



Research Paper

Assessment of Challenges faced by Students in Selected Tertiary Institutions in Lusaka, Zambia in Accessing Pre-exposure Prophylaxis Services: A Cross-Sectional Study

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DOI: <https://doi.org/10.5281/zenodo.11410533>

Abstract	Manuscript Information
<p>Background: Pre-exposure prophylaxis is an effective biomedical model in the prevention of HIV infection. However, low uptake and factors associated with non-use among eligible students in most settings are not clear. The aim of this study was to determine the prevalence of PrEP uptake and factors associated with non-use among students from selected tertiary institutions in Lusaka, Zambia.</p> <p>Methods: A structured questionnaire was administered to students at seven tertiary institutions in Lusaka between August 2020 and September 2021. A multi-variable logistic regression model was fitted to determine factors associated with non-use of PrEP. All statistical analyses were conducted using Stata version 16.</p> <p>Results: Overall, 425 questionnaires were given out but only 378 were returned giving 88.9% response rate. Most indicated that they had unprotected sex before 237(62.5%) and 293 (76.6%) were aware of PrEP. Multiple logistic regression analysis showed that participants who did not know eligibility criteria for PrEP were 23% more likely not to uptake PrEP compared to those that knew (adjusted odds ratio [aOR] = 1.23, 95% CI: 1.09 – 2.72; $p = 0.025$). Participants who did not know facilities that offer PrEP were 21% more likely not to have used PrEP compared to those who responded that they knew the facilities that offer PrEP (aOR = 1.21, 95% CI = 1.07 – 2.96; $p = 0.037$). Participants who did not know the benefits of PrEP were almost two and half times more likely not to uptake PrEP compared to those who knew the benefits (aOR = 2.49, 95% CI: 1.29 = 8.54; $p = 0.022$).</p> <p>Conclusion: The uptake of PrEP among students from selected institutions in Lusaka was low. Students should be made aware of the benefits and eligibility criteria of PrEP. Initiatives and efforts to heighten persistent uptake of PrEP among students may need a multi-factorial approach.</p>	<ul style="list-style-type: none"> ▪ ISSN No: 2583-7397 ▪ Received: 27-04-2024 ▪ Accepted: 25-05-2024 ▪ Published: 01-06-2024 ▪ IJCRM:3(3); 2024: 53-66 ▪ ©2024, All Rights Reserved ▪ Plagiarism Checked: Yes ▪ Peer Review Process: Yes <p>How to Cite this Manuscript</p> <p>Bright Musebo Makenzih, Patrick Kaonga, Eustarckio Kazonga. Assessment of Challenges faced by Students in Selected Tertiary Institutions in Lusaka, Zambia in Accessing Pre-exposure Prophylaxis Services: A Cross-Sectional Study. International Journal of Contemporary Research in Multidisciplinary.2024; 3(3): 53-66.</p>

KEYWORDS: Pre-exposure Prophylaxis, HIV/AIDS, Tertiary Institutions, PrEP Determinants

1. INTRODUCTION

Background: Pre-exposure prophylaxis (PrEP) for HIV prevention is safe and effective in reducing HIV incidence.

However, more evidence of PrEP knowledge, willingness and distribution preferences is required for scale-up among young people at-risk (Shamu, S *et al.*, 2021) ^[75]. The college

environment offers great opportunity for HIV high-risk behaviors, including unsafe sex and multiple partnerships. Oral pre-exposure prophylaxis (PrEP) is a critical intervention for HIV prevention among key populations (Olakunde B.O, *et al.*, 2024) [71]. However, little is known about its coverage among adolescent and young key populations while the overall incidence of HIV infection has seen some decline in recent years, rates of HIV infection among young adults have not seen a proportionate decline. As in the general population, African American young adults have been disproportionately affected by the HIV/AIDS epidemic (Adedeji.A *et al.*, 2009) [1]. Pre-Exposure Prophylaxis (PrEP) is the use of HIV Drugs before exposure to reduce chance of getting HIV (IPERGAY/WHO, 2016). In 2015, recognizing that the Pre-Exposure Prophylaxis (PrEP) has potential population-wide benefits, the World Health Organization (WHO) released new guidelines recommending that Pre-Prophylaxis (PrEP) should be offered as a choice to people who are at substantial risk of HIV infection as part of a combination HIV prevention programme (WHO, 2015). As of June 2018, 46 countries had regulatory approval for PrEP within their HIV policies: of these 39 had started implementation, a 40% increase from 2016, mostly in Europe and Africa (WHO, 2015).

The United Nations General Assembly's 2016, political declaration on HIV and AIDS including a commitment to provide three million people at higher risk of HIV infection with PrEP by 2020, however, by the end of 2017 only 350,000 people were on PrEP Despite having one of the highest burdens of Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) in Sub-Sahara Africa, Zambia has made progress towards reducing the devastating impact of HIV epidemic. In the last eight years, concerted efforts by main stake holders have resulted in a 27% decrease in new HIV infections and an 11% reduction of AIDS related deaths. However, Zambia's current progress towards the United Nations Program of HIV/AIDS (UNAIDS) 90-90-90 goals stands at 66-89-89 (WHO, 2016). Among pregnant women living with HIV, approximately 18% are not on antiretroviral therapy (ART), resulting in nearly 9,000 children infected by HIV from mother to child transmission in 2016, the annual incidence of HIV among adults aged 15 to 59 years in Zambia is 0.66%, 1.0% among females and 0.33% among males (ZAMPHIA, 2016). Prevalence of HIV among adults aged 15 to 59 years in Zambia is 12.3%, 14.9% among females and 9.5% among males. Interventions such as PrEP and community HIV epidemic control model (CHEC) necessary to identify the remaining 34% of the 1.2 million people living with HIV (PLHIV) as Zambia continuously seek novel approaches to stopping HIV infections. The aim of this study is to assess the attitude, awareness, utilization and factors associated with usage of pre-exposure prophylaxis (PrEP) in women of the reproductive age attending tertiary education in selected universities and colleges in Lusaka, Zambia.

Human Immunodeficiency Virus (HIV) remains a major public health challenge worldwide and a persistent risk to young people (Kimberly *et al.*, 2012) [25]. One-third of all new HIV infections

occur among people under age 30. Despite the efforts being put in place by WHO and the Ministry of Health in providing PrEP services in most health institutions across the country, most young people of the reproductive age in colleges and universities with multiple sexual partners still are not aware and are not able to prevent themselves from contracting HIV during their college life (Kimberly *et al.*, 2012) [25]. HIV acquisition remains high despite increased access to and initiation of antiretroviral therapy in sub-Saharan Africa according to the partners PrEP trial report. Therefore, it is important to find out the challenges being faced in accessing PrEP services among students at tertiary institutions.

2. GENERAL OBJECTIVES

To assess the challenges, awareness, utilization and factors associated with usage of pre-exposure prophylaxis (PrEP) in students attending tertiary education in selected colleges and universities.

3. SPECIFIC OBJECTIVES

1. To determine the Challenges and levels of awareness of Pre-Exposure Prophylaxis (PrEP) by students attending tertiary education in selected colleges and universities.
2. To evaluate the utilization of Pre-Exposure Prophylaxis (PrEP) by students attending tertiary education in colleges and universities.
3. To determine factors associated with utilization of Pre-Exposure Prophylaxis (PrEP) by students attending tertiary education in selected colleges and universities.

Research Question

What are the Challenges, level of awareness, utilization and what are the factors associated with the usage of Pre-Exposure Prophylaxis (PrEP) by students attending tertiary education in selected colleges and universities in Lusaka, Zambia?

4. LITERATURE REVIEW

Global Prevalence

The HIV epidemic has disproportionately affected the world's poorest and most disadvantaged regional populations such as the sub-Saharan Africa which accounts for more than 70% of the infections. In the year 2016, The Joint United Nations Programme on HIV/AIDS reported that in Eastern and Southern Africa which is considered as an epicenter of the prevalence and impact of HIV/AIDS is responsible for more than half (52.9%) of the people living with HIV globally, and accounts for 43% of all new infections (UNAIDS, 2017). The other region second to Eastern and Southern Africa is Latin American and the Caribbean which has an HIV burden of 2.1 million infections. Epidemiological data at country-level show that East and Southern parts of Africa have higher prevalence as well as negative impact such as lower number on treatment, morbidity and mortality compared with Western countries (UNAIDS, 2019).

Recently, there has been consented efforts in the fight against HIV infections worldwide but progress still remain a challenge

with a lot of significant disparities between the rich and poor, rural and urban areas especially in resource-poor settings. There are certain groups of individuals that are disproportionately burdened by HIV infection and remain at substantial increased risk of HIV infection such as MSM, female sex workers, intravenous drugs users. In resource-poor settings, women and young adolescent have significantly greater risk of HIV infection compared to the general population. For example, in Zambia the HIV prevalence among men is 9% compared to 15% among female and is higher in urban areas compared with rural areas. In Zambia, although the number of new HIV infections has been reported to slowly declining since the introduction of free ART, recently data still suggest there is still a lot to be done to achieve the 90-90-90 goal. The estimated annual new infection is at 3.9 incidence. (ECHO 2019). Further, the number of people living with HIV/AIDS in the Zambia is about 1.2 million and this may increase as people access treatment, prevention services and care due to these, people are able to live longer. (ZAMPHIA, 2016). The severity of the HIV/AIDS epidemic among college students has captured increasing attention of the Chinese government. Several interventions, including expanding the publicity of HIV/AIDS-related knowledge, sex and reproductive health education, making HIV testing more accessible on campuses, and offering adolescent peer education programmes on HIV/AIDS, have been taken to address the HIV epidemic on campus. However, the current interventions for preventing HIV/AIDS are not provided in all universities and are implemented ineffectively (Wei, L *et al.*, 2020)^[41].

Global and Regional Perspective

Globally, the HIV epidemic has disproportionately impacted key populations including pregnant women and their sexual partners (Choopanya *et al.*, 2009)^[15]. Regionally, pregnant and lactating in sub-Saharan Africa settings are at substantial risk of HIV acquisition and could benefit from pre-exposure Prophylaxis (PrEP) (Mofenson *et al.*, 2016). In addition, given available safely data, there does not appear to appear to be a safety-related rationale for prohibiting PrEP during pregnancy/lactating or for discontinuing PrEP in HIV-uninfected women receiving PrEP who become pregnant and are at continuing risk of HIV acquisition. (Baggalev, *et al.*, 2017). Nearly 80% of young women living with HIV susceptibility and a period of potential sexual Behavioural changes that may increase alter risk of HIV exposure. (Pintye *et al.*, 2016)^[57]. HIV prevention during pregnancy and breastfeeding is very important for prevention of HIV in women and infants, current guidelines recommend pre-exposure prophylaxis (PrEP) for individuals at high risk of HIV acquisition, including women of reproductive age and support continuation of PrEP in pregnant women. (Jillian *et al.*, 2016). A tool for assessing awareness of HIV prevention and risk during routine antenatal care could guide prioritization of women most likely to benefit from PrEP and other prevention strategies. (Pintye *et al.*, 2016)^[57].

Mothers' risk perceptions, risk behaviours and concerns of protecting unborn child during and after pregnancy may be powerful drivers of PrEP initiation and adherence, similar to

what was found in PMTCT programs. (Wagner *et al.*, 2014) however, the ongoing concern about taking medication during pregnancy, and beliefs about side effects among infants, may supersede women's concern about HIV acquisition. In this context, operations research is needed to determine how best to operationalize PrEP delivery to women who need it. Specifically, what cadre of providers should be trained to provide PrEP to pregnant women. (Drake *et al.*, 2014). Furthermore, Drake and colleagues suggested that PrEP efficacy requires adherence during periods of sexual activity and adherence requires PrEP access. Awareness and counselling. Currently, a major obstacle in the PrEP field is effective use, especially among women during at risk periods before periods of sexual activity. Little is known about how to successfully engage and retain period's women trying to conceive, as well as pregnant and breastfeeding women living in high burden settings in PrEP care, nor how to effectively support adherence and persistence to PrEP in this population. PrEP adherence in this population must be understood within the context of highly variable risk for HIV infection during pregnancy and breastfeeding. HIV/AIDS has become one of the most devastating diseases humanities has ever faced. It has become a major public health concern with about half of new infections occurring in young people. Sub-Saharan Africa, which has just over 10% of the world's population, remains the most seriously affected region. The impact of HIV/AIDS has caused much consternation among policy-makers as it threatens to erode socio-economic through its associated increase in morbidity and mortality of people in the productive age group (Asante, K.O and Oti-Boadi.M, 2013).

Novel approaches are needed to understand and evaluate provider and patient level barriers to the PrEP cascade in peri-conception, pregnancy and lactating periods in high HIV incident countries (Drake, *et al.*, 2014).

The World Health Organisation (WHO, 2015) set the threshold of ensuring PrEP availability where HIV incidence in 3 or more per 1000 Person Years. In communities where HIV incidence is lower than 3 per 1000 PY, it may make sense to target PrEP delivery to those at highest risk. (WHO, 2016). A recent study developed a risk score to predict maternal HIV acquisition in Kenya. For example, a risk score that is dependent on self-reported measures of behaviours may underestimate the true HIV acquisition risk, and not all women have insight into their partners' risk-taking behaviours (WHO, 2017). The generalizability of risk prediction methods requires careful consideration as part of future operations research to understand the role of targeting PrEP in different context. (WHO, 2017).

In sub-Saharan Africa, an estimated 7000 new HIV infections are occurring weekly in adolescent girls and young women. Further, adolescent girls have high pregnancy rates in a South Africa. Appropriately 1.6% of girl's 15-year-old, 3.7% of 16-year-old, and 7% of 17-year-old girls were pregnant in 2013 (partners PrEP trial). Prior studies have demonstrated significant challenges providing PrEP to pregnant and postpartum women are known, which makes pregnant and postpartum adolescents and young women a particular vulnerable group (WHO, 2016).

Operations research should include adolescent pregnant girls to evaluate predictors of PrEP initiation, retention and adherence among this particular population which may differ from adult pregnant and breastfeeding women. Including adolescent girls will increase the validity and generalizability of those interventions. Finally, it would be unethical to not provide adolescent girls and young women with PrEP and include them in PrEP studies (WHO, 2016). PrEP is a public health priority in settings of high HIV incidence (WHO, 2015). This is especially true during pre-conception, pregnancy and breastfeeding in Southern Africa where HIV incidence is high and the probability of vertical transmission is highest when women seroconvert and are viremic. In regions including Central Asia, Europe, North America, the Middle East and North Africa, new HIV infections in women and young women of key populations is often high and face tremendous challenges, including legal and social-culture issues related to societal attitudes about sexuality in youth, compounded by behaviours that are highly stigmatized (for example, same-sex, alcohol and drug use, teenage pregnancy), leading to increased vulnerability to HIV infection and considerable barriers to care including HIV testing and treatment service. These issues can also impede an appropriate public health response for these vulnerable populations, resulting in gaps in areas such as crucially needed epidemiologic surveillance across regions and vital research on how to address knowledge gaps concerning the care and treatment of HIV-affected young communities and use of PrEP (Choopanya *et al.*, 2009) ^[15].

Locally

Risk Factors for HIV

Age significantly increases the risk of HIV infection in Zambia. According to ZAMPHIA report, girls aged 15 – 24 years they have a higher prevalence compared to boys of the same age. In addition, people within this age group are at even higher risk if they practice condomless sex. Furthermore, having multiple partners or engaging in sexual acts under the influence of alcohol increase risk of both STI and HIV infection (CDC, 2016). Other risk factors of HIV can be social determinants of health which can predict and compound the impact of HIV transmission. For example, poor economic status, low income, low education and poor accessing health services are risks of getting HIV infection (Mayer *et al.*, 2014). Generally, HIV infection is higher among female sex workers and treatment of an HIV-infected partner reduces HIV transmission (Zhu *et al.*, 2015).

Advent of Antiviral Medication for HIV treatment

In the year 1996, brought advancement in the use of antiviral treatment of people living with HIV/AIDS (CDC, 2000). HIV treatment is one effective way of prevention of HIV infection and to slow or counter-act the spread of HIV pandemic. Recently, WHO recommended Test and Treat strategy which means that all HIV-infected individuals should be initiated on ART regardless of their CD4 cell count as soon as possible after testing HIV positive. This strategy is aimed at prevention of disease progression, limit transmission and improve clinical

outcomes (WHO, 2018). However, engaging many populations who especially those at greatest risk of HIV infection still is a major challenge to most HIV control strategies. (WHO, 2018). Many international organizations such as CDC and UNAIDS are determined to significantly reduce or even end HIV/AIDS using different approaches (WHO, 2018). It is against this background that some strategy in continuum of HIV care has been expanded even to include HIV-negative populations especially those at substantial risk of getting HIV. One such strategy that has emerged is a drug that has potential to protect HIV-negative people from acquiring HIV infection. This new biomedical HIV intervention is freely available in health care settings for individual to access (WHO, 2018). This approach to HIV infection prevention is not a vaccine but an antiretroviral and PrEP designed for individuals who are HIV-negative but at risk of being infected with HIV (WHO, 2016). PrEP is an approach to prevent HIV infection by taking oral “tenofovir daily, with or without emtricitabine,” and is reported to be protective and efficacious (Mayer *et al.*, 2016).

Utilization of PrEP

Currently, in many countries HIV care services do not capture PrEP utilization at national or health facility levels although there are attempts to fill this gap. This has been a challenge for most countries to have real-world data on the awareness and utilization of PrEP (Bien *et al.*, 2017). For example, Wu *et al.* (2017) assessed five years’ database for a health insurance and found that the data had records about many health issues including diagnoses, procedures, and prescriptions apart from demographics but no information about PrEP. The study recommended inclusion of PrEP which later studies reported an increase in the utilization of PrEP from 3.7% among female PrEP users to 18.6% although there were regional variations (Bush *et al.*, 2019). However, a commercial insurance limits the generalization of the findings.

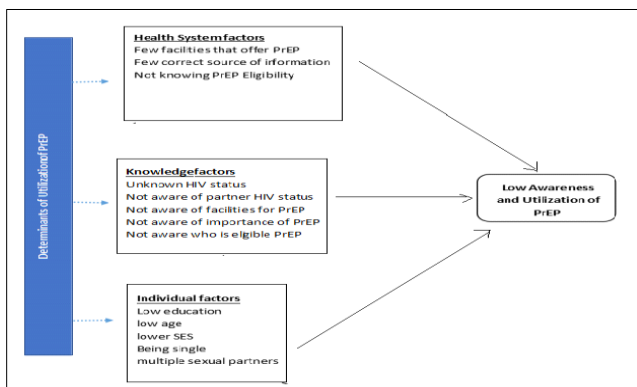
In many countries there has been regional variations in the utilization of PrEP as well as gender. Women have been disproportionately affected and utilization and awareness has consistently been lower compared to men. For example, in the USA a study reported average utilization of 26.9% with higher utilization in the Western and Southern of 31% and 30% while lower in the Northeast and Midwest regions of 21% and 17% respectively. Women accounted for 13.4% of PrEP users but 86% for men. One main challenge even among those that report utilization is the issue of adherence. Most studies have suggested that reported utilization does not equate to taking the medication (Laufer *et al.*, 2015). Some of the factors that has been reported to be associated with low awareness and utilization.

Johnson, *et al.*, 2012, like anyone else, adolescents and young adults have basic needs for food, shelter, education, family and social support and economic security (including work opportunities). They might also desire commodities (for example, fashionable clothes, jewellery, makeup, mobile phones) that enable them to attain a certain lifestyle and an enhanced social network. To meet both these needs and desires, adolescents and young adults sometimes engaged in partners’

selection behaviours that can increase the risk of HIV acquisition, including engaging in transactional sex or intergenerational sex (Stinson, *et al.*, 2012) [54]. The behaviours with their inherent problems such as power imbalance and intimate of HIV acquisition partner violence, can compound the risk. However, in generalized epidemic settings, where HIV risk is high, even sexual activity that does not involve these partner selection behaviours or psychosocial problems can result in HIV acquisition.

While the multiple factors that can make adolescents and young adults susceptible to HIV can and often do seem to occur together in a way that multiplies the likelihood of infection, these factors also provide important opportunities for interventions that mitigate the risk of HIV acquisition (Mlambo *et al.*, 2013) [38]. With appropriate planning and support, comprehensive HIV prevention programmes that include PrEP can offer substantial benefits to adolescents and young adults (Peltzer *et al.*, 2013) [72].

Figure 1: Conceptual framework



Source: Conceptualized by Authors (2023)

5. METHODOLOGY

Study design: This was a cross-sectional study design.

Study setting

The study was conducted from seven tertiary institutions in Lusaka namely University of Zambia (UNZA), University of Lusaka (UNILUS), Levy Mwanawasa Medical University (LMMU), Lusaka Apex Medical University (LAMU), Cavendish University, Rockview University and Evelyn Hone College. These are located in Lusaka City which has an approximate population of 3.5 million people (CSO, 2018). There are many public and private Universities and colleges in Lusaka but 7 were randomly selected. According to anecdotal data from the 7 tertiary institutions that were selected, the number of students at UNZA is about 30,000, about 7000 at UNILUS, 7500 LMMU, 5000 at Cavendish, 5000 at Rockview and 7000 at Evelyn Hone College.

Inclusion and Exclusion Criteria

Inclusion Criteria

1. Participants of 18 years or older
2. HIV-negative status

Exclusion Criteria

1. Those who were involved in another study
2. Not willingness to provide informed consent to participate in the study

Sample Size Determination

Our primary objective was to determine the prevalence of awareness and utilization of PrEP, and therefore, we used these to estimate the required sample size. Available data indicated that the proportion of students aware of PrEP service are not known and those who utilize the service are not known as well. Therefore, a default of 50% prevalence in both cases was used. Using prevalence formula:

n = sample size

z = 95% CI (1.96)

p = prevalence (50%) the default when the true prevalence is not known.

e = standard error (0.05)

Sample size = 385

It was assumed that a 10% non-response of missing data. With a statistical power of 80% at 5% level of significance. Since no previous similar study have been conducted in same setting, awareness and utilization was assumed to be 50% and therefore proportion of 0.5 was used in the sample size formula. A sample of 385 participants was calculated. Therefore, a total of 385 participants were recruited for this study.

Sampling

A systematic random sampling was used to select participants. Weighted sampling was done according to the total number of students in each institution during the study period. During sampling different Kth value were used for each site. The total expected number of students at the institution was divided by the sample size for each site to come up with the Kth value. Kth value was the interval used during the sampling. To determine the first participant, a random number was selected between 1 and Kth value and samples were then selected until the required sample was reached. A total sample size of 425 was recruited.

The source population was defined as student in any of the public and private tertiary institutions of higher learning in Lusaka between August 2020 and September 2021. From this source population, a cross-sectional study was conducted.

Measurement of Variables

The questionnaire assessed socio-demographic characteristics and knowledge related questions for awareness and utilization of PrEP. Outcome variables of interest were awareness and utilization of PrEP. Specifically, for awareness participants were asked,

- 1) "Before today, are you aware of PrEP?"
- 2) For utilization, participants were asked "Before today do you utilize PrEP?"

The collection demographic characteristics were informed by literature which included age, marital status, education level, employment status, residence religion, sexual partners and unprotected sex. Information on age was categorized to reflect what most studies conducted regarding PrEP awareness and use as well as local PrEP services. Education was recorded as the highest education level attended which was tertiary. Employment status was categorized as employed or not employed. For marital status, those married of cohabiting were classified as married and those are not married, widow or widower and divorced were categorized as not married. For residence, the categorization was based on Zambia Statistical Agency classification and it was categorized as urban and rural. Religion was categorized as whether a participant indicated that they were Christians or Muslims.

For question to assess knowledge regarding awareness and utilization participants were asked and were expected respond whether they know or not. Participants were asked

- 1) "As far as you know, before today do you your HIV status?"
- 2) As far as you know, before today do you know your sexual partner's HIV status?"
- 3) Are you aware that HIV can be prevented?"
- 4) Do you know correct HIV prevention methods? Participants were expected to mention at least any four correct methods to be considered that they know.
- 5) Do you know the correct source of PrEP?"
- 6) Do you know any health care facility that offer PrEP?"
- 7) Do you know who is eligible for PrEP?"
- 8) Have you had unprotected sex within 3-6 months?"
- 9) Do you know importance of PrEP? These questions were with "yes" or "no" responses.

Data collection

Two interviewers (research assistants) from each site were trained by the Principal Investigator (PI) in interview technique and research procedure. These interviewers were lecturers who were attending to students during their registration. After explaining the study's purpose, the interviewer asked the participants to sign a written informed consent form (Appendix III).

Then validate and reliable structured questionnaire was used to collect data. Data were collected from August 2021 to September 2021. A description of pre-exposure prophylaxis (PrEP) was provided to all participants to introduce the topic. The questions consisted of closed-ended questions regarding personal characteristics, challenges, awareness and utilisation of PrEP. Missing, inconsistent, or illogical information were clarified with notes and subsequently rectified. Only the PI was allowed to correct the information in the forms. An audit trail of data was kept of all data collection and data rectification. During data collection no participant exercised their right to withdraw from the study. The approximated time to answer the questionnaire was 20 minutes. After data collection, some random checks were conducted by the research assistants to help ensure completeness and accuracy of questionnaire.

Data management

The hard copy forms of the collected data were temporarily stored in an office accessible to the PI only. Data were entered into Epi-data (Epidata Association, Odense, Denmark), and this was done in order to check for logical errors, missing information, or incorrect coding could be automatically. Although basic data cleaning was largely handled by the Epi-data, data entry errors remained to be verified. Therefore, range checking, detection and handling of any missing data were performed on a daily basis as the data was being updated to maximize the completeness of data (WHO, 2008). Once data entry had been completed, it was de-identified and the resulting electronic dataset was securely stored in a password-protected computer by the PI.

Data analysis

Data from Epi-data was exported to Stata version 15 (Stata Corp., College Station, Texas, USA) for analysis. Frequency distributions for all categorical variables were created with their respective percentages. For all continuous variables were first tested for normality using Shapiro-Wilk test and were found to be not-normally distributed; and therefore, median and interquartile ranges (IQR) were reported for descriptive statistics. In all analyses, potential confounding variables and effect modifiers were considered. Descriptive statistical analyses were initially performed, followed by multivariate regression analysis. Specifically, characteristic variables that were not normally distributed between those who were utilizing PrEP and those who were not utilizing PrEP as well as those aware and not aware were compared using Mann-Whitney test. Chi-square test for categorical variables in situation where the assumption of a Chi-square test was met but if not, Fischer's exact test was used. Variables were tested for association with Utilization and awareness of PrEP. The association between each independent variable with awareness and utilization of PrEP was investigated using logistic regression models. Odds ratios and 95% CI for association between demographic and knowledge variables with awareness and utilization were presented. Potential confounding factors were considered based on prior knowledge and literature review. In the final analysis, multiple logistic regression models adjusting for all demographic characteristics were conducted to determine factors associated with awareness and non-utilization of PrEP. For all statistical analysis a p-value of <0.05 was considered significant.

Ethical Consideration

Ethical approval to conduct this study was obtained from the University of Lusaka School of Medicine & Health Sciences Research Ethics Committee Reference: IORG0010092/MPH19114700. Permission was obtained from Vice Chancellors and Principals from the respective institutions. Before data collection, participants were given information sheets and later signed an informed consent form. The study ensured that participants are aware of the purpose of the study so as to get their concern and participate freely. The statement of the research purpose, description of any potential risks or

discomforts, description of potential benefits and the description of confidentiality were explained to participants. No information regarding names of participants was obtained. The data set was handled with confidentiality and only used for purposes of this study. The data was not subject of undue prejudice.

6. RESULTS

Overview

Baseline demographic characteristic of the study participants

Overall, 425 questionnaires were distributed and 378 of them were returned giving a response rate of 88.9%. The median age of the participants was 22 years (interquartile range [IQR], 20 – 24). For gender, majority 209 (56.2%) were females almost everyone 363 (95.5%) was not employed and not married 355 (94.4%). A large proportion 340 (94.7%) of the participants were pursuing undergraduate programmes. For religious belonging, 168 (45.8%) were Pentecostals, 110 (29.9%) Protestants and only 11(3%) were Muslims. Furthermore, slightly over two-thirds 256 (67.2%) were from urban residential areas (Table 4.1).

Table 4.1: Baseline demographic characteristics of the students in selected tertiary institutions in Lusaka, Zambia, August 2021 (N= 378) institutions in Lusaka, Zambia, August 2021 (N= 378)

Characteristics	Median (IQR)	
Age in years, median (IQR)	22 (20 - 24)	
	Frequency	Percentage
Gender		
Male	163	43.8
Female	209	56.2
Employment status		
Employed	17	4.5
Not employed	363	95.5
Marital status		
Married	21	5.6
Not married	355	94.4
Study pursued		
Undergraduate	340	94.7
Post graduate	19	5.3
Religious belonging		
Catholic	78	21.3
Pentecostal	168	45.8
Protestants	110	29.9
Muslim	11	3
Residence		
Urban	256	67.2
Rural	125	32.8

IQR = Interquartile range

Characteristics of PrEP influencing factors among students from selected institutions in Lusaka

Predominately, participants reported that they had experienced unprotected sex before 237 (62.5%) but most 231 (63.9%) indicated that they did not have unprotected sex in the past 6 months. Majority 178 (54.6) of the sample responded that they knew their partner’s HIV status. Most 268 (81.7%) of the participants indicated that they have one sexual partner and about three-quarters 293 (76.7%) reported that they are aware of PrEP. Almost everyone 356 (94.7%) reported that they knew that PrEP can prevent HIV infection and 238 (62.6%) indicated that they

did know who is eligible for PrEP. Two-thirds 355 (67.9%) reported that they knew facilities that offer PrEP and more than half 218 (59.9%) responded that they would not recommend PrEP to someone (Table 4.2).

Table 4.2: Characteristics of PrEP influencing factors among students from selected institutions in Lusaka, Zambia, in August 2021 (N = 378).

Characteristics	19 (17 – 20)	
Age at first sexual debut (years), median (IQR)	19 (17 – 20)	
	Frequency	Percentage
Have you ever had unprotected sex before?		
Yes	237	62.5
No	142	37.5
Have you had unprotected sex in the past 6 months?		
Yes	130	36.1
No	231	63.9
Do you know your partner’s HIV status?		
Yes	178	54.6
No	148	45.4
How many sexual partners do you have?		
One	268	81.7
More than one	60	18.3
Are you aware of PrEP?		
Yes	293	76.7
No	89	23.3
Do you know PrEP can prevent HIV?		
Yes	356	94.7
No	20	5.3
Do you know who is eligible for PrEP?		
Yes	142	37.4
No	238	62.6
Do you know any facility that offer PrEP?		
Yes	122	32.1
No	355	67.9
Would recommend PrEP to someone?		
Yes	158	42.1
No	218	59.9

IQR = interquartile range

Prevalence of PrEP Uptake

In this study non-use of PrEP was 300 (79.4%; 95% CI: 76.2 – 84.2%) while uptake was 78(20.6%) as shown in Table 4.3.

Table 4.3: Prevalence of non-use of PrEP among students from selected tertiary institutions in Lusaka Zambia, August 2021 (N = 378).

Characteristic	Frequency	Percentage	95% CI
Uptake of PrEP	78	20.6%	15.8 – 23.6
Non- Uptake	300	79.4%	76.1 – 84.1

Association between demographic characteristics and non-use of PrEP among students from selected tertiary institutions in Lusaka, Zambia

There was no median difference between participants who had used PrEP before compared to those who reported never to use PrEP ($p = 0.309$). Among female participants, more were likely to never used PrEP compared to those who had used PrEP before (55.3% vs. 52.1%). There was almost an equal proportion of

participants who were not employed (93.2% vs 94.7%) and married (5.9% vs 5.7%) among those who had used PrEP before compared to those who had never used before respectively. Moreover, those who never used PrEP reported more postgraduate students than did those who had used PrEP before (5.3% vs 4.1%) but not significant. A significantly greater proportion of Muslims were reported among those who never used PrEP than those who used before (30.0% vs 21.9%, $p = 0.043$). More rural participants were found among those who had used PrEP than never used before (36.9% vs 30.7%) as shown in table 4.3.

Table 4.3: Association between demographic characteristics and non-use of PrEP among students from selected tertiary institutions in Lusaka, Zambia, August 2021 (N= 378).

Characteristics	Used PrEP before (N=78)	Never used PrEP (N=300)	P-value
Age in years, median (IQR)	22 (20 – 24)	22 (20 – 24)	0.329
Gender			
Male	35 (47.9)	123 (41.7)	0.309
Female	38 (52.1)	166 (55.3)	
Employment status			
Employed	4 (5.5)	13 (4.3)	0.922
Not employed	68 (93.2)	284 (94.7)	
Marital status			
Not Married	66 (90.4)	278 (92.7)	0.619
Married	4 (5.9)	17 (5.7)	
Study pursued			
Undergraduate	66 (90.4)	263 (87.7)	0.754
Post graduate	3 (4.1)	16 (5.3)	
Religious belonging			
Catholic	13 (17.8)	65 (21.7)	0.047
Pentecostal	4 (5.5)	6 (2.0)	
Protestants	38 (52.1)	126 (42.0)	
Muslim	16 (21.9)	90 (30.0)	
Residence			
Urban	45 (61.6)	206 (68.7)	0.398
Rural	27 (36.9)	92 (30.7)	

IQR = Interquartile range

Association between characteristics of PrEP influencing factors and PrEP uptake among students from selected institutions in Lusaka

Those who never used PrEP reported fewer experience of unprotected sex (61.0% vs 64.4%), unprotected sex in the last six months (35.4% vs 39.7%) and significantly knew their partner’s HIV status (61.1% vs 72.1%, $p = 0.038$) than did those who had used PrEP before respectively. For the variable for number of current sexual partners the proportion were similar except that there was a higher proportion of those who responded that they had no sexual partners among the ones that had PrEP uptake compared to those that did not (3.8% vs 3.1%) but no significant. Those that were aware of PrEP, a significant higher proportion was among those that had used PrEP before compared to those that had never used PrEP before (87.7% vs 24.6%; $p = 0.16$). Similarly, a higher proportion of participants who knew that PrEP can prevent HIV was those that used PrEP before than among those that had never used PrEP before (84.9% vs 67.6%). Furthermore, participants who responded that they knew PrEP

eligibility criteria, knew PrEP facilities, knew importance of PrEP and would recommend to someone, worried about PrEP safety and PrEP had benefits were more among those who had used PrEP before than those who had never used PrEP before (54.9 vs 32.6%, 47.2 vs 27.2%, 91.3 vs 67.1%, 93.5% vs 83.5% and 90.1% vs 67.1%) respectively as shown in Table 4.5.

Table 4.5: Association between characteristics of PrEP influencing factors and PrEP uptake among students from selected institutions in Lusaka, Zambia (N = 378).

Characteristics	Used PrEP before (N=78)	Never Used PrEP (300)	P-value
Age at first sexual debut (years)			
Have you ever had unprotected sex before?			
Yes	47 (64.4)	183 (61.0)	0.978
No	25 (34.3)	113 (37.7)	
Have you had unprotected sex in the past 6 months?			
Yes	29 (39.7)	99 (35.4)	0.346
No	41 (56.2)	181 (64.6)	
Do you know your partner’s HIV status?			
Yes	49 (72.1)	165 (61.1)	0.038
No	19 (27.9)	105 (38.9)	
Number of current sexual partners?			
Do not have	3 (3.8)	8 (3.1)	0.832
One	62 (79.5)	208 (79.4)	
More than one	13 (16.7)	46 (17.6)	
Aware of PrEP			
Yes	64 (87.7)	222 (24.5)	0.016
No	9 (12.3)	76 (25.5)	
Do you know PrEP can prevent HIV?			
Yes	62 (84.9)	198 (67.6)	0.003
No	11 (15.1)	95 (32.4)	
Do you know who is eligible for PrEP?			
Yes	39 (54.9)	97 (32.6)	<0.001
No	32 (45.1)	201 (67.5)	
Do you know any facility that offer PrEP?			
Yes	34 (47.2)	82 (27.6)	0.002
No	38 (52.8)	215 (72.4)	
If you knew the importance of PrEP would you recommend it to someone?			
Yes	65 (91.3)	194 (67.1)	<0.001
No	8 (10.9)	95 (32.9)	
Worried about PrEP safety?			
Yes	58 (93.5)	217 (83.5)	0.043
No	4 (6.5)	43 (16.5)	
Is PrEP beneficial?			
Yes	64 (90.1)	104 (67.1)	<0.001
No	7 (9.9)	51 (32.9)	

PrEP = Pre-exposure prophylaxis

Multivariable regression model for factors associated with non-use of PrEP among Students from selected tertiary institutions in Lusaka Zambia

In multivariable regression analysis, participants who did not know eligibility for PrEP were 23% more likely not to uptake

PrEP compared to those who knew the eligibility criteria (adjusted odds ratio [aOR] = 1.23, 95% CI: 1.09 – 2.72; $p = 0.025$). Participants who did not know facilities that offer PrEP were 21% more likely not to have used PrEP compared to those who responded that they knew the facilities that offer PrEP (aOR = 1.21, 95% CI = 1.07 – 2.96; $p = 0.037$). Similarly, those who did not know the importance of PrEP were 86% more likely not to uptake PrEP compared to those who knew the importance of PrEP (aOR = 1.86, 95% CI: 1.38 – 6.41; $p = 0.013$). Likewise, participants who did not know the benefits of PrEP were almost two and half times more likely not to uptake PrEP compared to those who knew the benefits (aOR = 2.49, 95% CI: 1.29 – 8.54; $p = 0.022$) as shown in Table 4.6.

Table 4:6 Multivariable regression analysis for the factors associated with non-use of PrEP among students from selected tertiary institutions in Lusaka, Zambia (N=378)

Characteristic	Odds ratio	95% CI	p-value
Religious belonging	Ref		
Catholic	0.13	0.119	0.01 – 1.68
Pentecostal	0.96	0.948	0.36 – 2.59
Muslim	1.85	0.296	0.58 – 5.94
Aware of PrEP	Ref		
Yes	0.41	0.11	– 0.197
No	0.41	1.58	
Do you know PrEP can prevent HIV?	Ref		
Yes	1.15	0.59	– 0.319
No	1.15	2.09	
Do you know who is eligible for PrEP?	Ref		
Yes	1.23	1.09	– 0.025
No	1.23	2.72	
Do you know any facility that offer PrEP?	Ref		
Yes	1.21	1.07	– 0.037
No	1.21	2.96	
If you knew the importance of PrEP would you recommend it to someone?	Ref		
Yes	1.86	1.38	– 0.013
No	1.86	6.41	
Are worried about PrEP safety?	Ref		
Yes	1.01	0.76	– 0.532
No	1.01	2.71	
Is PrEP beneficial?	Ref		
Yes	2.49	1.29	– 0.022
No	2.49	8.54	

aOR = adjusted odds ratio; CI = Confidence interval; PrEP = Pre-exposure prophylaxis; Ref = reference category; HIV = Human immunodeficiency virus

7. DISCUSSION

Overview of the findings

The main aim of this study was to examine the uptake and factors associated with non-use of PrEP among students from selected tertiary institutions of learning in Lusaka, Zambia. When the socio-demographics characteristics were examined, the results showed that there was no sufficient evidence of association between the explanatory variables and PrEP uptake. However, multiple regression analysis was conducted after controlling for

the demographic variables revealed that not knowing the importance of PrEP, facilities that offer PrEP, benefits and eligibility criteria of PrEP were all significant associated with non-uptake of PrEP.

In the current study, those who responded that PrEP is not important had increased odds of not using PrEP. The findings from this study suggests insight into multiple possible factors that maybe interrelated to PrEP uptake among students in tertiary institutions of learning in Lusaka. The observed low levels of PrEP uptake (20.6%) are in keeping with other population-specific studies and suggest that substantial work and effort remains if the full benefits of PrEP are to be achieved (Mayer and Krakower, 2015) [26]. The current study gives significant information on the need to scale-up PrEP uptake among eligible specific group of young adults (age 18 – 35 years) and factors associated with non-use among a student-based sample which a critical important target group especially for PrEP implementation efforts. According to Centre for Diseases Control (CDC), young adults are the highest group at risk for new HIV infection and therefore should be the prime targeted for HIV prevention-based interventions (CDC, 2018).

Although results from the demographic variables showed overall non-significance association with PrEP uptake, other studies that shown that education level is significant determinant of PrEP uptake (Perez-Figueroa *et al.*, 2017). Those with higher education are more likely to use PrEP compared to those who had less education (Eaton *et al.*, 2017) [17]. This study did not observe the difference since the two groups of students were both in the tertiary education category which other studies included other categories such as primary and secondary which potential creates a big difference (Ododo, 2015). Other studies have reported that higher education level is associated with higher likelihood PrEP uptake. It is assumed that the association higher knowledge obtained, power, and other benefits or education such as social networking which has the potential to protect an individual’s health and increase the sound decision making power (Phelan and Link, 2013) [31].

While not a lot of studies have assessed relationship between religious belief and uptake of PrEP, a few studies have demonstrated that spirituality, have negatively affected the uptake PrEP of people (Favazza, 2013; March and Gong, 2005) [19, 34]. It assumed that uptake of PrEP has a negative connotation and may mean that an individual is involved in promiscuous sexual activity (March and Gong, 2005) [34]. While everyone in this study indicated that they had religious belonging and majority were Christians (97%) with different denominations, there was no enough evidence to suggest that it influenced PrEP uptake. The median age of the participants was 22 years which could suggest younger age and give insight to these findings. Religious beliefs can sometimes influence uptake of PrEP both negatively and positively. For example, In USA a study assessed spirituality among Latinos across different age groups and reported that young people were more detached from religious institutions than older ones but there was not association with PrEP uptake (Martinez and Lipka, 2014). In line with previous studies (Holloway *et al.*, 2017; Kuhns *et al.*, 2017;

Marks *et al.*, 2017) [22, 27, 35], suggested that social demographic characteristics may not be good determinants of PrEP uptake but probably proximal indicators related to HIV risk are much better. In terms of improving uptake of PrEP among students it seems like there is need to connect them to HIV testing services and obtain information about PrEP since this study enrolled only those who are HIV negative indicating that they once did HIV test even if overall uptake of PrEP is low. Also, the finding that majority knew the HIV status of their sexual partners, it affirms to the fact that they are concerned about HIV and therefore presents a window of opportunity to intervene HIV acquisition through PrEP. The low PrEP uptake in the current study underscores the significance of linking students to HIV testing sites as one possible strategy to capture most of them into PrEP services. The HIV testing sites may serve as frontline points in the HIV infection prevention especially among young people such as students, and can be potential effective points to initial PrEP. Efforts to improve PrEP uptake should probably fully be incorporated with the HIV testing cascade and information as well as counseling about PrEP. Though a higher proportion of students were aware of PrEP, most of them were non-PrEP users. There is extant literature regarding barriers to PrEP uptake in different special populations such as men who have sex with men, doubts regarding PrEP safety and efficacy were significant hindrances (Barreras *et al.*, 2019; Brooks *et al.*, 2018; Leluti-Weinberger and Golab, 2016) [8,12,30] as were anxieties surrounding potential side-effects and cost (Auerbach *et al.*, 2015; Brooks *et al.*, 2018) [2, 12]. Prior studies have reported the positive and significant correlations between sexual activity and behavior with PrEP uptake (Brooks *et al.*, 2018) [12] whereas higher perceived HIV risk of HIV infection may result in higher use of PrEP. It is the perceived higher risk behavior which accelerates the need to explore effective intervention in future to reduce HIV acquisition. To the contrary, this study found low PrEP usage despite most students reporting that they have been involved in unprotected sex and sexual partners. Some strategies such as social support, student community engagements, intention motivation and improve attitude towards PrEP should be promoted among students which may increase PrEP uptake. This PrEP study among students from tertiary institutions may suggest what other studies have proposed that in order to enhance PrEP uptake peer support and other social support groups as well as family can play a positive role in encouraging individuals at risk of HIV infection to uptake PrEP as a preventive strategic (Martins *et al.*, 2019). In the Chi-square analysis, the non-significant findings of number of sexual partners and having unprotected with PrEP uptake may suggest the presence of different hidden factors might be at play to influence the association since this has been demonstrated in other studies as important drivers for PrEP initiation (Shrestha *et al.*, 2017) [74]. Multiple notable factors associated with current uptake of PrEP were observed. To begin, regarding PrEP as not important was associated with non-uptake of PrEP. Although is not known why considering PrEP as not important is associated with non-PrEP uptake, one plausible explanation could be that information sharing is low with the students. This information could be side

effects, psychological, effectiveness and emotional concerning the taking of PrEP (Eaton *et al.*, 2017) [17]. Furthermore, some studies have reported that one possibility for low uptake of PrEP could be due to stigma that may exist around students taking PrEP i.e. that its use is may be seen in a negative manner with frequently engaging in sexual activities or actually misinterpreted as being HIV positive (Finlayson *et al.*, 2017) [20]. This could be due negative messaging around PrEP uptake. For example, a qualitative study in USA among Men who have sex with Men (MSM) reported that more than three-quarters of the participants were aware of PrEP but less than a quarter were on PrEP and suggested that there was a lot of stigma surrounding it. Those who were on PrEP were regards as overly promiscuous and were considered those who want unprotected sex (Elopre *et al.*, 2016) [18].

It is surprising that majority reported that they had unprotected sex before when most of them knew how to prevent HIV infection but low PrEP uptake. This could further suggest that PrEP is not reaching those who are in need and research is justified to evaluate plausible reasons for low PrEP uptake. The current study showed that not knowing facilities that offer PrEP was associated with low PrEP uptake. Regarding the facilities that offer PrEP, a number of studies have suggested ways to access PrEP services for easy access which calls for greater need for social sciences and community engagement research to inform effective implementation strategies (Eaton *et al.*, 2017) [17]. A number of methodologies have been suggested how to access PrEP. Specifically, multiple efforts in the scale-up of PrEP uptake as key driving force but also some psychological and social realities aspects should be considered such as messaging, location of service areas, entry points into the service, population groups to be serviced and sustained care engagement.

Some studies have reported that when participants do not know the importance or need for PrEP they are less likely to uptake. For example, such findings have been observed in other observational studies in Australia and USA where is was reported that respondents who did not know the importance of PrEP are likely not to utilize PrEP (Krakower *et al.*, 2012; Gamarel *et al.*, 2015) [26, 21]. Furthermore, in keeping with this study other studies have reported similar finding between importance of PrEP and its uptake (Driessen *et al.*, 2011; Wetta *et al.*, 2013). Despite of consistent findings between this and others studies, study designs are different. This was a cross-sectional while the Australian study was a cohort study and therefore it could probably report on causality. One plausible explanation why not knowing or understanding the important of PrEP could lead to non-use of the PrEP could be due to less informed students are likely to attach little or no importance to the HIV biomedical intervention of PrEP resulting into non-use even if the service is available and effective against HIV prevention. These ideas have been shared by other in similar studies (Liu *et al.* 2014; Eaton *et al.*, 2017) [32, 17].

In order to promote PrEP, among students from tertiary institutions of Lusaka, it would probably help by introduction topic HIV prevention including PrEP in their curriculum of as

modules. However, in some cases where at the time when PrEP intervention there was no much information in the general public or specifically to young people such as students, it becomes difficult for to trust or appreciate the importance of PrEP especially when there is fear or uncertainly with regards to PrEP which could ultimately leads to low uptake (Hastie & Fahy 2009; Saxton *et al.* 2014; Stables & Rankin 2005)^[51]. In keeping with this study, low uptake of PrEP has been reported in different populations. For example, in this study since majority of the students reported at least had a sexual partner, HIV negative and exposed to sexual activity, this suggests that they were eligible for PrEP and it presents as a window of opportunity for an effective biomedical intervention to prevent these students from HIV infection. Based on the reported sexual activity, rapid promotion and initiation of PrEP in this sample is important and mirrors others special populations such as Men having Sex with Men where large-scale PrEP implementation have been shown to be necessary due to high sex activity (Murnane *et al.*, 2013)^[36]. In this study maybe the issue of unequal access to PrEP compare to other populations is possible since majority of the students reported that they did not know facilities that offer PrEP. Despite the access issue, young adults in most settings have been shown to be less likely to initiate PrEP even when is readily available (Eaton *et al.*, 2017)^[17]. This study may present an opportunity to reinforce the importance of strengthening student communities and social connections among various higher learning institutions not only on academic issues but also on how to prevent HIV acquisition which may increase PrEP uptake. Another strategy which has been shown to work in other social groups is the Decision of Innovation Theory which suggests that information tend to spread faster where there are network connections among individuals who are similar and, in this study, student is similar in many ways. Therefore, PrEP implementers can take advantage of student connections and engage them in PrEP which is an effective biomedical intervention to prevent HIV infection. In this study, students that responded that PrEP cannot prevent HIV infection were less likely to use PrEP.

Limitations of the Study

It is worth noting the limitations in this study. First, in the current study one main constraints is reliance on self-reported HIV status by the participants. Further, adherence to PrEP for those who initiated was not assessed so the question of effective to prevent HIV infection in this particular sample population could arise and cannot be answered. Even with these limitations in mind, it is important to assess how PrEP uptake unfolds in a naturalistic setting especially among these young adults who are at greater risk of HIV acquisition. Second, students were surveyed from selected number of tertiary institutions within Lusaka and therefore may not be representative of the larger population of students. Third, being a cross-sectional study, it impedes any inferences of causation between study outcome and explanatory variables. Fourth, the sample sizes across institutions varied and this may suggest that results related to PrEP uptake and factors associated with non-PrEP uptake may have been affected.

8. CONCLUSION

PrEP continues to appear as one of the effective biomedical intervention HIV prevention toolboxes. In this study PrEP uptake among students was 20.6%. Although majority of students had experienced unprotected sex, had sexual partners and were aware of PrEP, the uptake was low. The factors that were associated with not initiating PrEP were: not knowing facilities, importance, benefits of PrEP as well as eligibility criteria for PrEP. Initiatives and efforts to heighten and persistent uptake of PrEP among students in selected tertiary institutions of learning may need a multi-factorial faceted approach and tailored.

9. RECOMMENDATIONS

Taking into consideration that the specific characteristics of the sample participants, majority unemployed, have sexual partners and low PrEP uptake, the recommendation is that future researchers should examine more diverse samples using a prospective cohort design to determine whether and why students decide to use or not use PrEP. Also, future researchers could focus on other geographical areas other than Lusaka to determine whether other students from other areas have other factors that influence PrEP uptake. In addition, researchers should assess why students were not regarding PrEP as important factor in HIV prevention to better get a sense of whether this due to not being informed about PrEP. Furthermore, studies could try and replicate this study using a larger and more diverse sample of the general population to enhance generalizability.

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