7 Adherence to PrEP drugs 18
2.8 Factors that affect adherence and retention to PrEP 20
2.9 Association between socio-demographic characteristics of individuals and retention in PrEP care 22
2.10 Strategies and factors to improve retention to PrEP care 22
2.10.1 Provider support for adherence. 22
2.10.2 Social support and individual factors 23
2.11 Chapter Summary 23
Chapter Three: Research Methodology 24
3.1 Introduction 24
3.2 Study design 24
3.3 Study setting 24
3.4 Study population 24
3.5 Sample size determination 25
3.5.1 Sample size 25
3.5.2 Inclusion criteria 25
3.5.3 Exclusion criteria 25
3.6 Sampling method 25
3.7 Data collection instrument 26
3.8 Pilot study 27
3.9 Measures to ensure reliability and validity of questionnaire 27
3.10 Data collection process 28
3.11 Data analysis 29
3.12 Ethical considerations 30
3.12.1 Respect for persons 30
3.12.2 Justice 31

3.12.3 Beneficence and non-maleficence 31
3.12.4 Confidentiality and privacy 31
3.13 Chapter summary 32
Chapter Four: Results and Discussion of Findings..... 33
4.1 Introduction 33
4.2 Socio-demographic characteristics..... 33
4.2.1 Sex of participants 33
4.2.2 Age group of the participants..... 33
4.2.3 Educational level of participants..... 34
4.2.4 Relationship status of participants 35
4.2.5 Employment status of participants..... 36
4.3 Retention and adherence to PrEP care 36
4.3.1 Retention in PrEP care..... 36
4.3.2 Adherence to PrEP..... 37
4.4 Association between retention in PrEP care and socio-demographic characteristics of participants 38
4.4.1 Frequency distribution of socio-demographic characteristics according to the status of retention in PrEP care..... 38
4.4.2 Association between retention in PrEP care and socio-demographic characteristics of participants analysis..... 40
4.5 Structural factors that influence retention of clients on PrEP care..... 43
4.6 Strategies and factors that may improve retention in PrEP care 50
4.7 Chapter summary 57
Chapter Five: Conclusions, Recommendations, and Limitations 58
5.1 Introduction 58
5.2 Findings from the literature review and primary study..... 58
5.3 Recommendations 60
5.3.1 Offering PrEP education to patients and the public..... 60

5.3.2 Decentralisation of PrEP services 60
5.3.3 Expanding healthcare facilities' operating hours 60
5.3.4 Adequate healthcare worker staffing 61
5.3.5 Improving PrEP drugs' availability 61
5.4 Recommendations for future research 61
5.5 Limitations of the study 61
5.6 Conclusion 61
References 63
Appendices 73
Appendix 1: University of Namibia REC's clearance certificate 73
Appendix 2: Ministry of Health and Social Services' research approval letter 74
Appendix 3: Questionnaire in English 75
Appendix 4: Questionnaire in Oshikwanyama 78
Appendix 5: Informed consent form in English 83
Appendix 6: Informed consent form in Oshikwanyama 85

List of Figures

Figure 1: Sex of participants 33
Figure 2: Age group of participants 34
Figure 3: Educational level of participants 35
Figure 4: Relationship status of participants 35
Figure 5: Employment status of participants 36
Figure 6: Retention in PrEP care 37
Figure 7: Frequency distribution of missed PrEP doses 38

List of Tables

Table 1: Frequency distribution of socio-demographic characteristics of participants by the status of retention in PrEP care 39
Table 2: Crude odds ratios and Chi-square tests of association between retention on PrEP care and socio-demographic characteristics..... 40
Table 3: Frequency distribution of responses to structural factors' statements..... 43
Table 4: Frequency distribution of responses to strategies and factors that might influence retention of clients in PrEP care statements..... 50

Chapter One: Introduction and Background

1.1 Introduction

Human Immunodeficiency Virus (HIV) is one of the epidemics that has affected the world for years now and yet regardless of the efforts to combat it, it continues to have serious effects on societies globally (1). The World Health Organization (WHO) estimated that 36.9 million people globally were living with HIV in 2017, while 1.8 million people were newly diagnosed with the disease (2). In southern Africa, it is estimated that 19.6 million people are living with HIV, while 800 000 new infections are reported (3). Of these figures, Namibia alone is reported to have 200 000 people living with HIV, with 7400 new infections yearly. Namibia thus remains one of the countries burdened and overstrained by the HIV epidemic. The annual HIV incidence in the age group 15-64 years for the year 2018 was 0.36% (0.59% among females and 0.13% among males) (4). This corresponds to approximately 4,500 new cases of HIV annually among adults aged 15-64 years in Namibia (4).

The current management option for HIV includes lifelong antiretroviral treatment. Post-Exposure Prophylaxis and prevention of mother-to-child transmission have been integral in lowering HIV incidence, but reaching out to individuals at substantial risk owing to lifestyle practices requires newer preventive approaches (5). Oral Pre-Exposure Prophylaxis (PrEP) is now included as an additional option for people at substantial risk of HIV infection in the context of a combination HIV prevention package in Namibia (6).

Pre-Exposure Prophylaxis is defined as the use of antiretroviral drugs (ARVs) by HIV uninfected persons at substantial risk, to prevent the acquisition of HIV (7). WHO proposed a standard termed “Substantial Risk,” as an anticipated HIV infection incidence, where the risk factors include the involvement in a social network in which the HIV infection prevalence is high e.g. sero-discordant couples, limited use of condom usage, a history of sexually transmitted infections, exchange of sex for commodities, incarceration, drug and alcohol use, and sexual partners of unknown HIV status (8).

HIV pre-exposure prophylaxis (PrEP) is a biomedical HIV prevention modality that entails the daily use of a single-tablet antiretroviral medication by uninfected individuals at risk of HIV infection. The most used tablet is a combination of

emtricitabine (FTC) and tenofovir disoproxil fumarate (TDF). PrEP's efficacy in preventing HIV acquisition has been demonstrated in randomized controlled trials and open-label studies (8).

Pre-exposure Prophylaxis Initiative Trial (iPrEx), the first randomized controlled study of oral PrEP, was conducted in countries such as Brazil, Peru, Ecuador, South Africa, Thailand, and the United States of America. The initial results showed efficacy rates of over 77% when the pill was taken 90% of the time, and then later over 90% when taken daily. Therefore, the effectiveness of daily oral tenofovir/emtricitabine (TDF/FTC) as HIV pre-exposure prophylaxis (PrEP) in preventing HIV in community settings depends on factors such as uptake, continued engagement, and adherence (9).

Previous research studies on the retention of clients on PrEP are mainly based on retention of PrEP which was from placebo-controlled and open-label studies. The findings from the studies may not reflect retention in real-world settings. Currently, there is no clear definition for PrEP retention, as it is not a lifelong treatment but a prevention method for the general population to enroll during their periods of perceived high exposure risk to HIV infection (10). For this research study, retention in PrEP will be measured by the number of clients initiated on PrEP between January and December 2019 who were still on PrEP one month after PrEP initiation.

1.2 Background

Globally, there were about 38 million people living with HIV (PLHIV) in 2021. Of the PLHIV in the world, 20.6 million were in Africa while only 1.8 million were in North America, and Western and Central Europe. Although there were 650 000 Acquired Immune Deficiency Syndrome (AIDS)-related deaths in 2021, this number had reduced by 68% since the peak in 2004. Furthermore, the number of new infections reduced by 54% in 2021 since the peak incidence in 1996 (11). Namibia has made tremendous progress in controlling the HIV epidemic. This has resulted in significant incidence and AIDS-related mortality reductions. However, new infections continue to persist (12). HIV prevalence in Namibia is among the highest in the world (4). The 2018 Namibia Population-based HIV Impact Assessment (NAMPHIA) results indicate a national adult HIV prevalence of 12.6% with an estimated 200 000 PLHIV in Namibia (4). A reduction in the number of new HIV infections has been achieved through a comprehensive prevention strategy that includes education, awareness, the

practice of safer sex, early ART to achieve viral suppression sooner and reduce the probability of transmission, and, most recently, the adoption of comprehensive pre-exposure prophylaxis (PrEP) programs that include behavioral and biomedical interventions (13).

PrEP has been termed a 'bio-behavioral' HIV prevention strategy, as it sits at the interface of biomedical and behavioral prevention (14). Pre-exposure prophylaxis (PrEP) effectively reduces incident HIV infections, but its efficacy depends on adherence and retention in care, among other factors (15). There is limited data on PrEP adherence in real-world settings. For PrEP to help bend the curve of the HIV epidemic, primary care will need to keep individuals engaged with PrEP (16).

In September 2015, the Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD) study: immediate or deferred, published its primary results. This study randomised HIV-negative gay and other men who have sex with men (MSM) to immediate TDF/FTC or deferred PrEP initiation for one year. McCormack and colleagues reported an 86% HIV relative risk reduction in a modified intention-to-treat analysis (17). Adherence was measured using pill counts and self-report, and was over 80% by both measures, with no differences between the placebo and active TDF/FTC arms. However, low adherence has contributed to a lack of efficacy in some clinical trials, and, coupled with high rates of PrEP discontinuations observed in clinical practice, have led to an underestimation of the public health impact of PrEP (18).

The effectiveness of PrEP is tightly linked to adherence, which requires retention in care (19). Despite the growing adoption of PrEP in clinical practice, there are limited data on retention in care among individuals taking PrEP (16). Although several studies have now described initial PrEP outcomes in real-world settings, these studies still focus on specialised clinical programs and may not reflect a broad cross-section of individuals at risk of HIV acquisition (18). Successful PrEP implementation requires an understanding of factors that influence retention in care across heterogeneous real-world settings, particularly among historically underserved populations (16). Visit constancy, a widely used retention measurement in HIV care research, may be a better approach for accounting for spacing between visits. It is more suitable for long-term observation periods and can provide the aggregated individual-level patterns to reflect the overall retention structure (20). The primary goal of this study is to identify factors

that impact retention in PrEP care and measure the retention rate of clients in PrEP care.

1.3 Statement of the problem

Pre-Exposure Prophylaxis is a highly protective HIV prevention strategy, yet non-adherence can significantly reduce its effectiveness (20). Current reports from clinic-based PrEP registers or documents give the impression that current clients who are initiated on PrEP have poor retention in care. PrEP registers at Odibo Health Centre, Hamukoto Wakapa Clinic, and Engela District Hospital indicate that 400 clients were initiated on PrEP between January and December 2019, of which 26 (24%) clients were lost to follow up one month after PrEP initiation. This may have increased their chances of contracting HIV. Despite the importance of retention in PrEP care to reduce HIV acquisition, little is currently understood about how demographic, social, and structural factors influence retention which threatens the public health impact of PrEP (21).

1.4 Purpose of the study

The purpose of the study was aimed to determine the factors influencing the retention rate of clients receiving PrEP in Engela district, Namibia.

1.5 Research questions

- What is the retention rate of clients on PrEP in the Engela district three months after initiation?
- Which socio-demographic factors affect the retention in care of clients on PrEP in the Engela District?
- What structural factors affect the retention in care of clients on PrEP in the Engela District?
- What factors and strategies can be used to improve retention of clients on PrEP in the Engela District?

1.6 Study objectives

The study objectives were:

- To determine the retention rate of clients on PrEP in the Engela district three months after initiation.

- To identify socio-demographic factors that affect retention in care of clients on PrEP in the Engela District.
- To describe structural factors affecting retention in care of clients on PrEP in the Engela District.
- To determine factors and strategies to improve retention of clients on PrEP in the Engela District.

1.7 Significance of the study

Retaining clients on PrEP can help reduce the number of people getting infected with HIV in Namibia. Therefore, studying factors influencing the retention of clients receiving PrEP in the Engela district of Namibia will help provide relevant findings to stakeholders in healthcare services and the Ministry of Health and Social Services (MoHSS) on how to retain clients on PrEP. If factors associated with retention to PrEP care are identified, they can be addressed to improve retention of clients on PrEP care, thereby reducing the HIV infection rate in Namibia.

1.8 Limitations of the study

In this respect, a limitation is an 'imposed' restriction which is therefore essentially out of the researcher's control (22). The research study was limited by a small sample size, as only a few healthcare facilities offering PrEP in Engela District were part of the study. Engela District has 27 healthcare facilities, and only ten offer PrEP. In addition, only one district was used in this study. Therefore, it was not possible to generalize the results of the study to other districts in the country. Other limitations included recall bias and inherent biases with self-reported information. Furthermore, because the study was a cross-sectional study, it could not make causal inferences.

1.9 Delimitation of the study

This study was limited only to clients who were receiving PrEP in Engela District at selected public healthcare facilities who were initiated on PrEP between January and December 2019.

1.10 Chapter summary

The HIV incidence remains high among African countries, including Namibia. Several strategies are therefore required to reduce the transmission of HIV. Pre-exposure prophylaxis is effective in preventing HIV transmission. However, its effectiveness is affected by adherence and retention in care. The retention rate in PrEP care is low

globally, including in Namibia. It is, therefore, important that factors that influence retention in PrEP care are identified so that strategies can be implemented to improve this retention, which will in turn lead to improved effectiveness. Chapter One gave a brief introduction to the study topic, the background of the study, a discussion on the significance of the study, the aims and objectives of the study, limitation, and delimitations of the study. The next chapter contains analysis of the relevant literature about the topic.

Chapter Two: Literature Review

2.1 Introduction

A literature review gives the reader more information about what was already published before a specific study on the topic of interest. It also helps the researcher when it comes to discussing the findings. By conducting a literature review, the researcher identifies the research problem and refines the research question (23).

This Chapter provides relevant background information required for contextualizing the research questions and the case of interest in this study. The chapter further reviews the literature on the prevention of HIV, including Pre-exposure prophylaxis (PrEP). The chapter also contains a review of the current administration of PrEP and the gaps, challenges, and strategies regarding retention in PrEP care.

2.2 HIV Prevention Methods

Globally, the rapid scale-up of combination ART to more than 19 million people with HIV has resulted in substantial population-level reductions in HIV-related mortality and incident HIV infections (24). The scale-up of ART remains a key global priority in response to the ambitious but achievable targets of diagnosing 95% of all PLHIV, initiating 95% of all diagnosed people on ART, and achieving virologic suppression for 95% of people on ART by 2030 (24).

Effective combination HIV prevention programming uses reciprocally reinforcing interventions to address the risks of transmission and acquisition. No single intervention is effective enough to achieve HIV epidemic control (25). However, sets of interventions implemented with quality and to scale can substantially reduce HIV incidence. It is necessary for interventions to be evidence-based and grounded in human-rights based and gender-sensitive approaches, and to combine behavioral, biomedical, and structural interventions to address both immediate risk of transmission and acquisition, but also underlying causes of vulnerability. Effective HIV prevention encompasses tailoring programs to the national and subnational epidemic context and delivering programs with intensity, quality, and to the scale necessary to achieve epidemic control (4). Biomedical interventions for the prevention of HIV transmission include prevention of mother-to-child transmission (PMTCT) to prevent vertical transmission of HIV from infected mothers to their infants during either labor and delivery or breastfeeding, male and female condoms, and voluntary medical male

circumcision, which is the surgical removal of the foreskin from the penis by trained medical personnel under aseptic conditions (26). Behavioral interventions for the prevention of HIV transmission include abstinence, delay of sexual debut, monogamy, fidelity, and partner reduction. Structural interventions include support for legal and policy reforms on sexual offenses, reducing stigma and discrimination against PLWH and marginalized groups, and educating young women (26).

The first widespread use of antiretroviral drugs for prevention started in the 1990s with antiretroviral prophylaxis to prevent mother-to-child transmission of HIV (27). Research shows that when used in mother-to-child transmission, antiretroviral prophylaxis has three effects which are reducing the infectiousness of mothers by lowering the infected mother's viral load, providing PrEP to the infant, and providing postexposure prophylaxis (PEP) to the infant after birth (28). The United States of America (USA) Public Health Service has recommended PEP usage following occupational HIV exposure since 1996. When a person suspects that he or she has been exposed to HIV, there is a chance that the infection can be prevented from entering the body's cells through PEP use (29).

According to the Centers for Disease Control and Prevention (CDC), there have been around 38,000 newly diagnosed people per year between 2014 and 2018 globally, and as of 2018, about 1.2 million people were living with HIV. While overall incidence went down slightly over this period, some groups experienced increases in new HIV diagnoses. Since treatment alone cannot stop the HIV epidemic, prevention has been identified as a key piece of any strategy to end the epidemic. However, prevention is most efficient when targeted to those at greatest risk (6). HIV prevention has evolved from classical HIV prevention (that is, condoms) to a bio-medicalized approach that includes PrEP. Individuals must be more open-minded when new preventative strategies are available, to proceed to more breakthrough methods to protect the general public's public health. HIV prevention initiatives have used a standard disease preventive method, and prevention program leadership and administration have been deemed inadequate (30).

Post-exposure prophylaxis is an ART medication that is taken once or twice a day for approximately 28 days to prevent seroconversion. It is a combination of two HIV medications (TDT and FTC) that is only for emergency use in cases of possible HIV

exposure or infection (31). According to the CDC, taking PEP within 72 hours of a possible HIV encounter significantly reduces the risk of HIV infection. According to the CDC, even though PEP is not 100% effective, it is still the best way to prevent HIV infection when there is a risk of infection. PEP was first utilized after prenatal and occupational HIV exposures, and the results motivated researchers to investigate whether PEP would be useful for HIV exposures caused by sexual activity or injectable drug use (9).

Even though PrEP is new, it was noted that a shift away from the conventional method of leadership and activism is unavoidable, and some activists are still claiming that the condom is the only HIV prophylaxis that should be considered (32). Advocating for constructive social change necessitates leadership and stakeholder education and training. HIV prevention strategies, such as having conversations with patients and their sexual partners about HIV status and increased educational initiatives, could considerably reduce HIV infection (13).

2.3 Pre-Exposure prophylaxis

PrEP stands for pre-exposure prophylaxis, which means it prevents the HIV virus from infecting someone. PrEP is the use of ARVs by HIV uninfected persons to prevent he acquisition of HIV (17). Several clinical trials have demonstrated the efficacy of PrEP as high as 90% in population groups at high risk of disease acquisition (31). Global and Namibian ARV-based Prevention and Treatment guidelines now recommend PrEP as an additional prevention choice for people at substantial risk of HIV infection as part of a combination prevention approach. In Namibia, the MoHSS began the introduction of new and innovative ARV-based prevention methods by revising the National ART Guidelines to include the delivery of oral PrEP to populations at substantial risk (4).

PrEP requires diagnosing those who acquire the HIV virus early so that prompt and proper treatment can begin, thereby reducing the virus's impact (33). PrEP has been demonstrated to be highly efficient in preventing infection with HIV in those who engage in risky sexual practices. PrEP has shown promise as a safe and effective HIV prevention therapy, but data on public knowledge and use, as well as among primary care providers, is sparse. The PrEP action mechanism is like that of malaria prevention. ARVs of high levels in the bloodstream can form a protective barrier against HIV

when PrEP is taken. Consequently, the virus is stopped from entering the cells and replicating by the ARVs at the point of transmission, thus the person remains HIV negative (33). The iPrEx study, the first randomized controlled trial that proved that PrEP is beneficial in reducing HIV infection risk, was done in November 2014. The effectiveness of PrEP was bolstered by preliminary findings from two continuing PrEP studies in Europe, PROUD and IPERGAY, which revealed growing evidence for PrEP's effectiveness in providing HIV protection (34).

The iPrEx study which started in 2007, was the first to offer PrEP, which was provided to 2,500 men who have sex with men at 11 sites in six countries on four continents (Brazil, Ecuador, Peru, South Africa, Thailand, and the USA). It found that the HIV infection rate in HIV-negative gay men who were given PrEP was reduced by 44%, compared with men taking a placebo. Crucially, among those who took PrEP seven-days-a-week as prescribed, the risk of infection was reduced by 99% (34) . Similarly, the IPERGAY study, which offered oral PrEP at six hospitals in France and Canada, reported an 86% reduction in the HIV infection rate compared to those taking a placebo (16). The Partners PrEP trial recruited around 4,750 heterosexual couples in which one partner was living with HIV across Kenya and Uganda. The risk of HIV infection was reduced by 62% among those who took oral tenofovir and 73% among those who received Truvada (9).

Three further studies were published in 2012, the Partner's PrEP study, Preexposure Prophylaxis Trial for HIV Prevention among African Women (FEM-PREP), and TDF2. The Partner's PrEP study randomised 4747 sero-discordant heterosexual couples in Kenya and Uganda to TDF, TDF-FTC or placebo. They showed the efficacy of PrEP in preventing HIV, with 67% and 75% reduction for TDF and TDF-FTC compared to placebo, respectively. The TDF2 study in Botswana randomized 1219 men and women to TDF-FTC or placebo and demonstrated a 62% reduction in HIV infections (9). The FEM-PrEP trial aimed to estimate the efficacy of PrEP in heterosexual women. About two thousand women in Kenya, South Africa, and Tanzania were randomised to daily TDF-FTC versus placebo. However, due to low adherence in this population, the study failed to show efficacy. Based on the results of the iPrEx and Partner's PrEP studies, the USA Food and Drug Administration (FDA) approved daily oral TDF-FTC for use in individuals who are at high risk of acquiring HIV in July 2012 (35).

The Bangkok tenofovir study, published in 2013, randomised 2413 injection drug users to receive either TDF or placebo, resulting in a 48.9% reduction in HIV incidence among the participants (40). In 2015, Vaginal and Oral Interventions to Control the Epidemic (VOICE), IPERGAY, and PROUD results were published. VOICE targeted heterosexual women in Africa (South Africa, Uganda, and Zimbabwe) and randomised participants to receive one of five regimens. The five regimens were oral TDF, oral TDF-FTC, oral placebo, vaginal tenofovir (TFV) gel, and vaginal placebo gel (36). The results of this trial failed to demonstrate the efficacy of TDF-FTC due to low adherence. These results conflicted with the Partner's PrEP study which showed a 75% efficacy compared to placebo, and a higher level of adherence (36).

The PROUD and IPERGAY trials, both in MSM, were conducted in the UK and France (and Canada) respectively, and both reported 86% effectiveness (34). IPERGAY assessed the use of an on-demand regimen, rather than daily. Participants in IPERGAY were randomised to receive TDF-FTC or placebo and were encouraged to take two pills in the 2-24 hours before sex, one pill 24 hours after the first dose, and the fourth 24 hours later. For both PROUD and IPERGAY, the deferred arm within PROUD, and the placebo arm in IPERGAY, were closed early (and offered PrEP) as a result of the high efficacy of PrEP and the high HIV risk in those not receiving PrEP (36).

The safety and effectiveness of PrEP using the antiretroviral combination TDF/FTC for the prevention of HIV have been demonstrated in clinical trials, open-label studies, and demonstration projects (6). However, low adherence contributed to a lack of efficacy in some clinical trials and, coupled with high rates of PrEP discontinuations observed in clinical practice, this results in an underestimation of the public health impact of PrEP. Furthermore, youth are the least likely to initiate PrEP and discontinuation rates are high (37). Contrary to low adherence reported in early clinical trials, high adherence to PrEP among a sample of patients retained in care was reported in a recent study. PrEP patients who are successfully retained in care and who attend follow-up appointments are likely to be adherent to this treatment. Future research and interventions should therefore consider retention in PrEP care as a target for improvement (38).

2.4 PrEP administration in Namibia

Human Immunodeficiency Virus (HIV) and AIDS have affected Namibia in the same way that they have impacted many other southern African countries. As a largely semi-desert coastal country with a population of 2.4 million and an HIV prevalence rate of 12.6% in 2018, Namibia not only needs to understand its local epidemic but to address the public health issues associated with it. This is because the HIV prevalence in Namibia is among the highest in the world (39). Namibia is a sparsely populated country of 2.4 million people with an area of 825,615 km². The population is concentrated in small urban areas scattered throughout the country, particularly in the north near the border with Angola (40). The 2018 NAMPHIA results indicated that an estimated 176 000 people were living with HIV in Namibia (4).

There are numerous criteria that need to be met if an individual is to qualify for HIV PrEP. These include:

- Any HIV-negative person with sexual partners who are HIV positive with a viral load higher than 40 copies/ml,
- All HIV-negative people in mixed-status relationships where one partner is infected with HIV and the other one is not, regardless of the viral load of the partner who wants to conceive,
- The HIV status of the partners is unknown,
- Recent or frequent STIs,
- Multiple or concurrent sexual partners,
- The partner has a history of not using condoms on a regular basis,
- Frequent PEP users and a history of sexual intercourse while under the influence of alcohol or recreational drugs (4).

It is essential that protective precautions such as abstaining from sex or using condoms are adhered to during the first 20 days of daily dosing because it takes HIV PrEP up to 20 days to reach its maximum protection in blood, 7days in rectal tissues, and 20 days in vaginal tissues (4). In addition, the medication should be continued for 28 days after the last potential HIV exposure in those wishing to stop taking it (41).

The PrEP package of services is provided as part of the "combination prevention" package, which includes HIV testing services, the provision of male and female

condoms, lubricants, ART for HIV-positive sero-discordant couples, Voluntary Medical Male Circumcision (VMMC), and STI prevention (4).

At the initiation of PrEP, patients are provided a one-month supply of drugs after an HIV test that is negative has been done. According to PrEP guidelines in Namibia, during the first visit for PrEP initiation, a patient should be tested for HIV and taken blood for testing creatinine clearance, hepatitis B surface antigen (HBsAg), and syphilis (Rapid Plasma Reagin). One month after initiation, a repeat HIV test is done, and patients are provided with a three-month supply of drugs. Thereafter, patients are seen every three months where a repeat HIV test is done, and they are provided with a three-month supply of drugs. Creatinine clearance is tested every six months (4). Other HIV prevention methods should be discussed and provided at all visits. Users should be advised that a negative HIV test is required before PrEP drugs can be prescribed at initiation and with every prescription refill, as well as when restarting after discontinuation (42). It should be made clear that PrEP is not a treatment for HIV, despite using the same medicines, and therefore it should not be shared with people who have not tested HIV negative (43). After clients have initiated PrEP, the core focus of the service provider should be to support retention and maintain adherence among those using PrEP. For populations at substantial risk, there are important considerations that can affect their ability to be retained (44).

2.5 Implementation of PrEP programs

Implementation science can assist bridge the gap between research and practice, and many researchers have advocated for the use of an implementation science paradigm to increase the efficiency and effectiveness of HIV programs. The significance of implementation science globally and in Namibia extends beyond improving program effectiveness to explain what worked, why, and under what circumstances. Concerning the application of implementation science to PrEP, a recent program announcement for PrEP demonstration projects acknowledged that implementation science can be used to improve understanding of real-world approaches that increase PrEP provision and subsequent use among MSM and transgender people who are at high risk of HIV infection (45). Implementation science explores how the implementation process, implementation fidelity and adaptation, contextual variables, and intervention characteristics serve as barriers and facilitators to intervention implementation (46).

Many advocates support a well-planned strategy to implement interventions. However, some prefer a linear, sequential process while others favor a more iterative process. Whatever approach is used, most implementation initiatives begin with identifying an issue or need inside an organization and end with monitoring and assessment (45). Implementation fidelity is the amount to which an intervention was delivered as planned, whereas adaptation is the alteration of an intervention or its delivery throughout implementation. There is a long history of tension between the need to implement programs as intended and delivered in efficacy and effectiveness trials and the need to make local changes to fit the program to local conditions (46).

Although it is acknowledged that a high degree of fidelity is required to maintain the efficacy of an established intervention, adaptation is frequently required when the implementation protocol is not aligned with the needs of participants or the setting. It is frequently the case that features of the current participants like language, race, and class; intervention delivery staff; and contexts change from those used before to determine the efficacy of the intervention. In such cases, changes to the intervention's content or means of delivery are required. However, maladaptation, a situation in which modifications to the intervention content and/or delivery are made without rationale, is not supported (45).

To identify eligible individuals, implementation fidelity for PrEP screening and evaluating PrEP needs would imply strict adherence to the WHO guidelines. While some researchers have praised the guidelines for accurately identifying PrEP candidates, others have argued that many patients who would benefit from PrEP may be missed because the current guidelines do not consider some patients' more nuanced HIV risk factors. Thus, consideration of persons who do not match the existing recommendation requirements but are interested in PrEP may be warranted (47).

The successful deployment of PrEP in real-world situations necessitates anticipating and mitigating a plethora of obstacles. “When moving from study to real-world environments, the delivery of interventions in service delivery settings is quickly met with the complexities of culture, economics, behavior, gender, social circumstances, and political environment that must be adequately considered to optimize utilisation and continued engagement of services by clients” (48).

The "purview paradox" refers to the argument over the type of context in which PrEP should be implemented and the type of physician who should be prescribing PrEP (49). Lack of employees, low PrEP awareness among staff, cost concerns, and a lack of a PrEP protocol are barriers to PrEP implementation in healthcare facilities, whereas facilitators include the capacity to set policies and connect patients to local doctors. The key facilitator of PrEP implementation in primary care clinics is access to HIV-negative patients. Barriers to PrEP implementation in primary care clinics include insufficient PrEP understanding among staff and discomfort in assessing sexual risk (50). Limited access to and expertise in caring for HIV-negative patients are barriers to PrEP implementation in infectious disease clinics, while greater understanding of and support for PrEP among staff is the key facilitator (51). The greatest hurdle to PrEP implementation in family planning clinics is staff lacking PrEP expertise, whereas facilitators include access to women who may benefit from PrEP and patients' anticipation of receiving HIV prevention treatments. The primary hurdle to PrEP implementation in pharmacies is staff lacking PrEP knowledge, whereas facilitators include the ability to counsel patients about adherence and monitor adverse effects. It might be argued that PrEP should be used in a variety of settings and prescribed by a range of practitioners since the contextual qualities favored by one demographic may differ from those preferred by another (45).

The qualities of the intervention itself, such as its relative advantage over other alternative techniques, the complexity of its implementation, its cost, and its hazards, are critical to its effective implementation. In contrast to other HIV prevention strategies (for example, condoms), PrEP has been promoted as a user-controlled HIV prevention method that can be concealed and does not require the consent and participation of a sexual partner. However, physicians and researchers have voiced concerns about risk compensation, as well as increased sexual risk-taking behaviour because of greater HIV protection because of PrEP use. Potential MSM and transgender patients have expressed similar worries about the stigma associated with PrEP use (42).

The complexity of implementing an intervention is subjective, and it is frequently influenced by the ratio of implementation facilitators to barriers. As previously stated, both hurdles and facilitators to PrEP implementation have been observed in a range of situations. Staff who are knowledgeable about PrEP, comfortable assessing HIV risk,

and willing to prescribe PrEP are some of the facilitators of PrEP implementation; integration of PrEP with related services; and infrastructure that supports continuity of PrEP care are some of the facilitators of PrEP implementation. Staff who are less aware of PrEP, suspicious of its efficacy and safety in the real world, staff being less comfortable in estimating HIV risk, the time associated with PrEP screening and monitoring, and cost are frequently identified as barriers to PrEP implementation. To lessen the perceived complexity associated with PrEP adoption, facilitators must be enhanced while barriers, particularly expense and danger, which have also been highlighted as hurdles by patients, must be minimised.

2.6 Retention in PrEP care

The WHO defines retention rate as the number of PrEP users who continue the medication for three consecutive months after having initiated it. Retention is a critical metric but is also not so straight-forward as there is the question of whether it is retention with use of PrEP, or rather maintaining consistent retention in care. Arguably, the latter could pose a better metric provided individuals remain HIV-negative given that is the primary purpose of PrEP and engagement in prevention services in the larger picture (6).

Care retention can be measured through various methods, with the proportion attending follow-up visits or receiving medications favored as the metric of retention in prior PrEP studies. One method of measuring retention in care used in the HIV treatment literature, and recently examined in HIV prevention, is visit constancy, defined as visit attendance during regularly spaced intervals (52). A recent study examining retention within health clinics for lesbian, gay, bisexual, and transgender persons in Chicago found that PrEP users, even those who remained engaged with PrEP, had difficulty attending quarterly visits, with only 15% achieving perfect visit constancy over a year (that is, attending visits in all 4 quarters) (52).

Retention in care has been broadly used to describe whether patients are maintained in PrEP care. However, it is posited that measuring retention is a complex phenomenon. Building on the ‘prevention effective adherence’ concept, four distinct categories to characterize and measure retention in PrEP care were proposed. These include ‘indicated for PrEP and retained in PrEP care’, ‘indicated for PrEP and not retained in PrEP care’, ‘no longer indicated for PrEP’, and ‘lost to follow-up for PrEP care’.

Experiences in implementing PrEP programs suggest that individuals change their behaviours and sexual partnerships over time. Individuals who are attended to by friendly healthcare workers are more likely to be retained in PrEP care compared to those who are attended to by unfriendly staff (53). Some individuals may not need PrEP and are not lost to follow-up. Rather, they no longer meet the clinical criteria for taking PrEP. Capturing each of these retention-related outcomes is important for measuring progression through the PrEP continuum, both for individual patients and for population health metrics. Understanding how and why patients take up, adhere to, and are retained or disengaged from PrEP care is critical for developing effective PrEP interventions (16).

The efficacy of PrEP has been conclusively shown in clinical trials, such as the iPrEx, IPERGAY, and Partners PrEP, but reports from real-world implementation have only been available for around five years and largely focused on demonstration projects which are smaller scale and do not reflect the real-life world setting (34). A continuum outlines stages of engagement with PrEP and these are (a) awareness of PrEP, (b) PrEP access and uptake, (c) adherence to PrEP regimen, and (d) retention in PrEP care. Studies of the PrEP continuum in community settings around the United States reveal retention is a major challenge (54). High discontinuation rates were observed in patients receiving PrEP through community clinics in San Francisco and Chicago, where only 47% and 43%, respectively, were still retained in care within about a year after starting PrEP. Similarly, a study in Rhode Island, Mississippi, and Missouri found only 57% of PrEP clients were retained at 6 months (55).

The retention rate in Africa on PrEP was reported to be 63.1% in 2019 (46). Continuation status for many patients could not be ascertained due to being lost to follow-up. Although people in Sub-Saharan Africa increasingly know the benefits of PrEP, PrEP clients frequently discontinue the prophylaxis. More and better information may improve PrEP continuation in sub-Saharan Africa where HIV acquisition risk persists (56). Approximately 3 million individuals are thought to be eligible for PrEP globally but nearly all PrEP policies and demonstration projects have targeted, and been tailored to specific populations, thus excluding other high-risk individuals in the general population. Therefore, what is known about PrEP discontinuation is largely limited to men who have sex with men, female sex workers, sero-discordant couples, and high-risk women (57).

Preexposure prophylaxis (PrEP) is a highly efficacious intervention to prevent HIV, and demonstration projects and clinical cohorts in specialty clinics have demonstrated high retention. However, PrEP users in specialised settings may be more motivated and less diverse than the at-risk general population. For PrEP to help bend the curve of the HIV epidemic, primary care will need to keep individuals engaged with PrEP (52).

In the clinical setting, patients who are non-adherent are unlikely to be seeking prescription refills and may not be motivated to attend follow-up appointments. As a result, retention in care becomes a reliable indicator of adherence. Data suggest that retention in care, in conjunction with medication adherence, is a key component of successful PrEP implementation and should be a major focus of future intervention efforts (38). PrEP initiation and persistence in some cohorts exceed those in the routine clinical settings, hence the findings are likely optimistic of what could be expected in general medical care (58). The high number of discontinuations and re-initiation observed has important implications for PrEP programs (52). Retention in PrEP care is important for the prevention and early detection of HIV, safety monitoring, adherence and sexual behaviour counselling, and testing for other STIs (59). Despite its importance, long-term retention rates and characteristics of those who are not retained are understudied in real-life settings (57).

Other factors associated with reduced retention in PrEP care include language barriers between healthcare workers and their PrEP patients, healthcare facilities that have fixed working hours, shortage of PrEP drugs at healthcare facilities, shortage of healthcare workers, a lot of follow-up visits for PrEP care, and lack of supportive family members and/or partners for PrEP patients (60,61).

2.7 Adherence to PrEP drugs

Adherence is critically important to the success of any PrEP study, and previous studies have employed a variety of strategies to optimize and measure adherence. Unfortunately, none of the adherence measures employed are optimal, and all have been investigated retrospectively. Adherence to oral PrEP varies greatly between trials and study populations. Adherence was consistently high when measured via self-report, pill count, and electronic methods, but generally lower when assessed via plasma drug concentrations of TDF and/or FTC. Furthermore, detectable plasma TDF

rates are frequently reported although the lower limit of plasma drug detection corresponds to fewer than two pills per week, which is very poor adherence, making interpretation challenging (62).

Adherence has emerged as a critical factor for efficacy, with two major studies in African women demonstrating a failure of the intervention to prevent HIV acquisition, due in large part to low adherence (34). Importantly, sub-optimal adherence may also lead to the development of drug resistance which has the potential to impact subsequent treatment outcomes (38). One key limitation of measuring adherence to PrEP is that there is no gold standard measure available for comparison. Not only are there several different strategies to measure adherence, but the same measure is not necessarily comparable across studies or contexts due to subtle differences such as varying reporting periods. Broadly speaking, adherence measures can be divided into objective and subjective measures, which are typically further categorized into biological measures, self-reported, or other adherence estimates (63).

Adherence has been portrayed as the Achilles' heel of PrEP use. Low rates of adherence in early RCTs resulted in only moderate efficacy estimates of PrEP, increasing the time taken for regulatory approvals and creating uncertainties about the effectiveness of PrEP among key stakeholders and populations (15). Adherence is one of the great challenges of effective PrEP implementation, particularly among young MSM and transgender women. As PrEP moves from clinical trials into routine practice, adherence will determine how effective this therapy is at preventing HIV (64). PrEP is not meant to be a lifelong requirement, but high adherence is needed during periods of use when an individual is at risk of HIV (65). This confirms the importance of adherence as a major tool to be deployed in PrEP. The FEM-PrEP trial which was halted for futility, reported adherence by self-report and pill count as high, but plasma drug concentrations showed that only 15–26% of samples from HIV sero-converters had detectable concentrations of serum TDF and only 26–38% of non-seroconverting controls. This low level of adherence was recorded as 37% by the researchers and this may have resulted in the inability to assess the protective effect of Truvada in FEM-PrEP trial (66). This again points to the importance of ensuring adherence to PrEP management (31).

2.8 Factors that affect adherence and retention to PrEP

Education and knowledge can provide a basis for decision-making. The level of education of an individual is important as it may influence the individual's understanding of a certain concept and its impact on the health state. Lack of education in Sub-Saharan Africa may be a contributor to the increased number of HIV infections. Because the women lack knowledge about PrEP and other prevention strategies, they are at a greater risk of HIV acquisition (65).

One great hurdle impacting the uptake of PrEP is the stigma associated with the medicine and the person taking it. Firstly, the person taking it might be misperceived as HIV-positive by their partners (67). Fear and stigma are common feelings for individuals recently diagnosed with HIV infection (33). Persons living with HIV infection and their uninfected partners are often vulnerable to racial, social, and economic disparities and can experience fear and stigma and therefore have difficulty remaining in care. Though the clearly described relationship between retention in care and survival is partly mediated by adherence to effective antiretroviral therapy, patients who do not remain in care also cannot receive treatment for medical and psychiatric comorbid conditions or benefit from the careful clinical monitoring necessary when taking antiretroviral therapy. Individuals with poor retention in care due to stigma or fear or other factors have been shown to have higher HIV infection rates compared to those who are retained in care (59).

PrEP stigma is associated with perceptions of promiscuity, as many people associate PrEP use with risky sexual behaviours, as PrEP has often been associated with gay men. A qualitative investigation of PrEP trials has elicited both social and self-stigmatisation as instrumental challenges for participant adherence. Interviews with participants from the failed VOICE trial found that it was important for women from South Africa, Zimbabwe and Uganda to be perceived as healthy by the community (24). Taking medication associated with being HIV-positive did not align with their narrative of health through self-stigmatisation, which may have detrimentally affected adherence. Furthermore, participants were understandably concerned that community misunderstanding regarding PrEP could cause friends and family to believe that they were HIV-positive (6). Some participants resorted to hiding the medication and pill bottles. However, the conspicuous physical characteristics of the tablets were hard to

explain. In the most severe cases, participants experienced extreme reactions from their close family, even resulting in a spouse or partner separation (62).

Participants reported several side effects when using PrEP including diarrhoea, abdominal problems (gas or cramping), vomiting or nausea, headache, sleeplessness, joint pain, weight loss, dizziness, loss of taste, change in appetite, increase in body temperature, sweating, and decrease in sexual stamina. Many side effects abated over time and participants expressed greater tolerance after the first initial weeks of discomfort and after consultations with study counselors (68). Most participants reported no side effects or clinical challenges associated with PrEP use (16).

According to a study on maternal PrEP use in HIV uninfected pregnant women in South Africa on the role of stigma in PrEP initiation, retention, and adherence, strong relationships between stigma and PrEP care initiation at baseline and PrEP care retention at three months in a cohort of pregnant and postpartum women were identified. Associations between limited knowledge of partner serostatus and PrEP retention, and between both STI at baseline and gestational age at baseline and PrEP adherence, controlling for PrEP stigma, were also identified (27).

The expense of PrEP and accompanying treatment can be a significant barrier to availability. Most studies conclude that PrEP is cost-effective when targeted to high-risk individuals who are also highly adherent. The annual per-person cost for PrEP exceeds $10,000, not including associated clinical care. Although PrEP is covered by private insurance in the USA, co-payments, and deductibles may be prohibitively costly. Furthermore, many of the people most in need of PrEP have a lower likelihood of having appropriate or any insurance coverage (51).

While transport and the expenses associated with travelling long distances featured in responses prominently, participants mentioned that PrEP could only be accessed during clinic opening hours, which coincided with participants' own working days and hours. Participants are mostly restricted by financial barriers because of the monetary and time costs of travel to clinics, rather than the cost of PrEP, as PrEP is free at point-of-care (57). Factors such as cost, assistance with the medical visit and medication payments affect patients' experiences of taking PrEP. While many patients initially perceived the high cost of PrEP as a potential barrier to use, these barriers were overcome by the industry-sponsored medication assistance programs, which pay for

PrEP for uninsured patients and provide assistance with medication co-payments for insured individuals (16).

2.9 Association between socio-demographic characteristics of individuals and retention in PrEP care

Given challenges with early discontinuations in transgender women, an intensive, tailored time-limited intervention, such as PrEP case management or a mobile health intervention, could be considered proximate to PrEP initiation (57). Youth are more likely to discontinue PrEP late but also less likely to contact the primary care system during gaps. Mobile health interventions permitting two-way communication are highly acceptable and may be particularly effective at improving PrEP adherence in youth. Persons who use drugs are also more likely to discontinue late (52).

Studies conducted in the United States of America concluded that participants in a relationship were less likely to be retained in PrEP care compared to those who were single. This was attributed to fear of being stigmatised or being labelled unfaithful (69). Adherence is the biggest obstacle faced by the patients when taking PrEP. All the stigmas mentioned above are catalysts to obstacles to adherence to PrEP. For example, the PrEP user would find it hard to take a pill daily if they are scared of their partner mistaking them for being HIV-positive (70). The stigma of being labelled as someone having high risk-taking behaviours, and being called “Truvada whore”, especially amongst young adults and gay men, has a negative impact on adherence and retention in PrEP care. Lower drug adherence was found in Black and mixed-race men. The stigma of being branded homosexual can also impact adherence and retention in PrEP care. Older people were also more likely to be retained in PrEP care compared to those who were younger (33). In addition, a study done in the Democratic Republic of Congo revealed that individuals who were working were more likely to be retained in PrEP care compared to those who were not working (71). Furthermore, the same study revealed that education and sex were not associated with PrEP care (71).

2.10 Strategies and factors to improve retention to PrEP care

2.10.1 Provider support for adherence.

Regular adherence assessments by the provider, including nonjudgmental discussion of adherence difficulties, are important for identifying adherence barriers and providing additional counselling or other supports to improve adherence. Patients with

intermittent adherence will require more intense adherence counselling in order to develop the consistent adherence necessary to successfully use PrEP as a prevention strategy, which might not be possible if there is a staff shortage (48).

2.10.2 Social support and individual factors

Social support is strongly associated with better adherence. Patients in HIV-discordant relationships may not have support from their partners. Others may be living in households where family members or roommates do not know they are taking PrEP. Providers should review disclosure issues with their patients to identify who potentially could provide adherence support. Other agencies or community-based organisations may be able to provide additional counselling or resources as needed to improve adherence (15). Receiving education on PrEP is associated with improved knowledge of PrEP, which can lead to increased retention in PrEP care. Individuals with multiple sexual partners are more likely to be retained in PrEP care compared to those with single partners since they know that they are at an increased risk of contracting HIV. In addition, individuals who do not know their partners' status, who know that their partners are HIV-positive but not on treatment, or are on treatment but have detectable viral loads, are more likely to be retained in PrEP care for fear of contracting HIV (72).

2.11 Chapter Summary

The success of any health strategy can only occur if PrEP providers acknowledge the prevailing attitudes and beliefs that may affect ongoing engagement and retention in PrEP care such as understanding medication effectiveness and side effects, mistrust of healthcare providers, and stigma. This chapter presented a discussion on the national and local HIV/AIDS epidemics, as well as global HIV prevention strategies. It went on to present the studies that established PrEP's efficacy and effectiveness, as well as disparities along the PrEP continuum. Furthermore, the chapter discussed the application of implementation science to the current study, factors that affect PrEP adherence and retention in care, and strategies that can be used to improve PrEP adherence and retention in care. This literature review revealed that factors that influence retention in PrEP care are poorly understood. It was, therefore, the aim of this study to close this knowledge gap. Chapter Three will describe the research methodology that was used to answer the research questions posed in Chapter One.

Chapter Three: Research Methodology

3.1 Introduction

Chapter Two gave a review of the literature on the topic of retention in PrEP care. The purpose of this chapter is to give a detailed description of the research methodology of the study. This includes a description of the study design, the study population, determination of the sample size, selection of the sample, and the data collection instrument used. Data analysis and ethical considerations are also discussed in this chapter.

3.2 Study design

A research design is a framework used to collect and analyse data on variables specified in a certain research problem. A quantitative analytical cross-sectional study design was chosen for this study. This is because the design allowed for the assessment of associations between retention in PrEP care and the socio-demographic characteristics of the participants.

3.3 Study setting

A study site or setting is a physical, social, or cultural environment where a researcher conducts a study. The study settings for this study were selected public healthcare facilities in Engela District which provide PrEP. Engela district is one of the districts in the Ohangwena region of Namibia. It has a population of about 25 000 people. The population is served by ten public healthcare facilities. The study was conducted at three public healthcare facilities in Engela district namely Engela District Hospital, Odibo Health Centre, and Hamukoto Wakapa clinic. In total, the three healthcare facilities attend to 300 patients requiring PrEP per month.

3.4 Study population

A population is the number of individuals a researcher intends to study and draw conclusions on (73). The population for the study comprised all clients who were initiated on PrEP in Engela district selected healthcare facilities, namely, Engela District Hospital, Odibo Health Centre, Hamukoto Wakapa clinic between January and December of 2019. The selection of facilities was based on the high cumulative number of clients (>50 clients) initiated on PrEP before January 2019 with clear documentation records of the clients on PrEP. Odibo Health Centre had 180 patients,

Engela District Hospital had 160, while Hamukoto Wakapa clinic had 60 patients initiated on PrEP between January and December of 2019.

3.5 Sample size determination

3.5.1 Sample size

Sample size is the number of participants required for a study. A sample should be representative of the target population (74). For this study, Yamane's formula for sample size calculation $n = \frac{\mathrm{N}}{1+\alpha^2 N}$ was used to determine the sample size. In this formula, n is the anticipated sample size, N is the population size, and alpha is the level of significance (75). In this current study, N=400 and Alpha is 0.05, and therefore the sample size n=250, and 10% of the non-responders from the sample size are +/- 25 people.

3.5.2 Inclusion criteria

Eligible participants included in this study were patients above 18 years of age who were initiated on PrEP at the selected healthcare facilities between January and December of 2019 and were reachable through telephones or cell phones.

3.5.3 Exclusion criteria

Patients on PrEP below the age of 18 years and without contact details in the registers were excluded from the study.

3.6 Sampling method

Sampling is the process of selecting a subset of the population of interest in a research study (75). Sampling reduces the costs and time required to conduct a study. Sampling methods can be divided into probability and non-probability methods. In probability sampling, each element in a sampling frame has a known chance of selection into the sample while in non-probability sampling the chance is not known. Probability sampling methods include simple random, systematic, cluster, and stratified random sampling. Non-probability sampling methods include quota, convenience, purposive, and snowball sampling (75).

A proportional stratified random sampling method was used to select participants for the study. The method was chosen because the target population contained a group of patients who could be grouped according to the healthcare facility, they used to collect PrEP. Stratifying the population by healthcare facility made the sample more

representative of the target population. After stratifying the target population by the healthcare facility, simple random sampling was implemented for each stratum through the use of Microsoft excel. The names of all the 180 patients initiated on PrEP at Odibo Health Centre, 160 at Engela District Hospital, and 60 at Hamukoto Wakapa clinic who met the inclusion criteria were entered into Microsoft excel separately, and a random number was created for each name. The random numbers were arranged from smallest to biggest and the first 124 patients initiated on PrEP at Odibo Health Centre, 110 at Engela District Hospital, and 41 at Hamukoto Wakapa clinic on the list were chosen as potential respondents. Two hundred and seventy-five participants were chosen to ensure that the total of 250 participants required for the study would be met after accommodating those who refused to participate.

3.7 Data collection instrument

Questionnaires are one of the data collection methods commonly used in quantitative research. A self-administered questionnaire with closed-ended questions was used in this study. The questionnaire was designed by the researcher after consulting about literature on retention in PrEP care. It was available in both English and Oshikwanyama, a local language spoken by the majority of the people in the Engela District. The questionnaire consisted of different sections and the sections had questions on the socio-demographic profile of the participants, questions on adherence to PrEP, statements on structural factors that influence retention on PrEP, and statements on strategies and factors that may improve retention on PrEP. A Self-administered questionnaire allowed the researcher to collect the required data faster and at a cheaper cost. The questionnaire was divided into four sections namely, Section A, B, C, and D. See Appendix 3 for the English version of the questionnaire and Appendix 4 for the Oshikwanyama version. The sections are described below.

Section A: Socio-demographic characteristics

This section contained 5 questions, which include questions 1 to 5. The questions aimed to determine the socio-demographic characteristics of the participants and focused on the sex, age, educational status, relationship status, and employment status of the participants.

Section B: Adherence to PrEP

This section contained 2 questions, which include questions 6 and 7. The questions aimed to determine whether the patients were still on PrEP three months after initiation, and how adherent they were to PrEP.

Section C: Structural factors that influence retention on PrEP

This section contained 10 statements, which include statements 8 to 17. The statements aimed to determine structural factors participants thought influenced their retention on PrEP.

Section D: Strategies and factors that may improve retention on PrEP

This section contained 10 statements, which include statements 18 to 27. The statements aimed to determine strategies and factors that can be used to improve the retention of participants on PrEP.

3.8 Pilot study

A pilot study is usually conducted before the main study (76). It is the first step of the whole research and is used to test the feasibility of the main study (76). The pilot study for this research was conducted at Okatope clinic. Twenty-three participants took place in the pilot study. This is because, according to Cocks and Torgerson (2013), a pilot study should have a minimum of 9% of the sample size of the main study (76).

The pilot study was used to determine the reliability and validity of the questionnaire for the study. In addition, the pilot study was used to determine how the participants perceived the clarity of the questions. In addition, the pilot study was also used to determine if the time allocated for questionnaire completion was enough. The pilot study findings showed that the thirty minutes allocated for the questionnaire was sufficient and that all the questions in the questionnaire were clear.

3.9 Measures to ensure reliability and validity of questionnaire

Reliability of a questionnaire is the extent to which a questionnaire can produce the same results when administered to the same respondents under similar conditions (76). Internal consistency, stability, and equivalence are aspects of the reliability of a data collection instrument. Stability measures the replicability of results from a questionnaire, and a test-retest method is used for its determination. Internal consistency determines if different parts of an instrument measure the same construct. Internal consistency is only relevant for questionnaires that have items that are interconnected. Equivalence measures the extent of similarity in results obtained by

two observers studying a single phenomenon at the same time (76). The reliability of the questionnaire in this study was determined by administering it to the same participants on 2 different occasions and then comparing the responses. The Pearson's correlation coefficient for the two sets of responses was 0.83. The questionnaire was deemed reliable since a reliable questionnaire should have a coefficient which is between 0.80 and 0.90.

Validity refers to the extent to which an instrument measures what it is meant to measure. Validity can be divided into content, face, criterion, and construct validity (77). Face validity is whether a data collection tool looks like it is measuring what it is supposed to measure and it is very subjective. A data collection tool is said to have face validity if its content simply looks relevant to the individual completing it (77). The face validity of the questionnaire was measured during the pilot study. The pilot study participants commented on the readability, formatting, and clarity of the questions and language used in the questionnaire. The participants confirmed the questionnaire had face validity as they said that the questions were relevant to the topic.

Content validity is the extent to which an instrument's items adequately capture what is expected to be measured and it can be measured using a judgemental or a quantitative approach. A judgemental approach involves carrying out a literature review on the subject and consulting experts in the field. A quantitative approach involves requesting experts to score the questionnaire and coming up with an average score (77). A judgemental approach was used in this study to determine the content validity of the questionnaire. Literature review on retention on PrEP and consulting experts was performed. The researcher identified the important aspects of PrEP retention research from literature review. The consulted experts confirmed the content validity of the questionnaire.

3.10 Data collection process

A self-administered questionnaire was distributed to 250 participants at the selected three healthcare facilities in Engela District. Eligible participants were provided with information about the study purpose and their rights during the study. The researcher and the translator explained the study details to the potential participants and responded to their questions. Each potential participant had the study explained to

him/her by the researcher and the translator in an office provided at each healthcare facility for the study. Potential participants who agreed to take part in the study were requested to sign the informed consent and were then given a hard copy of the questionnaire to complete. The participants were allocated thirty minutes to complete the questionnaire. The participants were requested to indicate their responses using a cross (x). The completed questionnaires were handed over to the researcher at the end of the data collection period.

3.11 Data analysis

Data analysis involves using data to tell a story and interpreting the data to derive understanding (76). Chunks of raw data are reduced into smaller fragments that make sense during data analysis. Data analysis involves organising, reducing, and analysing the data. It is a time-consuming process (77).

In quantitative research studies, data analysis uses both descriptive and inferential statistics . Researchers summarise and describe data using descriptive statistics. Frequencies and percentages, frequency distributions, measures of central tendency, measures of variability, correlation coefficients, and several risk indexes are the most commonly used descriptive statistics. Measures of central tendency are mode, median, and mean, while measures of variability are range, standard deviation, and variance (76). The direction and magnitude of a relationship between two variables are described using correlation coefficients. Risk indexes like relative risk and odds ratio describe outcomes in relation to exposures (77).

Inferential statistics are used to extrapolate information about a population using data from a representative sample of that population. They make use of confidence intervals and statistical tests. The level of measurement of the dependent variable and the number of groups the independent variable has determine the statistical test that can be used. Independent group t-test, Chi-square tests, and analysis of variance (ANOVA) test are the commonly used statistical tests. Independent t-tests are used to determine if there is a difference between the means of a continuous variable between two groups while a one-way ANOVA test is used when there are three or more groups of the independent variable. The Chi-square test is used to determine if there is a difference in proportions of a nominal dependent variable in two or more groups of the independent variable (77).

In this study, the researcher coded the responses before entering the data into SPSS version 28, which was used for data analysis. Nominal data in the questionnaire included sex, relationship status, and employment status, while ordinal data included age groups and level of education. Descriptive statistics like percentages and frequencies were used to analyse nominal and ordinal variables. The frequency of each response was expressed as a percentage for clarity. One-sample non-parametric tests were used to determine whether the frequencies of the different responses to each statement were statistically significant. Tables, pie charts, and bar graphs were used for data presentation. Chi-square tests were performed to determine if there were associations between the PrEP retention rate and the socio-demographic characteristics of the participants. Logistic regression analyses were performed to determine the extent of these associations. The reference groups chosen for the logistic regression analyses were informed by the literature review findings. A 95% level of confidence and Chi-square p-values were used to determine the statistical significance of the findings. Questions in sections C and D of the questionnaire were analysed individually to determine how important each factor was.

3.12 Ethical considerations

Ethical clearance for the study was obtained from the University of Namibia's Human Research Ethics Committee (HREC), and healthcare facilities permission from the Ministry of Health and Social Services (MoHSS). See Appendix 1 for the University of Namibia's REC ethical clearance letter and Appendix 2 for the MoHSS approval letter.

Researchers must uphold the autonomy of the participants, maximise benefits, and reduce the harm that may arise from the study (78). The ethical principles that were applied by the researcher in this study include respect for persons, justice, beneficence, and non-maleficence. More details are discussed below.

3.12.1 Respect for persons

Participants in a research study should agree to take part in the study voluntarily, without fear, undue encouragement, or dishonesty (79). Informed consent protects the interests of participants. It ensures participants are offered enough information about a study before consenting to participate (79). All the participants in this study were independent persons who could sensibly make their own decisions. This is because all

of them were adults of normal mental capacity. The researcher explained to all potential participants that participation was voluntary and those who chose not to take part in the study would not be punished. The researcher also explained the study details to all the study participants. Those who consented to participate in the study were requested to sign an informed consent form. See Appendix 5 for the English version of the informed consent form and Appendix 6 for the Oshikwanyama version of the informed consent used in this study.

3.12.2 Justice

Justice in research involves choosing participants based on the requirements of the study, and not on a particular group's vulnerability (77). All the potential participants at the selected healthcare facilities had an equal opportunity to participate in the study through random sampling of the target population.

3.12.3 Beneficence and non-maleficence

Beneficence is the promotion of the good of the study participants by the researchers. Human research must yield benefits for participants or other people in society (77). In this study, healthcare facility managers were expected to use the findings from the study to reduce barriers to PrEP care, which would reduce the number of people getting infected with HIV in society.

Non-maleficence specifies that researchers must lessen unnecessary harm in studies that involve human beings (77). The researcher followed the coronavirus disease of 2019 (COVID-19) prevention protocols to reduce the risk of transmission to the researcher and the participants. The researcher ensured all participants were wearing masks, sanitised the hands of all participants during the face-to-face interactions, and ensured social distancing of 1.5 metres between the participants and the researcher.

3.12.4 Confidentiality and privacy

Confidentiality in research guarantees data provided by participants is kept in strict confidence while privacy ensures that participants have control over what they disclose to researchers (77). The researcher protected the privacy and confidentiality of all participants by making the questionnaires anonymous. After completing the data analysis process, the data were kept on a password-protected computer while the completed questionnaires were kept in locked steel cabinets that only the researcher had access to. The data would be kept for five years, after which it would be

permanently deleted from the computer and the hardcopy questionnaires would be destroyed through shredding.

3.13 Chapter summary

The research was conducted using an analytical cross-sectional study design. The study was conducted in Engela District in Namibia. Participants for the study included patients initiated on PrEP at three selected healthcare facilities in the district between January and June of 2019. Two hundred and fifty participants were chosen from the three healthcare facilities using a proportional stratified random sampling method. Data collection involved the use of a self-administered questionnaire. The reliability of the questionnaire was determined using a test-retest method while validity was ensured by consulting experts in the field of PrEP. SPSS was used for analysing the data. The next chapter will concentrate on the results of the study.

Chapter Four: Results and Discussion of Findings

4.1 Introduction

The research methodology was discussed in Chapter Three. This chapter contains a presentation of the study results, a discussion of the results, and the interpretation of the findings. The results are presented according to the questionnaire, starting with the socio-demographic characteristics of the participants, and ending with the strategies and factors that might be used to improve the retention of participants in PrEP care.

4.2 Socio-demographic characteristics

The participants were requested to respond to questions on sex, age group, educational level, relationship status, and employment status.

4.2.1 Sex of participants

Participants were requested to state their biological sex. The results are shown in Figure 1 below.

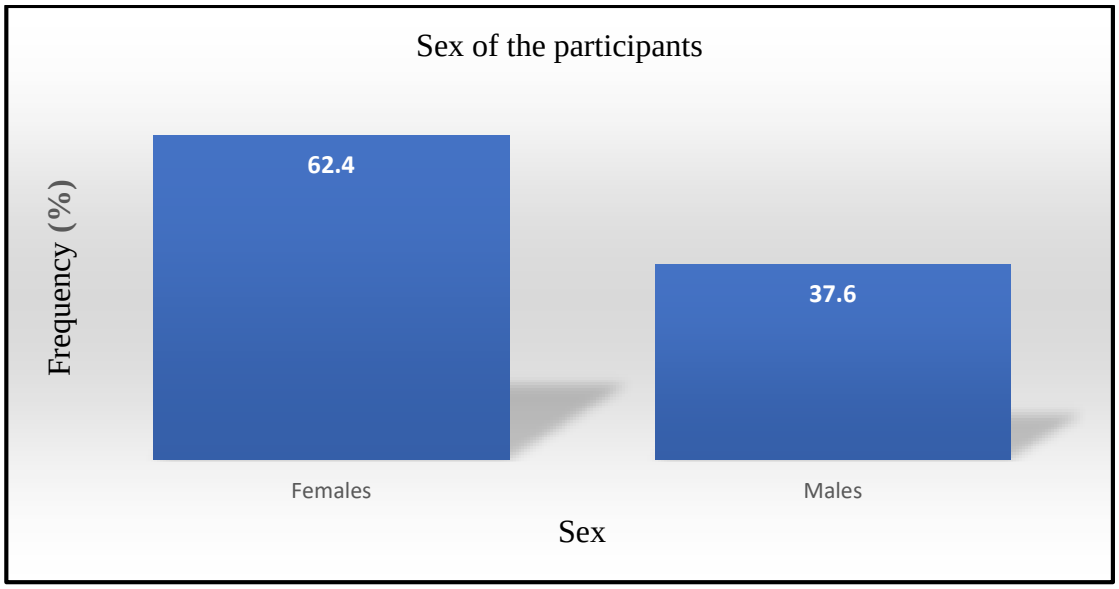

Figure 1: Sex of participants

Figure 1 above shows the majority of participants (n=156; 62.4%) were females while slightly less than two-fifths (n=94; 37.6%) were males.

4.2.2 Age group of the participants

Participants were requested to choose one age group to which their age belonged. The results are shown in Figure 2 below.

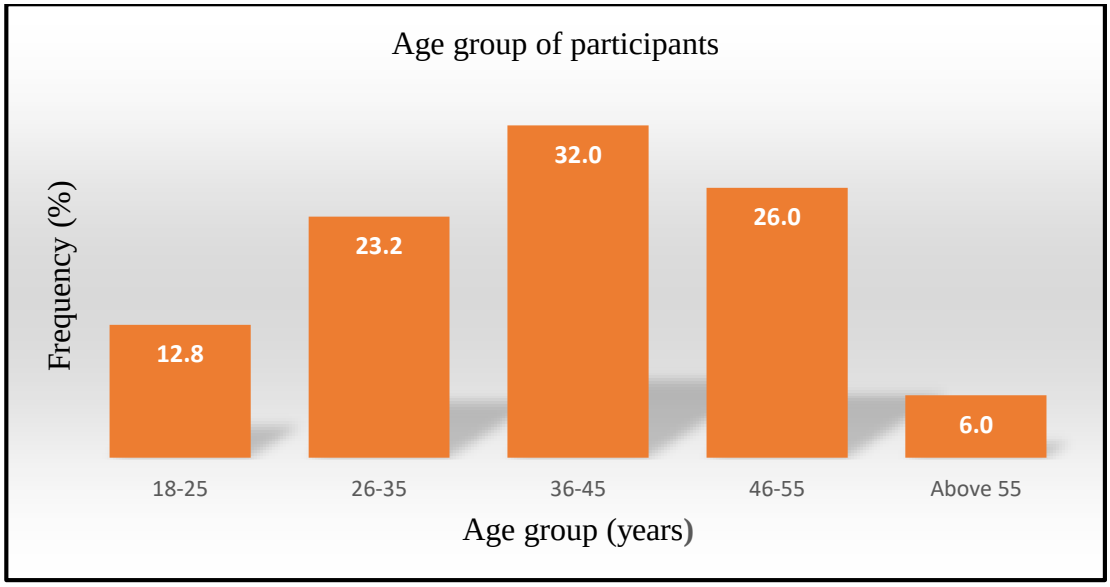

Figure 2: Age group of participants

Figure 2 above shows the majority of the participants (n=80; 32%), were in the 36-45 years age group, followed by the 46-55 years age group (n=65; 26%), then the 26-35 years age group (n=58; 23.2%), and the 18-25 years age group (n=32; 12.8%). The above 55 years age group had the least number of participants (n=15; 6%).

4.2.3 Educational level of participants

Participants were requested to choose from the provided responses their highest educational attainment. The given responses were 'no formal education', 'primary education', 'secondary education', and 'tertiary education'. The results are presented in Figure 3 below.

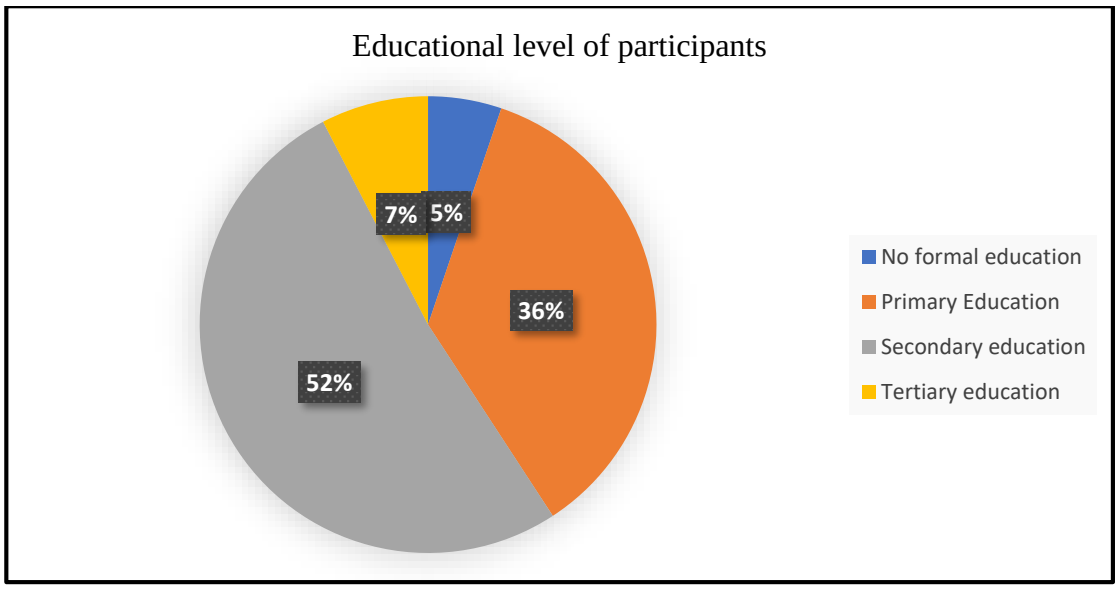

Figure 3: Educational level of participants

Figure 3 above shows the majority of the participants (n=129; 51.6%) had secondary education as their highest educational attainment, followed by those who had primary education (n=89; 35.6%), then those with tertiary education (n=19; 7.6%). Few participants (n=13; 5.2%) had no formal education.

4.2.4 Relationship status of participants

Participants were requested to state their relationship status. The results are presented in Figure 4 below.

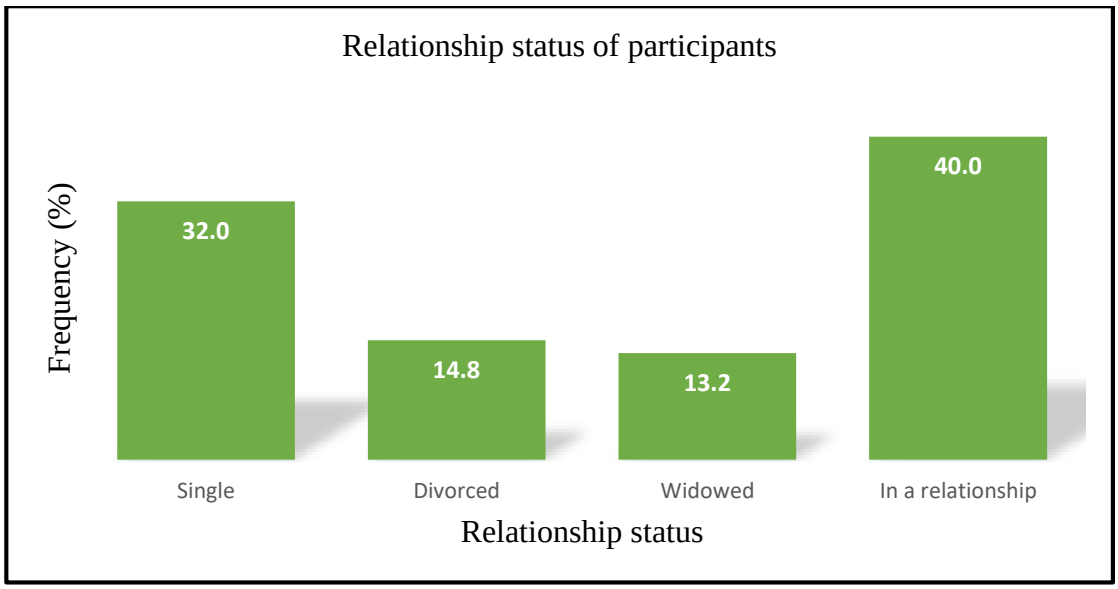

Figure 4: Relationship status of participants

Figure 4 above shows the majority of the participants (n=100; 40%) were in a relationship, followed by those who were single (n=80; 32%), then those who were divorced (n=37; 14.8%). Few participants (n=33; 13.2%) were widowed.

4.2.5 Employment status of participants

Participants were requested to state whether they were employed or not. The findings are presented in Figure 5 below.

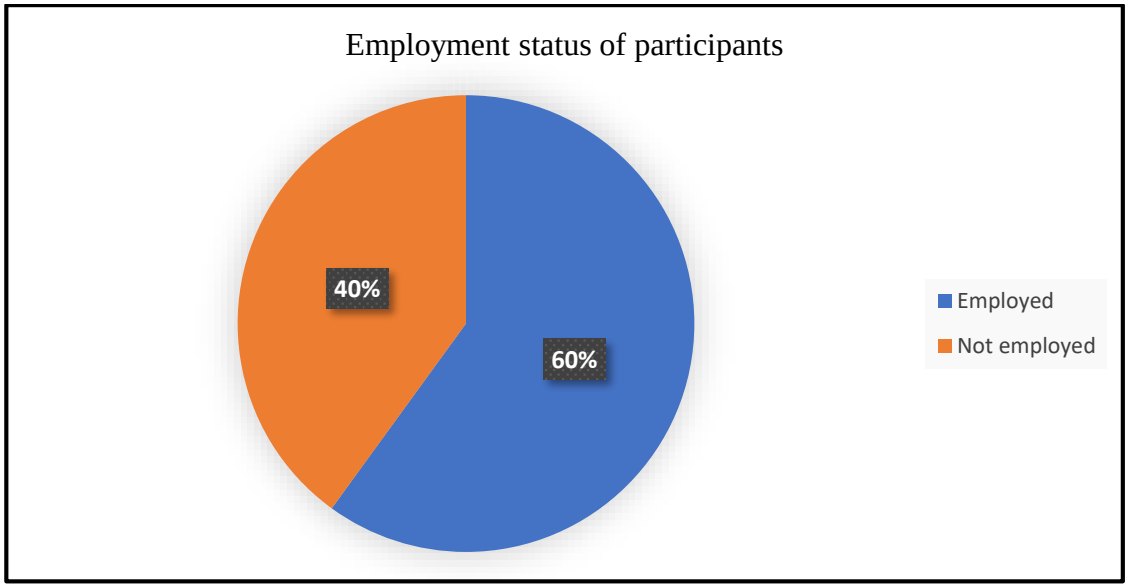

Figure 5: Employment status of participants

Figure 5 above shows the majority of participants (n=150; 60%) were employed while few (n=100; 40%) were not employed.

4.3 Retention and adherence to PrEP care

Participants were asked to state whether they were still collecting PrEP from the clinic and the number of PrEP doses they had missed whilst they were on PrEP. The findings are presented below.

4.3.1 Retention in PrEP care

Participants stated whether they were still collecting PrEP from the clinic or not one month after PrEP initiation. The results are shown in Figure 6 below.

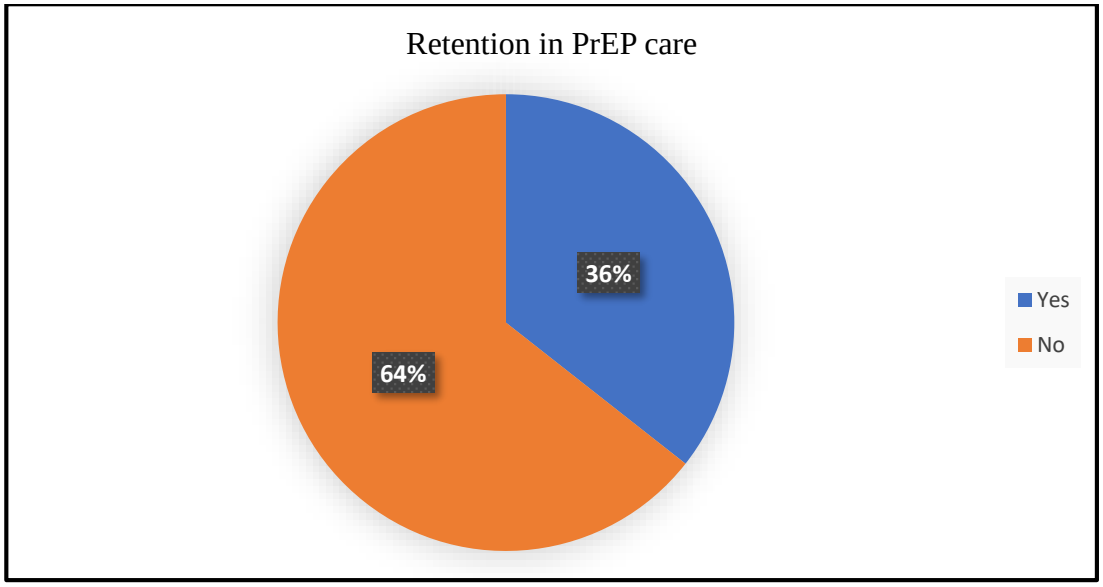

Figure 6: Retention in PrEP care

Figure 6 above shows the majority of participants (n=161; 64.4%) were not retained in PrEP care while few (n=89; 35.6%) were retained. The 95% confidence interval for the retention rate was 29.7% to 41.9%. The retention rate in the current study was lower than that reported in the United States of America and Africa, which were 57% and 63.1% respectively (61). The percentage might have been lower in this study because everyone was included in the study, not just high-risk populations as in the other studies. In addition, the retention rate might have been lower in the current study because participants might not have perceived themselves as high-risk populations and therefore stopped whenever they thought they were no longer at risk. Since 40% of the participants were not employed in the current study, this might have affected retention in PrEP care as these participants might have been unable to get money for transport to go to the local clinics where PrEP was available.

4.3.2 Adherence to PrEP

Participants stated the number of doses they had missed while they were on PrEP. The provided responses were ‘none’, ‘1-5’, ‘6-10’, and ‘>10’. The results are shown in Figure 7 below.

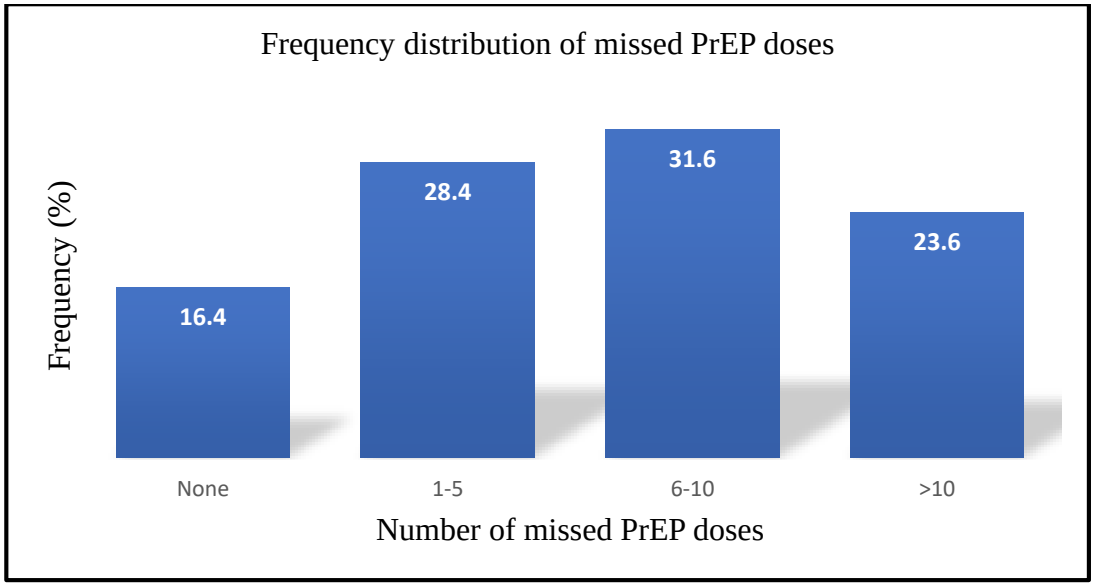

Figure 7: Frequency distribution of missed PrEP doses

Figure 7 above shows the majority of the participants (n=79; 31.6%) missed 6-10 doses whilst on PrEP care, followed by those who missed 1-5 doses (n=71; 28.4%), then those who missed more than 10 doses (n=59; 23.6%). Few participants (n=41; 16.4%) did not miss any dose. The current study showed that only 16.4% of the participants had perfect adherence to PrEP medication. This adherence rate was lower than in the FEM-PrEP trial, which was reported to be 37% (80). The low level of adherence in the current study can be attributed to ignorance of the importance of adherence to the effectiveness of PrEP among the participants. Moreover, some participants might have forgotten to take their drugs because of busy schedules.

4.4 Association between retention in PrEP care and socio-demographic characteristics of participants

To determine associations between each socio-demographic characteristic of the participants and retention in PrEP care, the socio-demographic characteristics were grouped according to the status of retention in PrEP care. Thereafter, logistic regression was performed to determine the crude odds ratios. The results are presented below.

4.4.1 Frequency distribution of socio-demographic characteristics according to the status of retention in PrEP care

The frequency distribution of the participants' socio-demographic characteristics was grouped according to their status of retention in PrEP care. The results are shown in Table 1 below.

Table 1: Frequency distribution of socio-demographic characteristics of participants by the status of retention in PrEP care

Characteristic	Total		Retained on PrEP care		Not retained on PrEP care	
	n	%	n	%	n	%
Total	250	100	89	35.6%	161	64.4%
Age						
18-25	32	12.8%	10	31.3%	22	68.7%
26-35	58	23.2%	18	31.0%	40	69.0%
36-45	80	32.0%	28	35.0%	52	65.0%
46-55	65	26.0%	23	35.6%	42	64.4%
>55	15	6.0%	10	66.7%	5	33.3%
Sex						
Male	94	37.6%	25	26.6%	69	73.4%
Female	156	62.4%	64	41.0%	92	59.0%
Relationship status						
Single	80	32.0%	38	47.5%	42	52.5%
Divorced	37	14.8%	10	27.0%	27	73.0%
Widowed	33	13.2%	13	39.4%	20	60.6%
In a relationship	100	40.0%	28	28.0%	72	72.0%
Education						
No formal education	13	5.2%	3	23.1%	10	76.9%
Primary education	89	35.6%	19	21.3%	70	78.7%
Secondary education	129	51.6%	59	45.7%	70	54.3%
Tertiary education	19	7.6%	8	42.1%	11	57.9%
Employment status						
Employed	150	60.0%	70	46.7%	80	53.3%
Not employed	100	40.0%	19	19.0%	81	81.0%

Overall, 89 (35.6%) out of the 250 participants were still retained in PrEP care during the data collection period. Among the participants who were retained in PrEP care, when comparing proportions for each characteristic, a bigger proportion of participants was aged above 55 years (n=10; 66.7%), a bigger proportion was females (n=64; 41%), and a bigger proportion was single (n=38; 47.5%). Furthermore, among the participants who were retained in PrEP care, a bigger proportion had secondary education (n=59; 45.7%), and a bigger proportion was employed (n=70; 46.7%). The findings in the current study concur with earlier studies which showed that older

people, those who are single, and those who attained higher education were more likely to be retained in PrEP care (36). These findings are plausible as those who are single do not have to explain to anyone why they are taking PrEP. Those with higher education were more likely to understand how PrEP works compared to those with less education and were, therefore, more likely to be retained in PrEP care. Older people were more likely to be retained in PrEP care possibly because of maturity which would reduce their risk-taking behaviours.

4.4.2 Association between retention in PrEP care and socio-demographic characteristics of participants analysis

Chi-square tests and logistic regression were performed to determine associations between retention in PrEP care and the socio-demographic characteristics of participants. The results are presented in Table 2 below.

Table 2: Crude odds ratios and Chi-square tests of association between retention on PrEP care and socio-demographic characteristics

Characteristics	**Crude Odds ratios**	**95% CI***	**Chi-square test summary**		
			Test statistic	**Degrees of freedom (df)**	***p*-value**
Age group			7.12	4	*p*=0.13
18-25 years	**0.23**	**0.06 – 0.84**			
26 – 35 years	**0.23**	**0.07 – 0.75**			
36– 45 years	**0.27**	**0.08 – 0.87**			
46-55 years	**0.27**	**0.08 – 0.90**			
>55 years	Reference	Reference			
Sex			5.33	1	***p*=0.021**
Male	**0.52**	**0.30 – 0.91**			
Female	Reference	Reference			
Relationship status			8.85	3	***p*=0.031**
Single	**Reference**	**Reference**			
Divorced	**0.41**	**0.18 – 0.96**			
Widowed	0.72	0.31 – 1.64			
In a relationship	**0.43**	**0.23 – 0.80**			
Education			14.91	3	***p*<0.01**
No formal education	0.41	0.09 – 2.00			
Primary education	0.37	0.13 – 1.06			
Secondary education	1.16	0.44 – 3.07			
Tertiary education	Reference	Reference			
Employment status			20.032	1	***p*<0.01**
Employed	Reference	Reference			
Not employed	**0.27**	**0.15 – 0.49**			

CI is the 95% confidence intervals

The findings in Table 2 are described below:

- **Chi-square tests results:**

  The Chi-square tests performed revealed there was a statistically significant association between participants' sex and their retention in PrEP care, χ^2 (df=1, n=250) =5.33, p=0.021; between participants' relationship status and their retention in PrEP care, χ^2 (df=3, n=250) =8.85, p=0.031; between participants' education and their retention in PrEP care, χ^2 (df=3, n=250) =14.91, p<0.01; and between participants' employment status and their retention in PrEP care, χ^2 (df=1, n=250) =20.032, p<0.01. However, there was no statistically significant association between participants' age groups and their retention in PrEP care, χ^2 (df=4, n=250) =7.12, p=0.13. These findings concur with earlier studies which showed that relationship status and age influenced retention in PrEP care (75). However, the results of this study were at variance with one study which showed that education affected retention in PrEP care (36). The results of the current study may be explained by the fact that since participants in the current study resided in an area with a high prevalence of HIV, they already knew the risk of contracting HIV regardless of their educational status. Therefore, their educational status did not influence their retention in PrEP care.

- **Age group crude odds ratios (OR) and 95% Confidence Intervals (CI):**

  Using age group >55 years as the reference group, the odds of being retained in PrEP care were significantly less for age groups 18-25 years, 26-35 years, 36-45 years, and 46-55 years, crude odds ratio (OR) = 0.23, 95% CI (0.06 – 0.84); OR = 0.23, 95% CI (0.07 – 0.75); OR = 0.27, 95% CI (0.08 – 0.87) and OR = 0.27, 95% CI (0.08 – 0.90), respectively. This means age groups 18-25 years, 26-35 years, 36-45 years, and 46-55 years were 77%, 77%, 73%, and 73% less likely to be retained in PrEP care compared to the age group >55 years, respectively. The results of the current study concur with the results of an earlier study which showed that older people were more likely to be retained in PrEP care (36). These results may be a result of maturity, which helps reduce risk-taking among older people.

- **Sex OR and 95% CI:**

Using females as the reference groups, males were statistically significantly less likely to be retained in PrEP care compared to females, OR = 0.52, 95% CI (0.30 – 0.91). This means that males were 48% less likely to be retained in PrEP care compared to females. The results of the current study are different from those of one conducted in the United States of America which showed no difference in retention between males and females (78). The results of the current study may be due to the reason that females in the study setting had less negotiating power on condom use with their partners compared to those in the study conducted in the United States of America. Therefore, as a result, to prevent contracting HIV, they were more likely to remain in PrEP care.

- **Relationship status OR and 95% CI:**

  Using single participants as the reference group, divorced participants and participants in a relationship were statistically significantly less likely to be retained in PrEP care compared to single participants, OR = 0.41, 95% CI (0.18 – 0.96); and OR = 0.43 95% CI (0.23 – 0.80), respectively. This means divorced participants and participants in a relationship were 59% and 57% less likely to be retained in PrEP care compared to single participants, respectively. There was no statistically significant difference in the participants' retention in PrEP care between single participants and widowed participants, OR = 0.72, 95% CI (0.31 – 1.64). The results of the current study concur with those of a study conducted in Uganda, which showed that participants in a relationship were less likely to be retained in PrEP care than those who were single (75). These results may be explained by the fact that participants in this study were afraid of being discovered to be taking PrEP by their partners, which would result in them being labelled as unfaithful or untrusting.

- **Education OR and 95% CI:**

  Using participants with tertiary education as the reference group, participants with no formal education, primary education, and secondary education had no statistically significant difference in retention in PrEP care compared to those with tertiary education, OR = 0.41, 95% CI (0.09 – 2.00); OR = 0.37, 95% CI (0.13 – 1.06); and OR = 1.16, 95% CI (0.44 – 3.07), respectively. The findings of the current study concur with those of a study done in the United States of America(78), which also showed no association between the educational level

of participants and their retention in PrEP care. These findings are possible because PrEP information to the public is so simplified that everyone can comprehend it without requiring higher educational attainment and make informed decisions regarding PrEP.

- **Employment status OR and 95% CI:**

  Using employed participants as the reference groups, the unemployed participants were statistically significantly less likely to be retained in PrEP care compared to the employed, OR = 0.27, 95% CI (0.15 – 0.49). This means that the unemployed were 73% less likely to be retained in PrEP care compared to the employed. The results of the current study concur with the findings of a study conducted in the Democratic Republic of Congo which showed that participants who were employed were more likely to be retained in PrEP care compared to those who were unemployed (71).These findings may be a result of participants requiring money for transport to go to the healthcare facilities which offer PrEP.

4.5 Structural factors that influence retention of clients on PrEP care

To determine structural factors that influence the retention of clients on PrEP care, participants were asked to respond to ten statements on the structural factors (numbered 6 – 17 on the questionnaire). They were asked to select one of the five provided responses. The responses were 'strongly agree', 'agree', 'not sure', 'disagree', and 'strongly disagree'. Table 3 below shows the frequencies of participants' responses to the structural factors' statements and the results of the one-sample Chi-square tests.

Table 3: Frequency distribution of responses to structural factors' statements

Statement	**Response**	**TOTAL**		**One-sample Chi-square test summary**		
		n	**%**	**Test statistic**	**Degrees of freedom (df)**	***p*-value**
8. Not having transport money will affect my retention in PrEP care.				81.72	4	***p* <0.01**

	Strongly agree	44	17.6			
	Agree	104	41.6			
	Not sure	21	8.4			
	Disagree	48	19.2			
	Strongly disagree	33	13.2			
9. Distance to the facility may affect my retention in PrEP care.				82.92	4	***p* <0.01**
	Strongly agree	64	25.6			
	Agree	86	34.4			
	Not sure	19	7.6			
	Disagree	68	27.2			
	Strongly disagree	13	5.2			
10. Language barrier with the health care worker can affect my retention in PrEP care.				13.00	4	***p* =0.011**
	Strongly agree	58	23.2			
	Agree	44	17.6			
	Not sure	32	12.8			
	Disagree	65	26.0			
	Strongly disagree	51	20.4			
11. Lack of friendly staff at the facility may affect my retention in PrEP care.				67.04	4	***p* <0.01**
	Strongly agree	73	29.2			
	Agree	83	33.2			
	Not sure	12	4.8			
	Disagree	33	13.2			

	Strongly disagree	49	19.6			
12. Fixed facility operating hours may affect my retention in PrEP care.				61.36	4	***p* <0.01**
	Strongly agree	79	31.6			
	Agree	69	27.6			
	Not sure	22	8.8			
	Disagree	61	24.4			
	Strongly disagree	19	7.6			
13. Shortage of drugs may affect my retention in PrEP care.				64.56	4	***p* <0.01**
	Strongly agree	46	18.4			
	Agree	91	36.4			
	Not sure	41	16.4			
	Disagree	59	23.6			
	Strongly disagree	13	5.2			
14. Shortage of staff at the facility may affect my retention in PrEP care.				65.08	4	***p* <0.01**
	Strongly agree	70	28.0			
	Agree	87	34.8			
	Not sure	26	10.4			
	Disagree	47	18.8			
	Strongly disagree	20	8.0			
15. Paying consultation fees at the facility may affect my retention in PrEP care.				48.92	4	***p* <0.01**
	Strongly agree	72	28.8			
	Agree	69	27.6			

	Not sure	32	12.8			
	Disagree	61	24.4			
	Strongly disagree	16	6.4			
16. Need for 3 monthly follow-up visits may affect retention in PrEP care.				37.24	4	***p* <0.01**
	Strongly agree	44	17.6			
	Agree	74	29.6			
	Not sure	49	19.6			
	Disagree	65	26.0			
	Strongly disagree	18	7.2			
17. Having a supportive partner may affect my retention in PrEP care.				51.40	4	***p* <0.01**
	Strongly agree	86	34.4			
	Agree	65	26.0			
	Not sure	28	11.2			
	Disagree	44	17.6			
	Strongly disagree	27	10.8			

The findings in Table 3 are described below:

- **Statement 8:** 'Not having transport money will affect my retention in PrEP care':

  The majority of the participants (n=104; 41.6%) agreed with the statement while a minority (n=21; 8.4%) were not sure. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =137.44, p<0.01. The results of the current study concur with the findings of a study conducted in Eswatini, which revealed that lack of transport money affected the participants' retention in PrEP care (63).

These findings are plausible because, without transport money, people who would have been initiated on PrEP might not be retained in care since they would not have the means to reach the healthcare facilities that provide PrEP, especially in situations where the clinics are far away from where they live.

- **Statement 9:** 'Distance to the facility may affect my retention in PrEP care':
  The majority of the participants (n=86; 34.4%) agreed with the statement while a minority (n=13; 5.2%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =82.92, p<0.01. The findings of the current study agree with those of a study done in Eswatini, which revealed that the longer the distance between the place of residence of participants and the healthcare facility that provides PrEP, the lower the retention rate (60). These findings show that access to healthcare facilities that provide PrEP is an important factor in determining retention in PrEP care.
- **Statement 10:** 'Language barrier with the healthcare worker can affect my retention in PrEP care':
  The majority of the participants (n=65; 26%) disagreed with the statement while a minority (n=32; 12.8%) were not sure. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =13.00, p=0.011. These results concur with the findings of a systematic review which revealed that language barriers may reduce patient satisfaction, which may lead to poor retention in care (68). If there are language barriers between the healthcare workers and the patients, the patients might feel that their explanations are distorted in the translations, which might lead to dissatisfaction with the care.
- **Statement 11:** 'Lack of friendly staff at the facility may affect my retention in PrEP care':
  The majority of the participants (n=83; 33.2%) disagreed with the statement while a minority (n=12; 4.8%) were not sure. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =67.04, p<0.01. These results concur with those of a study done in the United States of America, which revealed that participants who were being attended to by friendly staff were more likely to

be retained in PrEP care compared to those who were being seen by unfriendly staff (59). Friendly staff is more likely to be understanding and therefore people needing PrEP might feel comfortable being retained in PrEP care.

- **Statement 12:** 'Fixed facility operating hours may affect my retention in PrEP care':

  The majority of the participants (n=79; 31.6%) strongly agreed with the statement while a minority (n=19; 7.6%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =61.36, p<0.01. The results of the current study concur with those of a study done in the United States of America which revealed that people who were working found it difficult to collect their PrEP drugs since the healthcare facilities' opening hours were similar to their working hours (23). The results show that employed people might be forced to discontinue PrEP because of a lack of time to collect their drugs at healthcare facilities.

- **Statement 13:** 'Shortage of drugs may affect my retention in PrEP care':

  The majority of the participants (n=91; 36.4%) agreed with the statement while a few (n=13; 5.2%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =64.56, p<0.01. The results of the current study agree with those of a study done in the United States of America in which participants reported that they missed their PrEP doses because of a shortage of the PrEP drugs at their healthcare facilities (22). These results confirm that the availability of PrEP drugs at healthcare facilities may influence the retention of people in PrEP care.

- **Statement 14:** 'Shortage of staff at the facility may affect my retention in PrEP care':

  The majority of the participants (n=87; 34.8%) agreed with the statement while a few (n=20; 8.0%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =65.08, p<0.01. These findings concur with those of a study conducted in Zambia which revealed that the shortage of healthcare workers reduced the participants' retention rate (81). These findings are understandable

since the shortage of staff results in long waiting times to receive care, which may make some people not come back for services.

- **Statement 15:** 'Paying consultation fees at the facility may affect my retention in PrEP care':

  The majority of the participants (n=72; 28.8%) strongly agreed with the statement while a few (n=16; 6.4%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =48.92, p<0.01. The results of the current study agree with those of a study conducted in the United States of America, which revealed that costs for accessing PrEP were a barrier to retention (55). The results are understandable because, without consultation fees, people are likely to stay away from healthcare facilities since they may be refused care.

- **Statement 16:** 'Need for 3 monthly follow-up visits may affect retention in PrEP care':

  The majority of the participants (n=74; 29.6%) agreed with the statement while a few (n=18; 7.2%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =37.24, p<0.01. The results of the current study agree with those of a study conducted in the United States of America, which revealed that retention in PrEP care reduced as the need for follow-up increased (63). These results may be due to the fact that the more follow-up visits expected from people on PrEP, the more time and resources will be required to attend to these visits. People may therefore not have time and resources for such visits.

- **Statement 17:** 'Having a supportive partner may affect my retention in PrEP care':

  The majority of the participants (n=86; 34.4%) strongly agreed with the statement while a few (n=27; 10.8%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =51.40, p<0.01. The results of the current study concur with the findings of a study conducted in the United States of America in which some of the participants reported that support from their partners would improve their retention in PrEP care (82). These results show that people who have support from their partners are likely to be retained more

in PrEP care than those without supportive partners, possibly because they would not be judged on why they are taking PrEP.

4.6 Strategies and factors that may improve retention in PrEP care

To determine strategies and factors that might improve the retention of clients in PrEP care, participants were asked to respond to ten statements on the strategies and factors (numbered 18 – 27 on the questionnaire). They were asked to select one of the five provided responses. The responses were 'strongly agree', 'agree', 'not sure', 'disagree', and 'strongly disagree'. Table 4 below shows the frequencies of participants' responses to the structural factors' statements and the results of the one-sample Chi-square tests.

Table 4: Frequency distribution of responses to strategies and factors that might influence retention of clients in PrEP care statements

Statement	**Response**	**TOTAL**		**One-sample Chi-square test summary**		
		n	**%**	**Test statistic**	**Degrees of freedom (df)**	***p*-value**
18. Not knowing my partner(s) HIV status will improve my retention in PrEP care.				51.04	4	***p* <0.01**
	Strongly agree	88	35.2			
	Agree	58	23.2			
	Not sure	34	13.6			
	Disagree	48	19.2			
	Strongly disagree	22	8.8			
19. Knowing that my HIV+ partner(s) is/are not on ART may improve my retention in PrEP care.				59.08	4	***p* <0.01**
	Strongly agree	85	34.0			

	Agree	64	25.6			
	Not sure	28	11.2			
	Disagree	55	22.0			
	Strongly disagree	18	7.2			
20. Having an HIV+ partner(s) with detectable viral load may improve my retention in PrEP care.				85.52	4	***p* <0.01**
	Strongly agree	91	36.4			
	Agree	78	31.2			
	Not sure	23	9.2			
	Disagree	39	15.6			
	Strongly disagree	19	7.6			
21. Being in a sero-discordant relationship may improve my retention in PrEP care.				84.04	4	***p* <0.01**
	Strongly agree	78	31.2			
	Agree	87	34.8			
	Not sure	24	9.6			
	Disagree	48	19.2			
	Strongly disagree	13	5.2			
22. Having supportive family members or partners may improve my retention in PrEP care.				97.44	4	***p* <0.01**
	Strongly agree	98	39.2			

	Agree	72	28.8			
	Not sure	26	10.4			
	Disagree	42	16.8			
	Strongly disagree	12	4.8			
23. Receiving HIV prevention education /risk reduction activities at the facility may improve my retention in PrEP care.				51.96	4	***p* <0.01**
	Strongly agree	81	32.4			
	Agree	68	27.2			
	Not sure	33	13.2			
	Disagree	50	20.0			
	Strongly disagree	18	7.2			
24. Understanding the effectiveness of PrEP may improve retention in PrEP care.				73.08	4	***p* <0.01**
	Strongly agree	74	29.6			
	Agree	86	34.4			
	Not sure	25	10.0			
	Disagree	49	19.6			
	Strongly disagree	16	6.4			
25. Stigma related to PrEP use may reduce retention in PrEP care.				92.72	4	***p* <0.01**

	Strongly agree	94	37.6			
	Agree	75	30.0			
	Not sure	19	7.6			
	Disagree	45	18.0			
	Strongly disagree	17	6.8			
26. Increased awareness on the benefits of PrEP use may improve retention in PrEP care.				59.08	4	***p* <0.01**
	Strongly agree	68	27.2			
	Agree	88	35.2			
	Not sure	27	10.8			
	Disagree	41	16.4			
	Strongly disagree	26	10.4			
27. Having multiple sexual partners may improve my retention in PrEP care.				100.00	4	***p* <0.01**
	Strongly agree	81	32.4			
	Agree	93	37.2			
	Not sure	12	4.8			
	Disagree	39	15.6			
	Strongly disagree	25	10.0			

The findings in Table 4 are described below:

- **Statement 18:** 'Not knowing my partner(s) HIV status will improve my retention in PrEP care':

  The majority of the participants (n=88; 35.2%) strongly agreed with the statement while a few (n=22; 8.8%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =51.04, p<0.01. These findings are consistent with those of a study done in South Africa which showed that participants who did not know their partners' status were more likely to be retained in PrEP care (30). These findings show that when individuals are worried about an increased risk of contracting HIV, they are more likely to continue taking PrEP than those whose partners are HIV negative, who may feel safe.
- **Statement 19:** 'Knowing that my HIV+ partner(s) is/are not on ART may improve my retention in PrEP care':

  The majority of the participants (n=85; 34.0%) strongly agreed with the statement while a few (n=18; 7.2%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =59.08, p<0.01. The results of the current study are consistent with those of a study done in the United States of America, which showed that participants who knew that their partners were HIV positive but not on treatment were more likely to be retained in PrEP care compared to those whose partners were HIV negative or were HIV positive but on treatment (23). These findings show that individuals at increased risk of contracting HIV are more likely to be retained in PrEP care than those who have a reduced risk.
- **Statement 20:** 'Having an HIV+ partner(s) with detectable viral load may improve my retention in PrEP care':

  The majority of the participants (n=91; 36.4%) strongly agreed with the statement while a few (n=19; 7.6%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =85.52, p<0.01. The findings of the current study agree with the findings of a study in South Africa which showed that participants who felt that they were at increased risk of contracting HIV were more likely to be retained in PrEP care (67).

- **Statement 21:** 'Being in a sero-discordant relationship may improve my retention in PrEP care':

  The majority of the participants (n=87; 34.8%) agreed with the statement while a few (n=13; 5.2%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =84.04, p<0.01. These findings are consistent with findings of a study done in the United States of America, which showed the majority of participants would be retained in PrEP care if they knew their partners were HIV positive (23). These findings show that where individuals know that they are actually at risk of contracting HIV instead of just perceiving that they will contract the disease, they are more likely to be retained in PrEP care for their own safety.

- **Statement 22:** 'Having supportive family members or partners may improve my retention in PrEP care':

  The majority of the participants (n=98; 39.2%) strongly agreed with the statement while a few (n=12; 4.8%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =97.44, p<0.01. The results of the current study concur with the findings of a study conducted in the United States of America in which some of the participants reported that support from their partners would improve their retention in PrEP care (22). These results show that people who have support from their partners are likely to be retained more in PrEP care than those without supportive partners, possibly because they would not be judged on why they are taking PrEP.

- **Statement 23:** 'Receiving HIV prevention education /risk reduction activities at the facility may improve my retention in PrEP care':

  The majority of the participants (n=81; 32.4%) strongly agreed with the statement while a few (n=18; 7.2%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =51.96, p<0.01. The results of the current study agree with those of a study done in Kenya, which also showed that the majority of participants reported that education on PrEP would increase their retention in PrEP care (72). These findings are plausible because the more people know

about PrEP, the more they are likely to know the advantages of continuously taking PrEP when at risk of contracting HIV.

- **Statement 24:** 'Understanding the effectiveness of PrEP may improve retention in PrEP care':

  The majority of the participants (n=86; 34.4%) agreed with the statement while a few (n=16; 6.4%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =73.08, p<0.01. These findings are consistent with the findings of a study done in Kenya, which revealed that participants who had better knowledge about PrEP were more likely to be retained in PrEP care compared to those who had less knowledge (72).

- **Statement 25:** 'Stigma related to PrEP use may reduce retention in PrEP care':

  The majority of the participants (n=94; 37.6%) strongly agreed with the statement while a few (n=17; 6.8%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =92.72, p<0.01. The results of the current study concur with those of a study done in Kenya, which revealed that many participants stopped taking PrEP because of the stigma against people taking PrEP in their communities (72). These findings are understandable because no one wants to be labelled as being promiscuous, a commercial sex worker, or as being HIV positive when seen taking PrEP.

- **Statement 26:** 'Increased awareness on the benefits of PrEP use may improve retention in PrEP care':

  The majority of the participants (n=88; 35.2%) agreed with the statement while a few (n=26; 10.4%) strongly disagreed. There were statistically significant differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =59.08, p<0.01. These findings agree with the findings of a study done in Kenya, which also revealed that better knowledge about PrEP increased retention in PrEP care among participants (72).

- **Statement 27:** 'Having multiple sexual partners may improve my retention in PrEP care':

  The majority of the participants (n=93; 37.2%) agreed with the statement while a few (n=12; 4.8%) were not sure. There were statistically significant

differences in the frequencies of the responses indicated by the participants, χ^2 (df=4, n=250) =100.00, p<0.01. These findings concur with those of a study done in the United States of America which revealed that the majority of participants were likely to be retained in PrEP care if they were having multiple sexual partners (23). These findings are understandable because individuals with multiple sexual partners may not know the HIV statuses of each of their partners. Therefore, because they will be knowing the risk they are carrying, they are likely to protect themselves by keeping on taking PrEP.

4.7 Chapter summary

This chapter provided a description of the findings of the study. The majority of the participants were females, in the 36-45 years age group, had secondary education, were in a relationship, and were employed. The retention rate in PrEP care and adherence rate to PrEP was low among the participants. Logistic regression showed a statistically significant association between age group, sex, relationship status, and employment status with retention in PrEP care. However, there was no statistically significant association between education and retention in PrEP care, although this was found in the Chi-square test. More than three-fifths of the participants agreed or strongly agreed that distance to the healthcare facilities, lack of friendly staff at the healthcare facilities, shortage of staff at the healthcare facilities, and having a supportive partner would strongly influence their retention in PrEP care. In addition, more than two-thirds of the participants agreed or strongly agreed that knowing that their partners had undetectable viral loads, having family members and/or partners that are supportive, lack of stigma related to PrEP, and having multiple sexual partners may improve their retention in PrEP care. The next chapter contains the conclusions and recommendations of the study.

Chapter Five: Conclusions, Recommendations, and Limitations

5.1 Introduction

This chapter contains the limitations, conclusions, and recommendations of the research study. The objectives of this study were to determine the retention rate of clients in PrEP care three months after initiation, to identify socio-demographic factors that affected retention in care of clients on PrEP, to describe structural factors affecting retention in care of clients in PrEP, and to determine factors and strategies to improve retention of clients on PrEP in the Engela district of Namibia. The findings from the literature review and the current study are summarised, followed by recommendations from the findings of the current study.

5.2 Findings from the literature review and primary study

The literature review of this study focused on HIV prevention methods, especially PrEP, retention in PrEP care; adherence to PrEP; association between socio-demographic characteristics and retention in PrEP care; and factors and strategies to improve retention of clients in PrEP care. The primary study then determined the three months retention rate of clients on PrEP care, the associations between socio-demographic characteristics of participants and retention in PrEP care, structural factors affecting retention in PrEP care, and factors and strategies to improve retention of clients in PrEP care in Engela district.

Effective HIV prevention requires the use of a combination of interventions, the interventions can be divided into behavioural, biomedical, and structural (4). There are several biomedical interventions currently in use. These include PMTCT, VMMC, PEP, and PrEP. PrEP is a new biomedical intervention whose implementation is still being carried out in most developing countries (28). Preexposure prophylaxis involves the use of ARVs to prevent HIV transmission (29). PrEP effectiveness has been demonstrated in several studies that include the iPrEx, PROUD, and IPERGAY studies (30). The effectiveness of PrEP depends on the adherence of clients to PrEP drugs. Poor adherence is associated with reduced effectiveness and risk of developing drug resistance (38). The most commonly used combination pill for PrEP contains TDF and FTC (31). The criteria for individuals to qualify for HIV PrEP in Namibia cover circumstances where the individuals are at high risk of contracting HIV like having multiple partners or being in a discordant relationship (4).

Although different definitions of retention in PrEP care have been used in different studies, this study used the WHO definition, which stipulates that client are retained in PrEP care if they continue taking PrEP drugs for three consecutive months after initiation (49). Different methods are used to measure PrEP retention. However, the retention rate in PrEP care remains low globally (52). Organisational, individual, societal, and healthcare provider factors all influence retention in PrEP care (55). The retention rate of 35.6% reported in the current study was lower than that reported in earlier studies (52), possibly because the current study included everyone who was taking PrEP drugs, not only high-risk populations as in the earlier studies. Adherence is important for the effectiveness of PrEP. Although several methods are used to measure adherence to PrEP drugs, there is no gold standard among them.

Previous studies reported associations between relationship status, race, age, employment status, and sex with retention in PrEP care. However, other studies did not find associations between education or sex with retention in PrEP care (69). The Chi-square tests performed for the current study revealed statistically significant associations between sex and retention in PrEP care, relationship status and retention in PrEP care, education and retention in PrEP care, and employment status and retention in PrEP care. However, no association was found between age groups and retention in PrEP care. Logistic regression also revealed statistically significant associations between sex and retention in PrEP care, relationship status and retention in PrEP care, and employment status and retention in PrEP care. Furthermore, logistic regression did not show an association between education and retention in PrEP care but showed a statistically significant association between age groups and retention in PrEP care.

Factors mentioned in previous studies that improved retention to PrEP care include being in a discordant relationship, having multiple partners, not knowing a partner's HIV status, a partner who is HIV-positive but not on ARVs, and partners who are on ARVs but not virally suppressed (72). Previous studies showed that strategies that should be used to improve retention in PrEP care include, PrEP education, having easily accessible healthcare facilities providing PrEP, offering PrEP for free, having supportive friends, families, and partners; and having non-judgemental healthcare providers who offer adherence counselling to clients (16). The current study revealed that more than two-thirds of the participants agreed or strongly agreed that knowing

that their partners had undetectable viral loads, having family members and/or partners that are supportive, lack of stigma related to PrEP, and having multiple sexual partners may improve their retention in PrEP care.

5.3 Recommendations

From the findings of the research, the researcher made the recommendations below.

5.3.1 Offering PrEP education to patients and the public

The retention rate in PrEP care in this study was low possibly because of a lack of PrEP knowledge among the participants. To improve PrEP knowledge of patients, PrEP education should be offered at healthcare facilities and other public places such as schools, colleges, and churches in the district. The education can be offered in form of public talks by healthcare workers, posters with PrEP information in public places, advertisements in both electronic and print media, and through the use of testimonies from people who would have used PrEP before. These actions will reduce the stigma associated with PrEP care and misconceptions about PrEP. If the communities acquire enough knowledge about PrEP, they will be able to offer support to their friends and partners who are taking PrEP, resulting in an improvement in the retention rate in PrEP care.

5.3.2 Decentralisation of PrEP services

The majority of participants in this study agreed or strongly agreed that not having transport money and distance to a healthcare facility that offers PrEP care might influence their retention in PrEP care. Therefore, to improve retention in PrEP care, PrEP services should be decentralised in the district so that the services are nearer to where people live. This will require training healthcare providers, especially nurses at local healthcare facilities on PrEP care. This will ensure that all healthcare facilities in the district have nurses that are competent to offer PrEP care.

5.3.3 Expanding healthcare facilities' operating hours

The majority of participants in the current study agreed or strongly agreed that fixed healthcare facility operating hours might influence their retention in PrEP care. To improve PrEP care retention in the district, healthcare facilities should therefore operate for longer hours and outside the usual working hours, as well as during public holidays. This will ensure that all those who are employed also get time to collect their

PrEP drugs. Expansion of the operating hours will however require that more healthcare workers are employed at the healthcare facilities.

5.3.4 Adequate healthcare worker staffing

The current study revealed that the majority of the participants agreed or strongly agreed that the lack of friendly staff at healthcare facilities might affect their retention in PrEP care. If there are inadequate healthcare workers at healthcare facilities, they might be overworked leading to burnout, which results in them lacking empathy and being rude to patients. This may lead to clients discontinuing PrEP care. Therefore, to improve retention in PrEP care, healthcare facilities should be adequately staffed.

5.3.5 Improving PrEP drugs' availability

This study revealed that more than half of the participants agreed or strongly agreed that the shortage of PrEP drugs at healthcare facilities might affect their retention in PrEP care. The healthcare facilities in the district should ensure that there are no stockouts of PrEP drugs through the use of proper PrEP drug inventory management programs.

5.4 Recommendations for future research

Further studies that include both public and private healthcare facilities that offer PrEP care in the district should be conducted. This will allow for the generalisation of the findings to the whole district. Furthermore, after the recommendations have been implemented, a follow-up study should be conducted to determine if there has been an improvement in the retention of clients in PrEP care.

5.5 Limitations of the study

This study had several limitations. One of the limitations is that the study was conducted in one district of the country, which made it difficult to generalise the findings to other regions in the country. Another limitation is that the number of healthcare facilities to take part in the study was small, which also made it difficult to get a clearer picture of the retention rate and factors that affect retention in PrEP care in the district. Furthermore, the study relied on self-reported information, which may have been influenced by recall bias or desirability bias.

5.6 Conclusion

The study set out to determine the retention rate of clients on PrEP three months after initiation, to identify socio-demographic factors that affected retention in care of

clients on PrEP, describe structural factors affecting retention in care of clients in PrEP, and to determine factors and strategies to improve retention of clients on PrEP in the Engela district of Namibia. The study's objectives were fulfilled by studying the relevant literature about PrEP and retention in PrEP care (refer to Chapter 2), using an appropriate methodology (refer to Chapter 3), and using a reliable and valid data collection instrument (refer to Chapter 3 section 3.9). Findings from the current study in Chapter 4 showed a low PrEP care retention rate, and significant associations between sex and retention in PrEP care, relationship status and retention in PrEP care, and employment status and retention in PrEP care. The findings also showed that more than three-fifths of the participants agreed or strongly agreed that distance to the healthcare facilities, lack of friendly staff at the healthcare facilities, shortage of staff at the healthcare facilities, and having a supportive partner would strongly influence their retention in PrEP care. Furthermore, the findings revealed that more than two-thirds of the participants agreed or strongly agreed that knowing that their partners had undetectable viral loads, having family members and/or partners that are supportive, lack of stigma related to PrEP, and having multiple sexual partners may improve their retention in PrEP care. The majority of the participants agreed or strongly agreed that distance to the healthcare facilities, lack of friendly staff at the healthcare facilities, shortage of staff at the healthcare facilities, and having a supportive partner would strongly influence their retention in PrEP care.

Based on these findings, it was recommended that PrEP education be offered to patients and the public at healthcare facilities and other public places, PrEP services are decentralised, operating hours of healthcare facilities be expanded, healthcare facilities are adequately staffed, and PrEP drugs' availability is improved. Future research covering both public and private healthcare facilities may need to be conducted to ensure that the results are representative of the whole district.

References

1. World Health Organization. Policy Brief: Pre-exposure prophylaxis (PrEP): WHO expands recommendation on oral pre-exposure prophylaxis of HIV infection (PrEP). WHO. 2015. Available from: https://apps.who.int/iris/handle/10665/197906.

2. Jin F, Amin J, Guy R, Vaccher SJ, Selvey C, Zablotska I, et al. Adherence to HIV pre-exposure prophylaxis (PrEP) in a large-scale implementation study in New South Wales , Australia. AIDS. 2021; 35(12):1987-1996.

3. UNAIDS. UNAIDS Strategy 2016-2021. UNAIDS. 2015. Available from: https://www.unaids.org/en/resources/documents/2015/UNAIDS_PCB37_15-18.

4. Ministry of Health and Social Services. National Guidelines for Antiretroviral Therapy. 6th ed. Windhoek. Ministry of Health and Social Services. 2018.

5. Tetteh RA, Yankey BA, Nartey ET, Lartey M, Leufkens HGM, Dodoo ANO. Pre-Exposure Prophylaxis for HIV Prevention : Safety Concerns. Drug Saf. 2017; 40(4):273-283.

6. Eakle R, Venter F, Rees H. Pre-exposure prophylaxis (PrEP) in an era of stalled HIV prevention : Can it change the game ? Retrovirology [Internet]. 2018; 15(1):29. Available from: https://doi.org/10.1186/s12977-018-0408-3

7. Chou R, Evans C, Hoverman A, Sun C, Dana T, Bougatsos C, et al. Preexposure Prophylaxis for the Prevention of HIV Infection: Evidence Report and Systematic Review for the US Preventive Services Task Force. JAMA. 2015; 321(22):2214-2230.

8. World Health Organization. WHO recommendation on pre-exposure prophylaxis for HIV prevention. 1st ed. Geneva. WHO. 2018.

9. Nicol MR, Adams JL, Kashuba AD. HIV pre-exposure prophylaxis trials : the road to success. Clin Investig (Lond). 2013; 3 (3):295–308.

10. Davey DJ, Mvududu R, Mashele N, Lesosky M, Khadka N, Bekker L, et al. Early pre-exposure prophylaxis (PrEP) discontinuation among pregnant and postpartum women : Implications for maternal PrEP roll out in South Africa.

medRxiv [Internet]. 2021. 2021; Available from: https://doi.org/10.1101/2021.05.04.21256514.

11. UNAIDS. Global HIV & AIDS Statistics. UNAIDS. 2022. Available from: https://www.unaids.org/en/resources/fact-sheet

12. Ministry of Health and Social Services. Surveillance Report of the 2016 National HIV Sentinel Survey. 1st ed. Windhoek. Ministry of Health and Social Services. 2016.

13. Chan PA, Glynn TR, Oldenburg CE, Montgomery MC, Robinette AE, Almonte A, et al. Implementation of Preexposure Prophylaxis for Human Immunodeficiency Virus Prevention among Men Who Have Sex with Men at a New England Sexually Transmitted Diseases Clinic. Sex Transm Dis. 2016; 43(11):717–23.

14. Roberts ET, Matthews DD. HIV and chemoprophylaxis, the importance of considering social structures alongside biomedical and behavioral intervention. Soc Sci Med. 2012; 75(9):1555–61.

15. Gengiah TN, Moosa A, Naidoo A, Mansoor LE. Adherence challenges with drugs for pre-exposure prophylaxis to prevent HIV infection. Int J Clin Pharm. 2014; 36(1):70–85.

16. Spinelli MA, Buchbinder SP. Pre-exposure prophylaxis persistence is a critical issue in prep implementation. Clin Infect Dis. 2020; 71(3):583–5.

17. McCormack S, Dunn DT, Desai M, Dolling DI, Gafos M, Gilson R, et al. Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD): effectiveness results from the pilot phase of a pragmatic open-label randomised trial. Lancet. 2016; 387(10013):53-60.

18. Grinsztejn B, Hoagland B, Moreira RI, Kallas E, Madruga JV, Goulart S, et al. Retention , engagement , and adherence to pre-exposure prophylaxis for men who have sex with men and transgender women in PrEP Brasil : 48 week results of a demonstration study. Lancet HIV. 2018; 5(3):e136-e145.

19. Shover CL, Javanbakht M, Shoptaw S, Bolan RK, Gorbach PM. High Discontinuation of Pre-Exposure Prophylaxis Within Six Months of Initiation.

Paper presented at: Conference on Retroviruses and Opportunistic Infections (CROI); 2018 March 4-7; Boston.

20. Hojilla JC, Crouch PC, Santos GM, Vlahov D, Grant R, Freeborn K, et al. The PrEP cascade : Initiation of pre-exposure prophylaxis (PrEP) and retention in care in a clinic-based cohort of men who have sex with men. Paper presented at: The 9th IAS Conference on HIV Science; 2017 July 23-26; Paris.

21. Colasanti J, Kelly J, Pennisi E, Hu Y, Root C, Hughes D, et al. Continuous Retention and Viral Suppression Provide Further Insights Into the HIV Care Continuum Compared to the Cross-sectional HIV Care Cascade. Clin Infect Dis. 2016; 62(5):648-654.

22. Arnold T, Brinkley-Rubinstein L, Chan PA, Perez-Brumer A, Bologna ES, Beauchamps L, et al. Social , structural , behavioral and clinical factors influencing retention in Pre-Exposure Prophylaxis (PrEP) care in Mississippi. PLoS ONE [Internet]. 2017; 12(2):e0172354. Available from: https://doi.org/10.1371/journal.pone.0172354.

23. Sarr M, Gueye D, Mboup A, Diouf O, Bao MDB, Ndiaye AJ, et al. Uptake, retention, and outcomes in a demonstration project of pre-exposure prophylaxis among female sex workers in public health centers in Senegal. Int J STD AIDS. 2020; 31(11):1063–72.

24. Marcus JL, Buisker T, Horvath T, Amico KR, Fuchs JD, Buchbinder SP, et al. Helping our patients take HIV pre-exposure prophylaxis (PrEP): a systematic review of adherence interventions. HIV Med. 2014; 15(7):385–95.

25. Golub SA, Enemchukwu CU. The critical importance of retention in HIV prevention. Lancet HIV [Internet]. 2018; 5(9):e475–6. Available from: http://dx.doi.org/10.1016/S2352-3018(18)30130-9

26. Theofanidis D, Fountouki A. Limitations and Delimitations in the research process. Peroper Nurs Q. 2018; 7(3):155–62.

27. Gorman KO, Macintosh R. Research Methods for Business & Management: A Guide to Writing Your Dissertation. 2nd ed. Oxford: Goodfellow Publishers Limited. 2014.

28. UNAIDS. Global HIV & AIDS Statistics. UNAIDS. 2022. Available from: https://www.unaids.org/en/resources/fact-sheet.

29. World Health Organization. WHO technical update on pre-exposure prophylaxis (PrEP). World Health Organization. 2015. Available from: https://apps.who.int/iris/handle/10665/153587.

30. The U.S. President's Emergency Plan for AIDS Relief. Guidance for the Prevention of Sexually Transmitted Hiv Infections. USAID. 2011. Available from: http://pdf.usaid.gov/pdf_docs/Pcaac329.pdf

31. Moran A, Mashele N, Mvududu R, Gorbach P, Bekker LG, Coates TJ, et al. Maternal PrEP Use in HIV-Uninfected Pregnant Women in South Africa: Role of Stigma in PrEP Initiation, Retention and Adherence. AIDS Behav [Internet]. 2022; 26(1):205-217. Available from: https://doi.org/10.1007/s10461-021-03374-x

32. Fowler MG, Qin M, Fiscus SA, Currier JS, Flynn PM, Chipato T, et al. Benefits and Risks of Antiretroviral Therapy for Perinatal HIV Prevention. N Engl J Med. 2016; 375:1726-1737.

33. Celum C, Baeten JM. Antiretroviral-based HIV-1 Prevention: Antiretroviral Treatment and Pre-Exposure Prophylaxis. Antivir Ther. 2013; 17(8):1483–93.

34. Grant RM, Lama JR, Anderson PL, McMahan V, Liu AY, Vargas L, et al. Preexposure chemoprophylaxis for HIV Prevention in Men Who Have Sex with Men. N Engl J Med. 2010; 363:2587-2599.

35. Davies O, Ustianowski A, Fox J. Pre-exposure Prophylaxis for HIV Prevention : Why , What , Who and How. Infect Dis Ther. 2016; 5(4):407–16.

36. United States Public Health service. Preexposure prophylaxis for the prevention of HIV infection in the United States-2021 Update: A Clinical Practice Guideline. Centres for Disease Control and Prevenetion. 2021. Available from: https://www.cdc.gov/hiv/pdf/risk/prep/cdc-hiv-prep-guidelines-2021.pdf

37. Le AQ. Investigating biomedical HIV prevention approach for HIV negative patients Oral PrEP (Pre-exposure Prophylaxis) from a nursing perspective

(Nursing Thesis). Helsinki. Arcada University of Applied Sciences. 2017.

38. Hodges-Mameletzis, I., Dala, S., Msimanga-Radebe, B., Rodolph, M. & Baggaley, R. Going global: the adoption of the World Health Organization's enabling recommendation on oral preexposure prophylaxis for HIV. Sex Health. 2018; 15:489-500.

39. Thigpen MC, Kebaabetswe PM, Paxton LA, Smith DK, Rose CE, Segolodi TM, et al. Antiretroviral Preexposure Prophylaxis for Heterosexual HIV Transmission in Botswana. N Engl J Med. 2012; 367:423–34.

40. White E. HIV pre-exposure prophylaxis: additional insights through secondary analyses of the PROUD trial (Doctorate thesis). London. University College London. 2020.

41. Mansournia MA, Higgins JP, Sterne JA, Hernan MA. Biases in randomized trials: a conversation between trialists and epidemiologists. Epidemiology. 2017; 28(1):54-59.

42. Montgomery MC, Oldenburg CE, Nunn AS, Mena L, Anderson P, Liegler T, et al. Adherence to Pre-Exposure Prophylaxis for HIV Prevention in a Clinical Setting. PLoS One [Internet]. 2016; 11(6):e0157742. Available from: https://doi.org/10.1371/journal.pone.0157742

43. Ministry of Health and Social Services (MoHSS). The Namibia Aids Response Progress Report 2015, Reporting Period: 2013-2014. MoHSS. 2015. Available from: http://www.unaids.org/sites/default/files/country/documents/NAM_narrative_report_2015.pdf

44. Namhindo EE, Mei F, Cao R, Lai S, Dai Y, Lai H, et al. PrEP: AIDS-Free Hope in Namibia? Int J Biol. 2017; 10(1):13.

45. Nakathingo FM, Ashipala DO, Iiyambo PT. Knowledge, Awareness and Willingness to use HIV Pre-Exposure Prophylaxis (PrEP) Among Students at the University of Namibia. Glob J Health Sci. 2021; 13(3):48.

46. ICAP at Columbia University and U. S. CDC. Pre-Exposure Prophylaxis (PrEP) Training for Providers in Clinical Settings: Participant Manual, Version

3.0. New York. ICAP at Columbia University. 2019.

47. Ndzinisa T. Understanding user profiles for oral PrEP uptake : A qualitative study with adolescent girls , young women and men in Vulindlela (Master's thesis). Durban. University of KwaZulu-Natal. 2017.

48. National Department of Health. PrEP Implementation Pack: South Africa 2016-2017. Pretoria. National Department of Health. 2015.

49. Haynes A, Brennan S, Redman S, Williamson A, Gallego G, Butow P. Figuring out fidelity: A worked example of the methods used to identify, critique and revise the essential elements of a contextualised intervention in health policy agencies. Implement Sci [Internet]. 2016; 11(1). Available from: http://dx.doi.org/10.1186/s13012-016-0378-6

50. Feldstein AC, Glasgow RE. A practical, robust implementation and sustainability model (PRISM) for integrating research findings into practice. Jt Comm J Qual Patient Saf. 2008; 34(4):228–43.

51. Ministry of Health and Social Services. Infection, Prevention and Control Guidelines. 2nd ed. Windhoek. Ministry of Health and Social Services. 2015

52. Montgomery MC, Oldenburg CE, Nunn AS, Mena L, Anderson P, Liegler T, et al. Adherence to pre-Exposure prophylaxis for HIV prevention in a clinical setting. PLoS One [Internet]. 2016; 11(6):e0157742. Available from: https://doi.org/10.1371/journal.pone.0157742.

53. El-Desoky RH, Al-Dahir S, Butler I, Sarpong D, Nawas GT, Gillard C, et al. Are Providers PrEPed? A Retrospective Cohort Study Analyzing Retention in Care among Pre-Exposure Prophylaxis (PrEP) Patients. Clin HIV AIDS J [Internet]. 2019; 2(2):1-6. Available from: http://dx.doi.org/10.31021/chaj.20192111.

54. Meyers K, Golub SA. Planning ahead for implementation of long-acting HIV prevention: Challenges and opportunities. Curr Opin HIV AIDS. 2015; 10(4):290–5.

55. Edeza A, Karina Santamaria E, Valente PK, Gomez A, Ogunbajo A, Biello K. Experienced barriers to adherence to pre-exposure prophylaxis for HIV

prevention among MSM: a systematic review and meta-ethnography of qualitative studies. AIDS Care [Internet]. 2021; 33(6):697–705. Available from: https://doi.org/10.1080/09540121.2020.1778628.

56. Spinelli MA, Scott HM, Vittinghoff E, Liu AY, Gonzalez R, Morehead-Gee A, et al. Missed Visits Associated With Future Preexposure Prophylaxis (PrEP) Discontinuation Among PrEP Users in a Municipal Primary Care Health Network. Open Forum Infect Dis [Internet]. 2019; 6(4):ofz101. Available from: https://doi.org/10.1093%2Fofid%2Fofz101.

57. Lankowski AJ, Bien-Gund CH, Patel VV, Felsen UR, Silvera R, Blackstock OJ. PrEP in the Real World: Predictors of 6-Month Retention in a Diverse Urban Cohort. AIDS Behav. 2019; 23(7):1797–802.

58. Nunn AS, Brinkley-Rubinstein L, Oldenburg CE, Mayer KH, Mimiaga M, Patel R, et al. Defining the HIV pre-exposure prophylaxis care continuum. AIDS. 2017; 31(5):731–4.

59. Chan PA, Mena L, Patel R, Oldenburg CE, Beauchamps L, Perez-brumer AG, et al. Retention in care outcomes for HIV pre-exposure prophylaxis implementation programmes among men who have sex with men in three US cities. J Int AIDS Soc [Internet]. 2016; 19(1):20903. Available from: http://dx.doi.org/10.7448/IAS.19.1.20903.

60. Bärnighausen K, Geldsetzer P, Matse S, Hettema A, Hughey AB, Dlamini P, et al. Qualitative accounts of PrEP discontinuation from the general population in Eswatini. Cult Health Sex. 2021; 23(9):1198–214.

61. Al Shamsi H, Almutairi AG, Mashrafi S Al, Kalbani T Al. Implications of Language Barriers for Healthcare: A Systematic Review. Oman Med J. 2020; 35(2):e122

62. Sidebottom D, Ekström AM, Strömdahl S. A systematic review of adherence to oral pre-exposure prophylaxis for HIV – how can we improve uptake and adherence ? BMC infect Dis. 2018; 18(581):1–14.

63. Brooks KM, Anderson PL. Pharmacologic-based methods of adherence assessment in HIV prevention. Clin Pharmacol Ther. 2018; 104(6):1056–

1059.

64. Volk JE, Marcus JL, Phengrasamy T, Blechinger D, Nguyen DP, Follansbee S, et al. No New HIV Infections with Increasing Use of HIV Preexposure Prophylaxis in a Clinical Practice Setting. Clin Infect Dis. 2015; 61(10):1601–3.

65. Fuchs JD, Stojanovski K, Vittinghoff E, McMahan VM, Hosek SG, Amico RK, et al. A Mobile Health Strategy to Support Adherence to Antiretroviral Preexposure Prophylaxis. AIDS Patient Care STDS. 2018; 32(3):104–11.

66. World Health Organization. Report of a consultation : Preparing for Pre-Exposure from research to implementation. Geneva. WHO. 2010. Available from: https://apps.who.int/iris/handle/10665/44375.

67. Vasco EK. The lived experiences of young women on the use of HIV pre-exposure prophylaxis (Master's thesis). Stellenbosch. Stellenbosch University. 2021.

68. Van der Elst EM, Mbogua J, Operario D, Mutua G, Kuo C, Mugo P, et al. High Acceptability of HIV Pre-exposure Prophylaxis but Challenges in Adherence and Use: Qualitative Insights from a Phase I Trial of Intermittent and Daily PrEP in At-Risk Populations in Kenya. AIDS Behav. 2013; 17(6):2162–72.

69. Sevelius JM, Glidden D V, Deutsch M, Welborn L, Contreras A, Salinas A, et al. Uptake , Retention , and Adherence to Pre-exposure Prophylaxis (PrEP) in TRIUMPH : A Peer-Led PrEP Demonstration Project for Transgender Communities in Oakland and Sacramento , California. J Acquir Defic Syndr. 2021; 88:27–38.

70. Kibengo FM, Ruzagira E, Katende D, Bwanika AN, Bahemuka U, Haberer JE, et al. Safety , Adherence and Acceptability of Intermittent Tenofovir / Emtricitabine as HIV Pre-Exposure Prophylaxis (PrEP) among HIV-Uninfected Ugandan Volunteers Living in HIV-Serodiscordant Relationships : A Randomized , Clinical Trial. PLoS One. 2013; 8(9):1–10.

71. Carlos S, Burgueño E, Ndarabu A, Reina G, Burgo CL, Osorio A. Predictors

of retention in the prospective HIV prevention OKAPI cohort in Kinshasa. Sci Rep [Internet]. 2021; 11:1–10. Available from: https://doi.org/10.1038/s41598-021-84839-w

72. Jackson-Gibson M, Ezema AU, Orero W, Were I, Ohiomoba RO, Mbullo PO, et al. Facilitators and barriers to HIV pre- exposure prophylaxis (PrEP) uptake through a community-based intervention strategy among adolescent girls and young women in Seme Sub-County , Kisumu , Kenya. BMC Public Health. 2021; 21(1284):1–13.

73. Majid U. Research Fundamentals : Study Design , Population , and Sample Size. URNCST. 2018; 2(1):1–7.

74. Eale K. Analytic studies design , what they are , their presentations and calculations. 2014;

75. Bujang MA. A Step-by-Step Process on Sample Size Determination for Medical Research. Malays J Med Sci. 2021;28(2):15–27.

76. Mohajan HK. Quantitative Research : A Successful Investigation in Natural and Social Sciences. JEDEP. 2021; 9(4):50-79.

77. Polit D, Beck C. NURSING RESEARCH: Generating and Assessing Evidence for Nursing Practice. 10th ed. Philadelphia: Wolters Kluwer. 2017.

78. Yip C, Han N, Sng B. Legal and ethical issues in research. Indian J Anaesth. 2016; 60(9):684-688.

79. Ehrlich R, Joubert G. EPIDEMIOLOGY: A Research Manual for South Africa. 3rd ed. Cape Town: Oxford University Press. 2014.

80. Corneli AL, Deese J, Wang M, Taylor D, Ahmed K, Agot K, et al. FEM-PrEP: adherence patterns and factors associated with adherence to a daily oral study product for pre-exposure prophylaxis. J Acquir Immune Defic Syndr. 2014; 66(3):324-31.

81. Mukumbang FC, Mwale JC, Van Wyk B. PrEP in the Real World: Conceptualising the Factors Affecting Retention in Care of Patients on Antiretroviral Treatment in Kabwe District, Zambia, Using the Ecological Framework. AIDS Res Treat. 2017; 2017:

7356362.https://doi.org/10.1155/2017/7356362

82. Lankowski AJ, Bien-Gund CH, Patel VV, Felsen UR, Silvera R, Blackstock OJ. PrEP in the Real World: Predictors of 6-Month Retention in a Diverse Urban Cohort. AIDS Behav. 2019; 23(7):1797-1802.

Appendices

Appendix 1: University of Namibia REC's clearance certificate

UNAM
UNIVERSITY OF NAMIBIA

ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: DEC OSH 0009 **Date:** **04/04/2022**

This Ethical Clearance Certificate is issued by the University of Namibia Ethics Committee (REC) in accordance with the University of Namibia's Research Ethics Policy and Guidelines. Ethical approval is given in respect of undertakings contained in the Research Project outlined below. This Certificate is issued on the recommendations of the ethical evaluation done by the ethics committee.

Title of Project: FACTORS INFLUENCING THE RETENTION OF CLIENTS RECEIVING PRE- EXPOSURE PROPHYLAXIS IN ENGELA DISTRICT, NAMIBIA

Principal researchers: KRISTIANA KOSMAS

Staff Number/ Student number: 200711326

Remarks: Low Risk – Approved

Centre for Research Services

Take note of the following:

1. Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the ethics committee. An application to make amendments may be necessary.
2. Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the ethics committee
3. The Principal Researcher must report issues of ethical compliance to the ethics committee (through the Chairperson) at the end of the Project or as may be requested by the ethics committee
4. The ethics committee retains the right to:

i) Withdraw or amend this Ethical Clearance if any unethical practices (as outlined in the Research Ethics Policy) have been detected or suspected,

ii) Request for an ethical compliance report at any point during the course of the research.

The ethics committee wishes you the best in your research.

Prof Hans J Amukugo (Oshakati Campus Chairperson Decentralized Ethics Committee)

Prof. Davis Mumbengegwi (Head, Multidisciplinary Research)

Appendix 2: Ministry of Health and Social Services' research approval letter

REPUBLIC OF NAMIBIA

MINISTRY OF HEALTH AND SOCIAL SERVICES

OFFICE OF THE EXECUTIVE DIRECTOR

Ministerial Building
Harvey Street
Private Bag 13198, Windhoek

Tel: No: 061 -203 2507
Fax No: 061-222 558
Andreas.Shipanga@mhss.gov.na

Ref: 22/4/2/3
Enquiries: Mr. A. Shipanga

Date: 14 July 2022

Ms. Kristiana Kosmas
University of Namibia
Oshakati
Namibia

Dear Ms. Kosmas

Re: *Factors influencing the retention of clients receiving pre-exposure prophylaxis in Engela District, Namibia.*

1. Reference is made to your application to conduct the above-mentioned study.
2. The proposal has been evaluated and found to have merit.
3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**
   - 3.1 The data to be collected must only be used for academic purpose;
   - 3.2 No other data should be collected other than the data stated in the proposal;
   - 3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;
   - 3.4 A quarterly report to be submitted to the Ministry's Research Unit;
   - 3.5 Preliminary findings to be submitted upon completion of the study;
   - 3.6 Final report to be submitted upon completion of the study;
   - 3.7 Separate permission should be sought from the Ministry for the publication of the findings.
4. All the cost implications that will result from this study will be the responsibility of the applicant and **not** of the MoHSS.

Yours sincerely,

BEN NANGOMBE
EXECUTIVE DIRECTOR

All official correspondence must be addressed to the Executive Director.

Appendix 3: Questionnaire in English

Questionnaire

UNAM
UNIVERSITY OF NAMIBIA

Section A: Socio-demographic characteristics

1.Sex of the respondent?

- ☐ Female (1)
- ☐ Male (2)

2.Age (years)

- ☐ 18-25 (1)
- ☐ 26-35 (2)
- ☐ 36-45 (3)
- ☐ 46-55 (4)
- ☐ >55 (5)

3.What was the last level of schooling that you completed?

- ☐ no formal education (1)
- ☐ primary education (2)
- ☐ secondary education (3)
- ☐ University/college/vocational (4)

4. Relationship status

- ☐ Single (1)
- ☐ Divorced (2)
- ☐ Widowed (3)
- ☐ In a relationship (4)

5. Employment status

- ☐ Not employed (1)
- ☐ Employed (2)

Section B: Questions on adherence to PrEP

6. Were you still collecting PrEP from the clinic three months after PrEP initiation?

- ☐ Yes (1)
- ☐ No (2)

7. During the time on PrEP/while on PrEP, how many doses have you missed?

- ☐ None (1)
- ☐ 1-5 (2)
- ☐ 6-10 (3)
- ☐ >10 (4)

Section C: Questions To assess how structural factors may/can influence retention of clients on PrEP

	Strongly agree (1)	Agree (2)	Not sure (3)	Disagree (4)	Strongly Disagree (5)
8.Not having transport money will affect my retention to care					
9.Distance to the facility may affect my retention to care					
10. Language barrier with the health care worker can affect my retention to care					
11. Lack of friendly staff at the facility may affect my retention to care					
12. Fixed facility operating hours may affect my retention to care					
13. Shortage of drugs may affect my retention to care					
14. Shortage of staff at the facility may affect my retention to care					

15. Paying consultation fees at the facility may affect my retention to care					
16. Need for 3 monthly follow-up visit may affect retention to care					
17. Having a supportive partner may affect my retention to care					

Section D: Strategies and factors that may improve retention to care

	Strongly agree (1)	Agree (2)	Not sure (3)	Disagree (4)	Strongly disagree (5)
18. Not knowing my partner(s) HIV status will improve my retention on PrEP care					
19.Knowing that my HIV+ partner(s) is/are not on ART may improve my retention PrEP care					
20.Having an HIV+ partner(s) with detectable viral load may improve my retention on PrEP care					
21. Being in a serodiscordant relationship may improve my retention on PrEP care					
22.Having supportive family members or partner may improve my retention to care					
23.Receiving HIV prevention education /risk reduction activities at the facility may improve my retention to care					
24.Understanding the effectiveness of PrEP may improve retention to care					
25.Stigma related to PrEP use may reduce retention to PrEP care					
26.Increased awareness on the benefits of PrEP use may improve retention to PrEP care					

27. Having multiple sexual partner may improve my retention on PrEP care					

Appendix 4: Questionnaire in Oshikwanyama

Omapulo

Oshitukulwa sha A: Oukwatyavalulo

1.Oukakwashikekookanhu woye?

- ☐ Omukainhu (1)
- ☐ Omulumenhu (2)

2.Eedula doye?

- ☐ 18-25 (1)
- ☐ 26-35 (2)
- ☐ 36-45 (3)
- ☐ 46-55 (4)
- ☐ >55 (5)

3.Ondodo yaxuuninwa youhongelwe woye ?

- ☐ Ina ndi ya kofikola (1)
- ☐ Ehongo lopedu (2)
- ☐ osekundofikola/ (3)
- ☐ oshiputudilo shopombada (4)

4. Ekwatafano lopaunhu

- ☐ Ina hombolwa (1)
- ☐ Okwa hengana (2)
- ☐ Omufiyekadi / Omufilwalume

5. Oilonga

- ☐ Iha ndi longo (1)
- ☐ Oha ndi longo (2)

Oshitukulwa sha B: Omapulo enasha neliumbato li nasha noPrEP

6. Owa kala ho pewa ounamiti woPrEP koukilinika oule weemwedi nhatu konima eshi oPrEp ya hovela?

- ☐ Heeno (1)
- ☐ Ahowe (2)

7. Efimbo to longifia oPrEp, owa pitifapo omafiku angapi ino i longifa ?

- ☐ Ahowe nande (1)
- ☐ 1-5 (2)
- ☐ 6-10 (3)
- ☐ >10 (4)

Oshitukulwa sha C: Omapulo kombinga yeshiivo nghene oukwatya woPrEp tau kalekepo ediinino lelongifo loPrEp kovalongifi.

	Ohandi tu kumwe nasho lelalela (1)	Ohandi tu kumw nasho (2)	Kandishishi nawa (3)	Itandi tu kumwe nasho (4)	Itandi tu kumwe nasho nande nande (5)
8.Okuhena oimaliwa yosheendifo ota shi dulu oku nwefamo eitulemo lange lo ku diinina elongifo loPrEp					
9.Oshinanho shokuya koihakulilo ota shi dulu oku nwefamo eitulemo lange lo ku diinina elongifo loPrEp					

10. Ounghundi welaka pokati kange nomupangi otau dulu oku nwefamo eitulemo lange lo ku diinina elongifo loPrEp.					
11. Oku hena oipala yehafo kovapangi ota ku dulu oku nwefamo eitulemo lange lo ku diinina elongifo loPrEp.					
12. Eetudi do mayakulo peenhelo douhaku odo iha di shendje ota di dulu oku nwefamo eitulemo lange lo ku diinina elongifo loPrEP.					
13. Omumbwe yomiti yashonopala otai dulu oku nwefamo eitulemo lange lo ku diinina elongifo loPrEp.					
14. Eshonopalo lovanailonga peenhelo douhaku ota li dulu oku nwefamo eitulemo lange lo ku diinina elongifo loPrEp.					
15. Ofuto yaalushe to i peenhele douhaku otai dulu oku nwefamo eitulemo lange lo ku diinina elongifo loPrEp					
16. Omumbwe yo kuya keenhele douhaku oule weemwedi nhatu ota i dulu oku nwefamo eitulemo lnage lo ku diinina elongifo loPrEp					
17. Oku kala nakaume ha yambididange ota shi dulu oku					

nwefa mo eitulemo lange lo ku diinina elongifo loPrEp					

Oshitukulwa sha D: Omanwefemo e kalekepo lelongifo loPrEp

	Ohandi tu kumwe nasho lelalela (1)	Ohandi tu kumwe nasho (2)	Kandishishi nawa (3)	Itandi tu kumwe nasho (4)	Itandi tu kumwe nasho nande nande (5)
18. Oku hashiiva kutya kaume kange kopaihole okwa fikama peni kombinga yombuto yoHIV ota shi dulu oku yambulapo enwefemo lange lo ku diinina oPrEp					
19.Eshiivo kutya kaume kange kopaihole ena ombuto yoHIV ndele ke li kepango loARV ota shi dulu oku yambulapo enwefemo lange lo ku diinina oPrEp					
20.Oku kala moihole nomunhu ena ombuto yoHIV yanyaipala ota shi dulu oku yambulapo enwefemo lange lo ku diinina oPre					
21. Oku kala moihole nomunhu ena ombuto yoHIV ndele u mwe kena ombuto yoHIV ota shi dulu oku yambulapo enwefemo lange lo ku diinina oPrEp					
22.Oku kala u na ova kwapata ha ve ku yambidida ota shi dulu oku yambulapo enwefemo lange lo ku diinina oPrEp					

23.Eyandjo lomauyelele enasha nehongo lo ku keelela ombuto yoHIV peenhele douhaku ota li dulu oku yambulapo enwefemo lange lo ku diinina oPrEp					
24.Eshiivo loilonga yoPrEp ota li dulu oku yambulapo enwefemo lange loPrEp					
25.Omashongo kombinga yelongifo loPrEp otaa dulu oku nwefemo ediinino lange loPrEp					
26.Ouyelele wa wana kombinga youwa wo PrEp tau dulu oku yambulapo ediinino lange loPrEp					
27. Oku kala paiholole novanhu va konda pu umwe ota shi dulu oku yambulapo ediinino lange loPrEp					

Appendix 5: Informed consent form in English

INFORMED CONSENT FORM

Dear Participant

1. My name is Kosmas Kristiana, student number [200711326]. I am studying towards a Master's In Public Health degree at the University of Namibia (UNAM), and I am conducting a survey about [FACTORS INFLUENCING THE RETENTION OF CLIENTS RECEIVING PRE-EXPOSURE PROPHYLAXIS IN ENGELA DISTRICT, NAMIBIA.].
2. The purpose of the study is to investigate factors influencing retention of clients on pre-exposure prophylaxis in Engela District.
3. No harm is anticipated from this study as you will be requested to complete the questionnaire on your own.
4. It is anticipated that the results of this study will help in the formulation of strategies that will improve retention in PrEP care, which will reduce HIV transmission in the population.
5. There will be no payment for participating in this study.
6. I have selected you to participate in my study, because you belong to the group of people I want to include for my research. I would therefore like to invite you to complete this questionnaire.
7. The research I am conducting has been approved by the UNAM Research Ethics Committee. I would appreciate it very much if you would complete this questionnaire, and I would like to assure you of the following:
    a. You do not have to fill in this questionnaire if you do not want to.
    b. You can stop filling in the questionnaire and stop participating at any time if you want to, and there will be no negative consequences for you.
    c. Your participation is completely anonymous. This means that, even if I ask information that might identify you or if I know you, I am not allowed to make your identity known to anyone. When I report on my questionnaires' data and results, I will not mention any personal information about participants that might identify them.
    d. All completed questionnaires and data will be stored in a safe and secure place, and only authorised University officials, my supervisor and I will have access to it. After five years, all the questionnaires and data will be destroyed in an environmentally friendly way.
8. If you have any questions about this questionnaire, or if you do not understand anything, please feel free to ask me, and I will be happy to explain it to you.
9. If you want to know more about the research I am doing, please feel free to ask me, and I will be happy to tell you more.
10. It should take about [15-20 minutes] for you to complete the questionnaire.
11. You can reach me on my cell phone at [+264816488094], or send an e-mail to [liisak984@gmail.com].

12. If you want to contact the UNAM Centre for Research Services for more information or because you have a comment or complaint about this research or about me, please call (+ 264 61) 206 4673, or write an e-mail to research@unam.na. Please provide specific information.
13. Thank you very much for your willingness to participate in this research!
14. Participant consent signature……Date……

Appendix 6: Informed consent form in Oshikwanyama

Ombapila yediminino

Omukufimbinga

15. Edina lange o Kosmas Kristiana, onomola dididiliko yange yokoshiputudilo oyo [200711326]. Ame omunafikola wo Masters mo Public Health moshiputudilo shopombada shaNamibia (UNAM).
16. Oha ndi ningi omapekaapeko kombinga yiinwefemo tai kalekepo ediinino mo ku longifa oPrEp mEngela mo Namibia.
17. Omapekaapeko aa itaa ka eta eehameko lonhumba ku keshe ou ta ka kufa ombinga osho yo, oku kufa ombinga momapekaapeko aa etokolo loye mwene no ito fininikwa.
18. Oidjemo yomapekaapeko aa oya teelelwa i ka kwafele mo ku eta po eenghendabala do ku yambulapo ediinino lelongifo loPrEp olo la teelelwa yo li hwepopaleke etandavelo lombuto yoHIV.
19. Ino teelelwa oku yandja nande oshimaliwa molwa ekufombinga momapekaapeko aa.
20. Owa hoololwa u kufe ombinga momapekaapeko aa no wa teelelwa u nyamukule omapulo e li mombapila yomapulo.
21. Omapekaapeko aa o adiminwa kokangudu komapeekaapeko komoshiputudilo shopombada shaNamibia (UNAM), onghene oto indilwa opo u kufe ombinga momapekaapeko aa.
    a. Ekufombinga momapekaapeko aa olopaliyambo lela no ita li fininikilwa omunhu.
    b. Keshe omukufimbinga e li hanga a tokola a kufe ombinga pehovelo ndele ta shendje omadilaadilo aye, ito handukilwa no ta efiwa a fiyepo ekufombinga momapekaapeko aa keshe efimbo eli a kwatwa komaliudo oukwatya ou.
    c. Omupekaapeki ota holeke ouyelele aushe womukufimbinga. Omukufimbinga keshe ita pulwa a holole edina laye nepulo ta li yandjwa o lina onomola ponhele yedina lomukufimbinga.
    d. Ouyelele wa yandjwa komukufimbinga ota u ka patelwa mepeko li li meshina lo ku topaatopa. Ombapila yomapulo omu mwa shangwa omanyamukulo komukufimbinga ota i ka patelwa mokakefa ndele omupekaapeki oye ashike ta dulu oku ka patulula.
22. Ngeenge ou na epulo lonhumba, manguluka u kwatafane naame.
23. Ngeene owa hala oku shiiva shihapu kombinga yepeekaapeko e li, manguluka u kwatafane naame.
24. Omapekaapeko aa o taa tengenekwa a kufe ominute omulongo nominute nhano fiyo ominute omilongo mbali (15-20).
25. Ohandi monika konomola +264816488094 ile ko liisak984@gmail.com
26. Oto dulu yoo oku kwatafana nokangudu komapekaapeko komoshiputudilo shopombada shaNamibia (UNAM) konomola +264 61 206 4673 ile ko research@unam.na
27. Tangi unene ke kufombinga loye momapekaapeko aa.
28. Eshainoke lomupekaapeki……Efiku……

Kufa ko epandja e li nde to kala na lo..

Penuna epandja la shikula ko nde to nyamukula amapulo.