KNOWLEDGE LEVEL ON TREATMENT-AS-PREVENTION AMONG HIV SERO-POSITIVE ADULTS ON ANTIRETROVIRAL THERAPY IN THREE HEALTH FACILITIES OF LUSAKA DISTRICT IN ZAMBIA.

By

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The University of Zambia,

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DECLARATION

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CERTIFICATE OF APPROVAL

This dissertation of Fredrick Ngwenya has been approved as partial fulfilment of the requirements for the award of Master of Public Health in Population Studies by the University of Zambia.

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Knowledge Level on Treatment-As-Prevention among HIV Sero-Positive Adults on Antiretroviral Therapy in Three Health Facilities of Lusaka District in Zambia.

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ABSTRACT

Background: Knowledge on treatment-as-prevention is envisioned as a motivation intervention for optimal adherence to antiretroviral therapy (ART) and attainment of viral load (VL) suppression. Thereby averting sexual transmission of new HIV infections. Hence, the study assessed knowledge on treatment-as-prevention among people living with HIV (PLHIV) on ART, and the factors associated with knowledge on TasP in Lusaka district of Zambia.

Methods: A cross sectional study design was used concurrently with in-depth interviews (IDIs) between December 2018 and January 2019. Kalingalinga, Chipata, and Chilenje public health facilities were selected for data collection due to short turnaround time of VL test results. The 63.4% prevalence of suppressed VL in Lusaka Province was used to calculate the sample size of 362 respondents by applying the single proportion formula. The sample was apportioned to the study sites using probability proportional to size. The simple random technique was used to select respondents aged 18-59 years-old and on ART for over nine months. Stata version 14 was used to analyse quantitative data. Reported frequencies, proportions, confidence intervals (CIs), and p-values using chi square tests. In the multivariate binary logistic regression, unadjusted odds ratio and adjusted odds ratio (aOR) with CIs and p-values were reported. Followed up 55 participants for IDIs drawn from 362 respondents. The selection was varied based on VL levels. Microsoft office word was used to write up hand written interviews, informal observation notes, and to transcribe audio-recorded interviews. Notes and transcripts were combined and analysed thematically. Convergent and divergent quantitative and qualitative findings were merged in the discussion.

Results: Of the 362 PLHIV on ART : (a) 125 (34.5%, 95% CI: 9.14 to 42.9, p < 0.01) reported having knowledge on treatment-as-prevention, (b) there was less than 50% difference in knowledge across the statistically significant social – demographic variables with p < 0.5, (c) 102 (28.2%) knew had suppressed VL, 10 (2.8%) knew had unsuppressed VL and 250 (69.0%) did not know their VL test rests, and (d) those with unsuppressed VLs were (aOR=2.65, 95% CI: 1.29 to 5.42, p < 0.01) associated with knowledge on TasP compared to those with suppressed VLs. While the facilitators for knowledge on treatment-as-prevention were: (1) ssources of knowledge including friends on ART, learning by being in a discordant relationship, self-taught through internet, radio, health care providers, and through enhanced adherence counseling especially among those with unsuppressed VL, and (2) benefits of 'treatment-as-prevention' consisting of reduced stigma and worry-free sexual relationship due to negligible risk to infect partner. The barriers comprised: (1) inadequate literacy on VL and its implication on HIV transmission but with more emphasis on CD4 count literacy, (2) waiting time affected follow up of VL results and to attend literacy sessions, (3) extended fast track short-visits limited interaction with literacy sessions, and (4) undetectable VL is perceived transmittable.

Conclusion: The findings imply that by increasing knowledge level on TasP among PLHIV on ART and addressing barriers of waiting time and extended fast track short-visits could motivate optimal adherence to ART and avert VL rebounds.

Key Terms: Treatment-as-prevention, Knowledge level, Viral Load, Antiretroviral, HIV Positive, Sexual transmission, Lusaka, and Adults

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DEDICATION

I dedicate the dissertation to my ever supporting and lovely wife Kachana Chungwe, my awesome boys Besa and Chileshe Mulenga-Ngwenya. Your relentless encouragement and patience throughout my study has seen me this far.

Lastly and not the least, to God Almighty, in supplication I say thank you for the strength, and for exposing me to different lessons in life to do this work to the best of my abilities.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES, MAPS AND ILLUSTRATIONS

LIST OF ABBREVIATIONS AND ACRONYMS

AIDS   Acquired Immuno Deficiency Syndrome

PLHIV   Person or People Living With HIV

ART   Antiretroviral Therapy

CD 4   Cluster of Differentiation 4

CSO   Central Statistics Office

HTC   HIV Testing and Counselling

HIV   Human Immuno-deficiency Virus

HPTN   HIV Prevention Trial Network

ICF   Informed Consent Form

LMIC   Low and Middle Income Countries

PEP   Post Exposure Prevention

PMTCT   Prevention of Mother To Child Transmission

PrEP   Pre Exposure Prevention

PHIA   Population-based HIV Impact Assessment

TasP   Treatment as Prevention

ZDHS   Zambia Demographic and Health Survey

ZAMPHIA   Zambia Population-based HIV Impact Assessment

OPERATIONAL DEFINITIONS OF TERMS

Adherence- it is an extent, to which an individual-patient who is HIV sero-positive consistently takes antiretroviral therapy regimen drugs accordingly as prescribed by a healthcare provider with optimal compliance above 95%.

Antiretroviral therapy – it is the treatment and care provided to an HIV sero-positive individual-patient using a combination of prescribed antiretroviral drugs.

Factors - one of the several psychological, social and economic things that could influence how an individual-patient takes or adheres to the ART regimen.

Knowledge level on 'Treatment as Prevention'- is whether the sero HIV positive individual on ART has knowledge or no knowledge on the benefit of attaining viral load suppression with the aim of preventing HIV transmission to a sexual partner.

Sub-optimal adherence – It is individual's failure (estimated at below 95%) to follow the taking of prescribed ART drugs to an extent to which HIV sero-positive individual-patient's viral load suppression is lost.

Loss-to-follow-up – a sero-positive individual-patient's disengagement from care and cannot be traced by the ART healthcare providers for continuity of treatment and care.

Sero-positive – an HIV status showing the presence of HIV viruses/infection in the blood/body of an individual-patient detected before initiation of antiretroviral therapy.

Viral load - it is the amount/level of virus in the blood of an individual-patient after testing for viral load volume.

Viral load suppression - it is the amount of HIV viruses at/below 1000 per cubic millilitre in an HIV sero-positive individual-patient's blood/body upon testing for viral load.

CHAPTER ONE: BACKGROUND

1.0. Introduction

The chapter gives the background of the study, by explaining the three ninety-percent goal which is the campaign to halt the spread of HIV and ending AIDS by 2030. Then explains the knowledge of antiretroviral therapy (ART) with regards to HIV treatment and prevention. This is followed by describing the evidence on knowledge on treatment-as-prevention (TasP) in relation to the three ninety goals and the knowledge on ART. The statement of the problem and the justification of the research follows, and it ends with the knowledge translation theory, and the conceptual framework.

1.1. The three ninety percent goals

The number of people receiving antiretroviral therapy (ART) in sub-Sahara Africa (SSA) increased from 9.7 million by 2012 to more than 19 million in 2016 (Maartens, Celum and Lewin 2014) and (Arpadi *et al* 2017) respectively. Thus, reduced HIV related deaths to 51% by 2017 (United Nations Joint Programme on HIV/AIDS (UNAIDS 2018). The nisus are now focused on reducing the occurrence of new HIV infections by achieving universal viral load suppression. However, despite ART becoming relatively available to attain that, recent data shows that the pace of decline in new infections is too slow (UNAIDS 2018). Global HIV/AIDS campaigns target ninety percent (90%) of people on ART to achieve viral suppression by 2020 (Orne-Gliemann *et al* 2015). By attaining ninety percent (90%) viral suppression among people on ART, this will halt new HIV infections, thereby ending the AIDS epidemic by 2030 (Papworth *et al* 2013).

1.2. Knowledge on ART

Some analyst have observed that knowledge on ART has been gradually increasing (Gouse *et al* 2017). Kasumu (2014) also observed that the knowledge on ART increased particularly among the educated populations and adherence counseling as the main form of education on ART. Recent qualitative findings by Horter et al (2019) assert that the combination of viral load awareness, and knowledge on the effects of ART could motivate ART adherence thereby averting new HIV infections.

In recent years, other analysts agreed that treatment-as-prevention (TasP) is a promising intervention to end the HIV epidemic in combination with attitude and behavioral intervention (Pillay *et al* 2015). The UNAIDS describe TasP with a slogan as "undetectable HIV viral load is untransmittable" (UNAIDS 2016). TasP reduces the risk of HIV transmission to a negative partner by over ninety-six percent (96%), as evidenced in the HIV Prevention Trial Network

(HPTN) 052 study that involved HIV discordant couples indicate where (Hosseinipour *et a* 2011).

The primary purpose of ART is to treat HIV/AIDS in order to improve health and extend a person's lifespan , while preventing new HIV infections by attaining VL suppression has been stated as the secondary benefit of ART (UNAIDS 2018). A person with viral load volume of 1000 copies of HIV per milliliter or below reduces the chances of infecting their sexual partner. Viral load volume test is the gold standard measure of HIV treatment outcomes as opposed to Cluster Differentiation (CD) 4 cell count (UNAIDS 2016). Thus, in 2015 the World Health Organization (WHO) and national governments adapted guidelines to put on ART treatment every individual that tested HIV positive. The guidelines are premised on expanding access to ART services in order to suppress VL and sustain health so as to prevent further spread of HIV (ASHM 2015).

1.3. Evidence of knowledge on treatment-as-prevention

There is limited literature indicating whether improved knowledge on ART means improved knowledge on TasP of HIV through sexual transmission (Baggaley *et al* 2016). However, there is some evidence showing expanded knowledge on TasP through the elimination of mother to child transmission of HIV (Option B plus), post-exposure prophylaxis and prep-exposure prophylaxis interventions (Hayes, Sabapathy and Fidler 2011; Han et al 2019).

Bond and colleagues (2016) revealed that knowledge on TasP is not adequate. People start ART not to prevent new HIV infection but to restore health and maintain social responsibilities to their household members and their social network (Bond *et al.*, 2016a). In addition, there is limited literature showing TasP as the motivation factor to ART adherence and viral load suppression (Baggaley *et al* 2016). This gap of knowledge on TasP must be assessed. Thus, Killingo, Taro and Mosime (2017) in their study recommended for a global scale-up campaign on the education on ART using appropriate models so as to increase the uptake and adherence to ART.

Ultimately, an individual-patient's knowledge and beliefs about disease and treatment can influence adherence. Patients who have adequate knowledge of a disease have better treatment outcome than those with inadequate knowledge (Haberer *et al* 2017).

The overall purpose of this dissertation was to establish whether sero-positive individuals on ART know that TasP is a mode of preventing HIV from infecting their sexual partners. The other purpose was to establish the association of knowledge on TasP with social-demographic and clinical factors.

Establishing the knowledge level on TasP among people living with HIV (PLHIV) could inform HIV 'test and treat' policy. A novel HIV prevention programme, which requires evidence-based information to strengthen it. This would reinforce adherence-counselling message on TasP and HIV prevention at population level.

Knowledge on various conventional HIV prevention interventions are measured during the demographic and health surveys.

1.4. Statement of the problem

Sub-optimal adherence to ART has been common especially in sub-Sahara Africa. This accounts for 2% to 70 % range loss of viral load suppression after two years of suppression in the region. It is also known that social factors contribute to exacerbate adherence failure (Haberer *et al* 2017) . What is not well known is whether individual-patients on ART know that the life-long treatment can prevent further spread of HIV infections, and how that knowledge interact with the contextual factors. It is also not known whether individual-patients would be motivated to adhere to ART if they knew that being on ART is TasP (Bond *et al* 2016).

In Zambia, half (720,000) of HIV positive people are not on ART (Ndongmo *et al* 2016). Only one percent (1%) of those on ART access routine viral load checking (Ndongmo *et al* 2016). Meaning those who are not on ART are infectious due to unsuppressed viral load, hence HIV new infections continue to occur amidst availability of HIV 'test and treat' services (Ndongmo 2016; Barradas 2017). In 2017, the national HIV viral suppression prevalence was eighty-nine point two percent (89.2%) and sixty-three point four percent (63.4%) at national level and in Lusaka province respectively (Barradas *et al* 2017).

Despite the progress towards the attainment of 90% VL suppression by 2020 in Zambia, Lusaka had 89,489 PLHIV inactive on ART. There were also 8,892 AIDS related adult deaths, 64,154 PLHIV were lost to follow-up, 15,811 were confirmed transferred out, 58 stopped , and 815 were not accounted for (Zambian Ministry of Health, 2017). Besides that, the benefit of TasP is not well understood, even after the enactment of the 'test and treat' policy (Bond *et al,* 2016). This study therefore, intended to establish the knowledge level on TasP and the factors that influence viral load suppression.

1.5. Justification

The findings on the knowledge of TasP would be a motivating factor for adherence among PLHIV, as recommended by the World Health Organisation, (2017). Therefore, the established the level of knowledge on TasP would influence the measure of knowledge on TasP in

Population-based HIV surveys such as the Zambia Demographic and Health Survey, and the next Zambia Population-HIV Impact Assessment in alignment to the third 90 goal to stop new HIV infections, and ending AIDS by 2030. This would also influence the explicit messaging of the benefits of ART as TasP, which would promote optimal ART adherence and motivate linkage of asymptomatic HIV sero-positive individuals to care.

Furthermore, the study findings have the potential to strengthen adherence counseling, by motivating PLHIV that ART is mutually for attaining good healthy, and for the prevention of new HIV infections.

1.6. Knowledge Translation Theory

Knowledge Driven Model a linear process of knowledge transfer as adapted from (Estabrooks *et al* 2006). The model advances that proven evidence intervention should be implemented and made accessible to enhance utilisation. It envisages that evidence from basic research must be scaled-up to applied research to improve health outcomes. A social science approach nested within the knowledge translation theory.

Though linear in application, knowledge translation theory embraces interplays of social networks to transfer knowledge through reciprocity interactions for a common gaol. Social networks in this context would include interaction with health literacy at health facilities during enhanced adherence counselling and differentiated service delivery (Perazzo 2016 & Tsondai *et al* 2017), or through other sources. Other sources of health literacy on TasP would be forms of social networking such as friends, radio and the internet. Thus, in this context social networking would be social interaction which involves sharing of health knowledge/literacy on TasP and viral load (Das *et al* (2010). Viral load is synonymous with TasP because knowing viral load would entail level of viral suppression whether it is possible to transmit HIV to a sexual partner or not.

Social networks have social capital as a resource. In this case, social capital would include knowledge sharing on TasP as a resource attributed to reducing the further spread of HIV by motivating PLHIV on ART to adhere.

Therefore, on a broader agenda to end the AIDS pandemic by 2030, the model appropriately shows a linear process, from the implementation of 'test and treat' policy in 2016 in Zambia aimed at ending AIDS by 2030. However, assumes that in the trajectory to ending AIDS there are factors which could facilitate and impede acquisition of knowledge on TasP. Knowledge on TasP is crucial to preventing new HIV infections (WHO 2015). Hence, aimed to establish knowledge level on TasP among PLHIV on ART and factors associated with adherence.

4

1.7. Conceptual Framework

The framework illustrates the assumed association between independent variables and dependent variable. It also illustrates how the association could be affected by the facilitators and barriers to acquired knowledge on treatment-as-prevention.
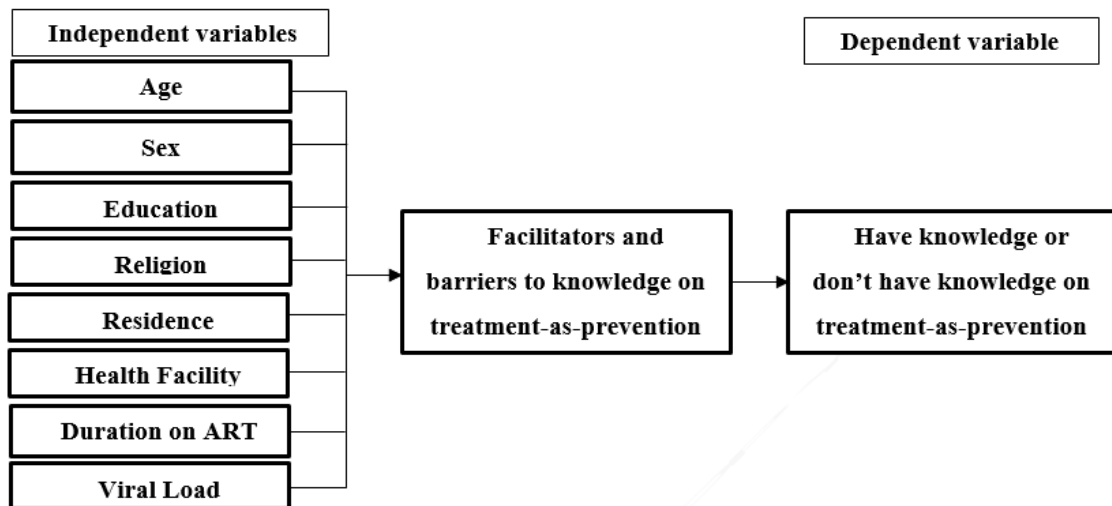
Figure 2.1: Conceptual framework

Source: Author (2020)

CHAPTER TWO: LITERATURE REVIEW

2.0.Introduction

The chapter reviews literatures on the primary and secondary purpose of ART, key studies conducted on TasP, the decentralization of ART provision, enhanced adherence counseling, knowledge translation on TasP, the research question, the research aim and the specific objectives of the study, in that order.

2.1. Primary and secondary purpose of ART

The primary focus of ART has been to restore the health of individual-patients. Patients were initiated on ART depending on CD 4 cell count volume or clinical manifestation. However, through a number of randomized controlled trials, both clinical and community intervention studies, the use of antiretroviral therapy has shown that it is able to prevent new infections of HIV once viral load suppression is attained. Thus, it is expected that those who attained viral load suppression will not be able to spread the HIV infection. This concept is called 'treatment-as-prevention' (Hosseinipour *et al* 2011; UNAIDS, 2016; World Health Organisation, 2017). This prompted the World Health Organization's and its member countries to adapt the 'test and treat' guidelines. The guidelines are premised on putting individual-patients on ART regardless of the CD 4 cell count volume or clinical manifestation of an individual–patient. The goal of the 'test and treat' guidelines are to reduce the global HIV infection rate. This is envisioned to be achieved through having 90% of people who are HIV positive to test for HIV, and 90% of those infected initiated on ART, and 90% of those on ART to achieved viral load suppression. Government of Zambia has since started offering ART at 'test and treat' basis while sero-positive individuals are healthy. The aim is to stop new infections at population level (Ndongmo 2016; Bond et al 2016; Barradas et al 2017)

New infections continue to occur even when ART has become more available and relatively easily accessible (Ndongmo *et al.*, 2016). This is attributed to loss of viral load suppression (Haberer *et al.*, 2017), due to lose-follow-up of HIV sero-positive individuals on ART, sub-optimal adherence and difficult to link healthy sero-positive individuals to care (Zürcher *et al.*, 2017).

2.2. Key studies conducted on Treatment-as-prevention

A meta-analysis study indicated a general estimate of 77% of individual-patients in sub-Sahara Africa to have achieved an adequate adherence level as compared with just 55% of clients in North America. However, morbidity and mortality rates still remain high in SSA as compared to North America due to persistent critical factors mentioned above (Heestermans *et al.*, 2016).

Adherence to ART comes with it another benefit. However, this benefit called treatment-as-prevention is a hidden one or considered secondary. According to a study, (a randomized controlled trial), provided over 96% evidence that TasP effectively reduce the transmission of new HIV infections. The study was conducted among discordant couples during the HPTN 052 intervention trial. Results indicated reduction of HIV type one transmission among 54% study participants of five SSA countries. HIV type one is most prevalent in SSA. They concluded that there is a high reduced infection rate among couples who start ART while health (Hosseinipour *et al.*, 2011).

Subsequently, large scale randomized community intervention trials have conducted similar studies at a population level (Hayes, Sabapathy and Fidler, 2011; Orne-Gliemann *et al* 2015). Among other studies is the HPTN 071, which conducted trials in SSA between 2013 and 2017. The HPTN 071 intervention studies coincided with the UNAIDS and national governments offering ART treatment all HIV positive individuals. Due to overwhelming evidence of TasP of HIV at population level (Hayes, Sabapathy and Fidler, 2011).

2.3. Decentralization of ART Provision

Initiating every individual that tested HIV positive on ART treatment triggered implementation of a number of flexible initiatives to deliver ART especially to stable PLHIV. So as to increase access and coverage as reported by a Working Group on Modelling of antiretroviral therapy monitoring strategies in sub-Sahara Africa, (2015), Prust, (2017) and Tsondai *et al.*, (2017). Differentiated care also aimed at PLHIV to achieve viral suppression, as indicated from a 'cost effectiveness of routine viral load monitoring systematic review study (Barnabas *et al.*, 2017). Differentiated care study findings did not show whether PLHIV know that TasP is a prevention for new HIV infections (Labhardt *et al.*, 2017). In the same vein, CAPRISA 058, a community randomized controlled intervention study was implemented. Participants were assigned at random between didactic routine counseling and adherence counseling arms. Findings showed a positive relationship between adherence to ART and HIV viral load suppression. However, findings did not indicate the relationship between knowledge on TasP and HIV viral load suppression. They concluded that participants who underwent didactic routine counselling achieved HIV viral load suppression than those that received enhanced adherence counselling (Loggerenberg *et al* 2016).

2.4. Enhanced Adherence Counselling

In a similar study, Santillan, (2015) simulated a model called 'information, motivation and behavior skills'. They found no association between self-reported adherence and better treatment outcome. Knowledge on TasP' was not assessed in this study too.

Schwartz *et al.*, (2017a) and Das *et al.*, (2010) emphases that if adults living with HIV have knowledge on 'undetectable viral load is untransmittable' that could be motivation to attain viral suppression. Treatment-as-prevention could further control the population level spread of new HIV infections if comprehensively implemented. Unfortunately, basic knowledge of ART is imprecise among PLHIV due to scientific concern that TasP is not primary benefit for PLHIV. Rather their attainment of good health is, reveals Bond *et al.*, (2016).

The change of policy to 'test and treat' allow PLHIV start ART when they are health. Thus, PLHIV should be privy of the robust benefits of ART in preventing new HIV infections. They should be active agents, in a conscious manner, not feint or as a bait to attain good health (Bor *et al.*, 2018).

Prior to the implementation of population level effect of ART drugs in Zambia and south Africa, Bond et al., (2016) conducted a formative research in which they observed that knowledge on TasP were conjecture among PLHIV on ART. Rather adults aimed to maintain good health to continue providing moral support to their families and community. However, since the launch of 'test and treat' policy in 2016/17 (MOH, Zambia, 2017), Differentiated Service Delivery (DSD) models have increasingly been implemented across Lusaka district capital. The DSD characterise flexible distribution of ART drugs and enhanced adherence counselling aimed at sustaining viral load suppression among stable clients and encouraging adherence among unstable clients. Apart from the mainstream ART service provision a health facilities, DSD offer an alternative source of health literacy of ART.

Correlation studies on adherence counseling and viral load suppression among sero-positive individuals do not indicate whether TasP of HIV infections is known among PLHIV (ACORD, 2007). It is also not clear whether HIV sero-positive individuals aim to attain viral load suppression to stop new HIV infections (Das *et al.,* 2010; Labhardt *et al.,* 2017).

2.5. Knowledge Translation on TasP

Campbell *et al* (2015) and Renju *et al* (2017) observed that PLHIV and healthcare provider relationship is paternalistic. This kind of relationship affects adherence to ART. Because providers tend to aim to achieve viral suppression without a patient fully knowing the science behind it. Concerns of disengagement from care and treatment, low number of healthy PLHIV

linking to care, and loss to follow up are attributed to strained relationships between them (Loggerenberg *et al.,* 2016; Bor *et al.*, 2018). People living with HIV who separate from care even after attaining viral load suppression continue to spread new HIV infections in the population (Das *et al.*, 2010 ; Schwartz *et al.*, 2017; Bor *et al.*, 2018).

The dilemma to weigh the severity and threat of HIV is still a problem among many sero-positive adults, unless more enlightenment is provided new infection will continue to occur, (Killingo, Taro and Mosime, 2017).

The perceived threat of HIV is semblance to the 'Tripartite distinction' theory by Widdows, (2017). The theory distinguishes the conceptual overlap of 'disease', 'illness' and 'sickness'. The tripartite distinction sees 'disease' as a matter of objective fact. Being diseased would include having an infection. 'Illness' is the subjective experience of ill-health. Someone with an infection who is unaware of any symptoms is diseased, but not ill. Possibly one may be ill but not diseased. However, an ill person may experience symptoms which are unpleasant, but for which no biological basis exists. Being 'sick' is a social matter. To be sick is to have one's role in society altered. For example, missing work, avoiding or being barred from various social interactions, (Widdows, 2017).

In line with the 'tripartite distinction' theory, a number of PLHIV are diseased but are neither ill nor sick (they are healthy). Some know it while others do not know. Those diseased with HIV but are healthy and not on ART continue to add new infection in the population. They may be on ART but are not motivated to achieve viral suppression because they are healthy. Putting healthy PLHIV into care is the major challenge in real-life settings (Bor *et al.*, 2018).Thus, individual-patients must be enlightened to understand the HIV infection and the relationship between treatment, adherence and successful outcome. When they understand high level of ART adherence would ensue among those without the knowledge (Kip, E., Ehlers and Wal, 2009)

Knowledge on ART adherence is obtained through health education and counselling at health facilities, support groups or other sources, (ACORD, 2007). Education and counselling refer to communication strategies that may target ART initiation, dose-taking execution, and/or persistence. Health education is an exchange of information about medication to increase health literacy and reduce dosing errors. Counselling on the other hand reinforces education, (Chisholm-Burns *et al.,* 2010).

Counselling focuses on ART adherence-related beliefs, attitudes, feelings, and skills in a collaborative individual-patient and counselor exchange. It involves assessing needs and

context, information about behavior change, facilitating adherence behavior change to the extent that the patient is able, willing and motivated, identifying and modifying goals, and arranging for ongoing assistance or changes in medication plans, (Perazzo, 2016). It is expected that knowledge on TasP is provided to PLHIV unconditionally because it is their fundamental human right, (UNAIDS, 2017).

The knowledge-health correlation is one of the important measures for predicting health outcomes during a chronic epidemic, (UNAIDS, 2017). Knowledge on HIV and ART are measured to that effect. In that light, the previous Population-based HIV Impact Assessment survey conducted in sub-Sahara Africa region, never included knowledge on TasP among the specific objectives, (Barradas et al 2017). Similarly, the 2013-14 Zambia demographic and health survey never measured knowledge on TasP, however, information on the awareness of HIV and ART were collected, (Central Statistical Office Zambia, 2014).

By and large, an analyst asserted that to reverse new infection trends of HIV require strategies aligned to time and local context. This can be done by adopting a combination of effective and efficacy prevention strategies. '…bringing programs to scale, and sustaining efforts over time' (The Henry J. Kaizer Family Foundation 2017, p.3). Hence, carried out the research to establish the knowledge level on 'treatment-as-prevention' among PLHIV on antiretroviral therapy.

2.6. Research question

The research question was "What is the knowledge level on treatment-as-prevention among adults on antiretroviral therapy in four urban health facilities of Lusaka district in Zambia?"

2.7. Research aim

The aim of this study was to establish the level of knowledge on treatment-as-prevention among adults on antiretroviral therapy in four urban health facilities of Lusaka district in Zambia.

2.7.1. Specific Objectives

2.7.1.1. To determine the proportion of adults on antiretroviral therapy with knowledge on treatment-as-prevention.

2.7.1.2. To establish the differences on knowledge on treatment-as-prevention across the social-demographic and clinical characteristics among adults on antiretroviral therapy.

2.7.1.3. To assess whether adults on antiretroviral therapy know their HIV viral load test status (results)

2.7.1.4. To determine factors associated with knowledge on treatment-as-prevention among adults on antiretroviral therapy.

2.7.1.5. To understand factors facilitating and barring the acquisitions of knowledge on treatment-as-prevention among adults on antiretroviral therapy.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

Chapter three describes how the research was conducted. It explains the research design, the research sites and population, sampling technique and the sample size, data collection methods, data analysis, and ethical consideration.

3.1. Study design

This was a cross-sectional design followed up with In-depth Interviews (IDIs) (Appendix B). The purpose of the convergent parallel design was used to collect complementary data as well as for validation. This was because of limited literature on knowledge on treatment-as-prevention, hence had to adapt more rigour research design.

Thus cross sectional study was used to collect the current knowledge level on treatment-as-prevent in different health facilities. To complement and validate the data, phenomenology study was used to capture the experiences and perceptions of some of the selected respondents from the cross-sectional study.

3.2. Study site and population

Lusaka district is the capital city of Zambia, domicile to 1,747,152 people, (Central Statistics Office (CSO), 2010). The District Health Office (DHO) and its partners have the mandate to provide universal health coverage to all residents. Formal health services are delivered through the 187 health facilities, of which 163 are urban health centres (UHC). The DHO owns 42 of them, 37 are UHCs, and five are high-level hospitals (Central Statistics Office (CSO), 2010). The HIV viral suppression due to ART care was at 63.4 percent (63.4%) as of 2017 (Barradas *et al.*, 2017) . The study sites and population of people on ART is shown in table 3.1 below, according to the Lusaka ART data audit, (Zambian Ministry of Health, 2017).

Table 3.1: Study Site Population

Health facility	Active on ART
Kalingalinga	7,258
Chilenje	6,227
Chipata	12,497
Lusaka Trust	623

3.3. Selection of Health facilities

There were four ART facilities which were stratified for data collection, there are located in the peri-urban areas of Lusaka district. The selection were based on the ART facility's

provision of viral load testing services , quick turnaround of viral load test results, and geographical representation of the study sites in the district. That is, these health facilities provide ART services to people from different areas of the district and beyond.

Kalingalinga ART facility is the largest coordinating centre for viral load testing in Zambia, and is implementing the Differentiated Service Delivery model for ART. While Chilenje ART facility also had been implementing the Differentiated Service Delivery model and fast-track viral load testing initiative. Chipata ART facility had hosted a 'test and treat' implementation intervention, which was conducted on door-to-door basis, at the same time had been implementing the differentiated service delivery intervention. Lusaka Trust, is a private ART centre and one of the oldest to offer HIV services in Zambia. All facilities are ART dispensing centres. Since the outcome was viral load suppression, it was imperative that ART facilities selected provided readily available viral load results.

Each of the four sites had a probability proportion to size (PPS) sample calculated from the population of people active on ART as shown in table 3.2 below. Each of the four samples had a 0.05 weight probability of inclusion proportional to their respective facility population.

3.4. Target and Study population

The target population was adults living with HIV who accessed ART and /or viral load testing at these ART facilities in Lusaka province, where the reference of the study population is made

Figure 2.2: Lusaka District Health Facilities

Source: Zambia Ministry of Health, 2017

to in similar settings. Adults living with HIV on ART attending ART clinic on respective material days were sampled out as study respondents in the four (4) ART health facilities of Lusaka district (figure 2.2).

3.4.1. Inclusion

The participants were aged 18-59 years-old. Only people living with HIV (PLHIV) who had been on ART for nine months and above were selected to take part in the study. This was because at nine months or above a patient on optimal adherent to ART would have attained viral load suppression. These were selected from the ART registers at respective health facilities.

3.4.2. Exclusion

Women were pregnant excluded because pregnant women initially start ART to prevent the virus from infection the unborn baby. Those aged 59 and above are known to adhere well to ART than those below 59 year-old (Kasumu, 2014), thus were not included to avoid confounding the level of adherence. Also, the prevalence single proportion used, the 63.4% of viral suppression was among those aged 15-59 years-old, so used 59 as the ceiling age (Barradas *et al*., 2017).

3.5. Sampling methods

3.5.1. Quantitative

The respondents were selected using simple random technique. The sampling unit was a person living with HIV (PLHIV). Then the sampling frame included all the PLHIV visiting the ART facility during each day data was collected. The sampling frame list was accessed from the ART registers during the research period at respective facilities. A simple random sampling technique used to select respondents from the sampling frame. The simple random sampling used a raffle to select respondents each day during data collection. The names of the participants were coded with serial numbers used for the raffle, at respective facilities.

The sample size was estimated using the prevalence of 63.4% of persons aged 15 to 59 year-old who attained HIV viral load suppression in Lusaka province (Barradas *et al.,* 2017). A total of 362 respondents were selected due to under sampling at Lusaka Trust. The under sampling at Lusaka Trust Hospital was due to non-response. Table 3.2 shows the intended sample size and the actual sampled size.

3.5.1.1. Sample size

The research study used a prevalence of 63.4 % with 0.05 margin of error, and confidence interval of 95%. Prevalence of 63.4% was derived from 2017 proportion of PLHIV living with HIV who attained viral load suppression in Lusaka province (Barradas.,2017).

A single population proportion survey formulae was used to calculate the sample size, as shown below (Hulley *et al.*, 2007)

$$S = \frac{(z^2) \times \rho \times (1 - \rho)}{(e^2)}$$

Where; S is the sample size. 'Z' is the 'Z' score (Z squared), which determined by the confidence interval. This was the probability that the value of the parameter falls within the specified range of values. The 'Z' value here was considered at 1.96 'Z' score, thus the confidence interval is 95%. 'P' as the population proportion of the prevalence of HIV viral load suppression in Zambia. 'e' as the margin of error, the small amount that is allowed for in case of miscalculations or change of circumstances (Hulley *et al.*, 2007).

Thus, therefore, $S = \frac{(1.96^2) \times 0.634 \times (1 - 0.634)}{(0.05^2)} = 356.5680922$

Table 3.2: Sample size

Health Facility	Total Active on ART	Cumulative population	Sample size required	Sampled size
Kalingalinga	7,258	7,258	87	100
Chilenje	6,227	13,485	84	91
Chipata	12,497	25,982	168	170
Lusaka Trust	623	26,605	8	*1
Total			357	362

*The Lusaka Trust sample was combined with the Chilenje sample in table 4.5, 4.6 and 4.7 analysis due to few observation.

3.5.2. Qualitative

A total of 55 participants for IDIs were drawn from the 362 respondents. These had different levels of viral loads. The number of participants selected depended on reaching saturation of responses.

3.6. Data collection

3.6.1. Quantitative

An interviewer-administered questionnaire was used which was pretested and reviewed before data collection. Data were collected between 21/12/2018 and 31/01/2019. Available viral load results between 2016 and 2019 were obtained from the Smartcare (electronic data capture system) health information system. The groups were segmented into two periods during data analysis, which comprised those that started ART before August 2016 (Test and Treat scaling policy) and those that started after August 2016.

In each research site, at least one research assistant was recruited to collect data. A research assistant (RA) was supported by a healthcare provider (HCP). The major role of the HCP were assisting to select and usher participants to the RA. The RA then administered the informed consent form (ICF) to each potential and eligible participant. Private places were sought to conduct the ICF and the interviews.

The ICFs, questionnaires were piloted at one ART facility to test for responsiveness and preciseness of the questions. Then later, were refined or revised to reduce responder and interviewer bias. The questionnaires were structured with closed ended responses only and with skips. RAs were oriented to conduct the interviews. Printed formatted questionnaires were used. Questions were translated into Chinyanja and Bemba on the spot during the interviews.

Each interview took less than 10 minutes. Literate participants were asked to complete the questionnaire on their own. The RA read the questions for those who could not read and marked the responses accordingly.

3.6.1.1. Research materials

Information Sheets and Consent Forms, printed paper questionnaires (Appendix B), and stationery was used to facilitate data collection. Ink and inkpad were used to thumb printing for participants who could not write.

Records on viral load testing (volume and date tested) were collected as secondary data from participates' Smartcare (data electronic capture) ART files.

3.6.2. Qualitative

Some participants were selected for in-depth interviews shortly after filling-in the questionnaires. The discussions were mainly around the emerged salient issues from the questionnaire on knowledge level and viral load volume (VLV).

Interview-guides were translated into Chinyanja and Bemba on the spot during the interviews.

Printed interview-guides were used, the interview guides had open-ended questions with probes and new leads were discussed.

3.7. Data management and Analysis

3.7.1. Data management

3.7.1.1. Quantitative

Each participant was allocated a special number, which indicated on the questionnaire and on the consent form. Each day of data collection, questionnaires were checked for completeness and correct entries. Data were entered into Microsoft off Excel spreadsheet at the end of each day.

Codes were assigned to the closed-ended responses for each question (appendix C and E). Then entered on excel spread sheet with participants coded with serial numbers entered on the far left column followed by question one to the last question in respective columns. Then the responses for each respondent were entered in the rows moving from the left to the right. The outcome variables were coded "1" for knowledge on TasP and "0" for no knowledge on TasP. Data were imported on to Stata software version 14 for cleaning that is checking for missing values. When wrongly entered values were found the data was corrected comparing the hardcopy and the excel spreadsheet. Then a research assistant was tasked to entered data in the similar manner, which was compared with the earlier spreadsheet. Mismatches were corrected. Data were entered according to the health facilities. Where the list of respondents from one facility ends then another list starts consecutively.

3.71.2. Qualitative

Material that were used to capture the in-depth discussions were notebooks and audio recorders. The discussions were decoded using Microsoft Office word; the handwritten notes were written up on the Microsoft office word, and the audio recordings were transcribed into text. Consent forms are kept and secured in a locked filling cabinet. Participants' information are kept onto a computer protected with a password.

3.7.2. Data analysis

3.7.2.1. Quantitative

The respondent from Lusaka Trust Hospital was combined with the respondents from Chilenje Health Facility because it was the only observation and her residence was around Chilenje Township. The data set were entered into Microsoft office excel spreadsheet and imported into Stata version 14. Descriptive analysis of social demographic and clinical factors were done and reported frequencies and percentages. Then social demographic information and clinical

factors were cross tabulated with for differences in knowledge level on TasP using Z score test calculator of proportions with p-value set at 0.05. Thus used frequencies, percentages, 95% Confidence Interval (CI) and p-values to report and interpret the results.

The association was done within each sub-variable because these were covariates which were later used in the multivariable binary logistic regression. Manual backward stepwise regression was used for the reduced model by removing covariates with the highest P-value until all were statistically significant at p-value of 0.05 or below. Reported unadjusted odds ratios (uOR) and adjusted odds ratio (aOR) at 95% confidence intervals with p-values.

Table 3.3: illustrates the variables analysis plan, and table 3.4 shows objective analysis plan. Stata, a computer software version 14 was used to analysis the data.

Table 3.3: Main outcome analysis plan

			Statistical tests		
			Z score test	Binary logistic regression model	
Explanatory question	**Variable range**	**Outcome variable**	Bivariate differences	Full/Unadjusted	Reduced/Adjusted
Can an HIV positive adult on antiretroviral treatment with suppressed viral load be able to transmit HIV to HIV negative sexual partner without using condom? (appendix C and E)	Dichotomy (Yes or No)	- 'Yes' have no knowledge on TasP - "No" have knowledge on TasP.	Measured the differences between knowledge level on TasP and social-demographic and clinic characteristics. The difference of P-value lesser than 0.05 at confidence interval of 95% were considered statistically significant	The association between social demographic and clinical factors and knowledge on treatment-as-prevention were assessed. The association of probability threshold at 0.05, 95% confidence interval (CI) with uOR, either statistically significant or not were reported.	Backward step adjustment for each explanatory variable to assess association with dependent variable. The explanatory variable with statistically significant association with the dependent variable at probability threshold lesser than 0.05 and 95% CI reported aOR.

Table 3.4: Reporting plan of specific objectives

Objectives	Measurement type
To determine the proportion of PLHIV on antiretroviral therapy with knowledge on treatment-as-prevention.	Descriptive statistics –measured pproportion of PLHIV on antiretroviral therapy with knowledge on treatment-as-prevention over the total participants; disaggregated by year initiated ART, which was either by started Art before the 'test and treat 'policy or after. Expected outcome was binary, the proportion with knowledge on TasP and the proportion without Knowledge on TasP.
To establish differences in knowledge on TasP across the social-demographic and clinical characteristics among PLHIV on antiretroviral therapy.	Analytical statistics –measured the differences in knowledge on treatment-as-prevention and social-demographic factors of PLHIV on antiretroviral therapy.
To assess whether PLHIV on antiretroviral therapy know their HIV viral load test results	Analytical statistics – compare whether difference in knowledge of their viral load test results were statistically significant with knowledge of TasP. Expected outcome was binary, either have knowledge on TasP or not.
To determine the association between social- demographic factors and knowledge on TasP among PLHIV on antiretroviral therapy.	Analytical statistical – assessed the multiple independent variables association with the binary outcome of either have knowledge on TasP or not.
To understand factors facilitating and barring acquisition of knowledge on treatment-as-prevention among PLHIV on antiretroviral therapy.	Descriptive- In-depth explanation of the sources of knowledge, factors facilitating and barring PLHIV on ART having knowledge on treatment-as-prevention.

3.7.2.2. Qualitative Analysis

Handwritten notes and observations notes were written up, and audio recordings (used audio recorder) were transcribed and decoded. Microsoft Office Word was used to process and manage the data. The three set of data consisting handwritten notes, observation notes and transcribed transcripts were combined during analysed. The data were analysed thematically by creating categories with similar and different emerging meanings across the participants.

3.7.3. The merging of the quantitative and qualitative data

The quantitative and qualitative findings were independently analysed. However, the qualitative and quantitative findings were triangulation at discussion as shown in figure 1. The qualitative data provided the context to the frequencies, percentages, p-value, odds ratio, and the 95% confidence intervals.

3.8. Ethical considerations

Ethics approval was sought before conducting the study. Application was sent to the Bioethics Committee of the University of Zambia. Permission were requested from the National Health Research Authority Zambia and the Ministry of Health.

Detailed informed consent forms were provided (*see* ICF at the appendix B). ICF were paper based. The information sheet and the consent forms were directly translated into Chinyanja and Bemba upon providing study information or while in situ as the researcher was conversant with the written and spoken local languages (Chinyanja and Chibemba). Thus, three language options were mainly opted for by the participants. Chinyanja and Bemba were common languages spoken in the four communities, including English.

The student and the research team protected the identity of the participants. Steps were taken to make sure that all the information participants provided were separated from identifying (name, address, phone number) of study participants. This was done so that someone reading research report or seeing our presentations would not be able to identify participant/s.

The possible risks or discomforts were explained to the participants. The interviews were held in a place or room with privacy and away from destruction or noise. The interview space were sought from within the health facility premises.

Permission was also sought from the participants to use the data they provided to write scientific outputs. These may include technical report, conference presentations and publication in a scientific journal. They were assured that their names and the name of the

health facilities would not be mentioned in these writings. Their information would be presented in a general sense.

Participants were accorded equal chance to take part in the study through sampling. However, some participants may not have taken part due to restriction stated in the exclusion criteria. Participants had a choice whether or not to take part in the study, or withdraw during the interview.

The study may had no direct benefit to the participants. However, the interview questions could have catalysed some participants thinking and conscience around treatment-as-prevention knowledge and viral suppression. Furthermore, the research study could influence some adjustment to the operation of ART and viral load services in future. This would benefit the PLHIV on ART.

CHAPTER FOUR: RESULTS

4.0.Introduction

The quantitative and qualitative results are presented separately. The interpretations of the results are around salient issues and objectives of the study. Thus the results are presented according to the order of the objectives.

4.1. Quantitative findings

The results are illustrated in the tables below and are briefly stated in the text. The tables are labeled to show the tabulation of the results. The results section include the social-demographic information, differences in knowledge on TasP across social –demographic information, self-reported knowledge of own viral laod, and factors associated with knowledge on TasP. These are reported descriptively, consisting of frequencies and percentages.

The differences in knowledge on TasP were analysed using the Z score test of proportion of and reported using frequencies, percentages, confidence intervals (CI) and probability values (P-value). While the factors associated with knowledge on TasP were analysed using the binary Logistic Regression, and reported the unadjusted and adjusted odds ratio, CI and p-values (Table 4.5).

4.1.1. Social – demographics information

The social demographic characteristics included age, sex, education, religion, residence, health facility, knowledge of own viral load results, reasons for initiating on ART, knowledge on TasP, and whether study respondents would consider using TasP for HIV prevention with their sexual partners (Table 4.5).

While the clinical characteristics consisted period of initiating on ART; either initiated ART before or after the scaling up of 'test and treat' (TT) policy as at August (08) 2016, which was implemented in all the three facilities before the official pronouncement in February 2017 (Zambian Ministry of Health, 2017). Those that started ART before 08/2016 were regarded as having started ART before the 'test and treat' policy regardless of how long they have been on ART. While those that started ART as at 08/2016 where regarded as having started ART after the 'test and treat' policy. There is also the viral load status (obtained from the Smartcare electronic filing system or database at the time during data collection). The period of initiating on ART segments the social –demographic information into two components (Table 4.5).

Table 4.5: Social-Demographic information

Characteristics	Total N=362 (%)	Period Initiated on ART	
		Before 08/2016 'Test and Treat Policy' N=213 (%)	After 08/2016 'Test and Treat' Policy N=149 (%)
Age group			
18 – 24	35 (9.70)	18 (51.4)	17 (48.6)
25 - 34	85 (23.5)	32 (37.6)	32 (62.4)|
35 - 44	144 (39.8)	95 (65.9)	49 (34.1)
45 – 54	84 (23.2)	56 (66.7)	28 (33.3)
55 – 59	14 (3.90)	12 (85.7)	2 (14.3)
Sex			
Men	157 (43.4)	95 (60.5)	62 (39.5)
Women	205 (56.6)	118 (57.6)	87 (42.4)
Education			
Primary School	127 (35.2)	69 (54.3)	58 (45.7)
Junior Secondary	79 (21.8)	49 (62.1)	30 (37.9)
Senior Secondary	97 (26.7)	55 (56.7)	42 (43.3)
Tertiary	59 (16.3)	40 (67.8)	19 (32.2)
Religion			
Catholic	74 (20.4)	42 (56.7)	32 (43.2)
Protestant	288 (79.6)	171 (59.4)	117 (40.6)	
Residence			
Live within Facility catchment	129 (35.5)	67 (51.9)	62 (48.1)
Live outside facility catchment	233 (35.5)	146 (62.7)	87 (37.3)
Health Facility			
Kalingalinga	100 (27.5)	60 (60.0)	40 (40.0)
Chipata	170 (27.5)	92 (54.1)	78 (45.9)
Chilenje	92 (26.3)	61 (66.3)	31 (33.7)
Viral Load Status			
Suppressed	328 (90.6)	194 (59.1)	134 (40.9)
Unsuppressed	34 (9.40)	19 (55.9)	15 (44.1)
Knew their viral load status			
Knew had suppressed viral load	102 (28.2)	74 (72.5)	28 (27.5)
Knew had unsuppressed viral load	10 (2.8)	7 (70)	3 (30)
Didn't know their viral load status	250 (69.0)	129 (51.6)	121 (48.4)
Reason for starting ART			
For own health	301 (83.2)	179 (59.5)	122 (40.5)
Treatment-as-prevention	8 (2.2)	3 (37.5)	5 (62.5)
PMTCT	53 (14.6)	31 (58.5)	22 (41.5)

Knowledge on TasP			
Knowledge	125 (34.5)	80 (64.0)	45 (36.0)
No knowledge	237 (65.5)	213 (58.8)	149 (41.2)
Would consider using TasP			
Yes	244 (67.4)	149 (61.1)	95(38.9)
No	118 (32.6)	64 (54.2)	54 (45.8)

There were 362 respondents in the age range of 18-59 years with a median age of 39 years. Median age was reported because the Shapiro Wilk test for normality had a significant p-value of 0.0418, thus decide to report the median age. Majority were aged 35-44 year-old.

There were 56 (66.7%) study respondents aged 45-54 years-old that initiated ART before the TT policy in 2016, of these 95 (60.5%) were men. While 127 (35.2%) attained primary level education (Table 4.5).

Those that were Protestant Christians and initiated ART before the TT policy were 171 (59.4%) as compared to the Catholics 42 (56.7%), whereas, 146 (62.7%) resided outside the ART facility catchment areas, and 61 (66.3%) accessed ART services form Chilenje Health Facility (Table 4.5).

The study respondents that initiated ART before the TT policy and had attained viral suppression at the time of data collection were 194 (59.1%), while 129 (51.1%) did not know their viral load status (results), and 31 (58.5%) initiated ART for their own health or to restore their health after their fell sick (Table 4.5).

4.1.2. Proportion of Adults on ART with Knowledge on TasP

Those with knowledge on TasP were 125 (34.5%), and 80 (64.0%) of them initiated ART before the TT policy as compared to the 237 (65.5%) without knowledge on TasP. However, 149 (61.1%) reported that they 'would consider TasP' as an HIV prevention measure (Table 4.5).

4.1.3. Differences in knowledge on treatment-as-prevention

The differences between those with knowledge on TasP to those without knowledge on TasP were statistically significant among the age group 25-34 years-old having 33(38.8%, 95% CI: 11.7 to 41.9) and 52 (61.2%, 95% CI: 47.9 to 74.4) with $p < 0.01$, between men 56 (35.7%, 95% CI: 23.1 to 48.2) and 101 (64.3%, 95% CI: 54.9 to 73.6) with $p < 0.01$, among those that

attained Senior Secondary School level 36 (37.1%, 95% CI: 21.3 to 52.8) and 61 (62.7%, 95% CI: 50.7 to 75.0) with p < 0.01, among the Protestant Christians 95 (32.9%, 95% CI: 23.5 to 42.4) and 193 (67.1%, 95% CI: 60.4 to 73.6) with p < 0.01 and among those that resided within the ART facility catchment area 53 (41.1, 95% CI: 27.8 to 54.3) and 76 (58.9%, 95% CI: 47.8 to 69.9) with p < 0.04, respectively (Table 4.6).

Table 4.6: Differences in Knowledge on TasP

Characteristics	Knowledge		No Knowledge		
Age	Frequency (%) =125	95% CI	Frequency (%)=237	95% CI	P-value
18 – 24	17 (48.6)	24.8 , 72.3	18 (51.4)	28.3 , 74.5	< 0.86
25 – 34	33 (38.8)	11.7 , 41.9	52 (61.2)	47.9 , 74.4	< 0.01
35 – 44	47 (32.6)	19.2 , 46.0	97 (67.4)	58.0 , 76.7	< 0.01
45 – 54	22 (26.2)	7.8 , 44.5	62 (73.8)	62.8 , 75.9	< 0.01
55 – 59	6 (42.9)	3.2 , 82.5	8 (57.1)	22.8 , 91.4	< 0.59
Sex					
Men	56 (35.7)	23.1 , 48.2	101(64.3)	54.9 , 73.6	< 0.01
women	69 (33.7)	22.5 , 44.8	136 (66.3)	59.0 , 74.8	< 0.01
Education					
Primary School	44 (34.7)	20.5 , 48.7	83 (65.3)	55.1 , 75.6	< 0.01
Junior Secondary	20 (25.3)	6.2 , 44.3	59 (74.7)	63.5 , 85.7	< 0.01
Senior Secondary	36 (37.1)	21.3 , 52.8	61 (62.9)	50.7 , 75.0	< 0.01
Tertiary	25 (42.4)	22.9 , 61.7	34 (57.6)	41.0 , 74.2	< 0.24
Religion					
Catholic	30 (40.5)	22.9 , 58.1	44 (59.5)	44.9 , 73.9	< 0.11
Protestant	95 (32.9)	23.5 , 42.4	193 (67.1)	60.4 , 73.6	< 0.01
Residence					
Live within facility catchment	53 (41.1)	27.8 , 54.3	76 (58.9)	47.8 , 69.9	< 0.04
Live outside facility catchment	72 (30.9)	20.2 , 41.6	161(69.1)	61.9 , 76.2	< 0.01
Health Facility					
Kalingalinga	26 (26.0)	9.14 , 42.9	74 (74.0)	64.1 , 84.1	< 0.01
Chipata	64 (37.6)	25.8 , 49.5	106(62.4)	53.1 , 71.6	< 0.01
Chilenje	35 (38.0)	21.9 , 54.1	57 (62.0)	49.3 , 74.6	< 0.02
Viral Load Status					
Suppressed	106 (32.3)	23.4 , 41.2	222 (67.7)	61.5 , 73.8	< 0.01
Unsuppressed	19 (55.9)	33.6 , 78.2	15 (44.1)	18.9 , 69.2	> 0.49
Knew their viral load status					
Knew had suppressed viral load	42 (33.6)	19.3 , 47.9	65 (27.4)	16.6 , 38.2	> 0.49
Knew had unsuppressed viral load	7 (5.6)	1.9 , 92.8	8 (3.4)	1.2 , 66.8	> 0.39
Didn't know their viral load status	76 (60.8)	49.8 , 71.8	164 (69.2)	62.1 , 76.3	> 0.19
Reason for starting ART					
For own health	107 (85.6)	78.9 , 92.3	194 (81.8)	76.4 , 87.2	> 0.39
Treatment-as-prevention	2 (1.6)	-34.8 , 66.8	6 (2.5)	-09.6, 59.6	> 0.79
PMTCT	16 (12.8)	-03.6 , 29.2	37 (15.7)	03.9 , 27.4	> 0.78
Would consider using TasP					
Yes	87 (69.6)	59.9 , 79.3	157 (66.2)	58.8 , 73.6	> 0.58
No	38 (30.4)	15.8 , 45.0	80 (33.8)	23.4 , 44.2	> 0.71

Period Initiated on ART					
Before 08/2016 'TT' Policy	80 (37.6)	26.9 , 48.2	133 (62.4)	54.2 , 70.6	< 0.01
After 08/2016 'TT' Policy	45 (30.2)	16.7 , 43.6	104 (69.8)	60.9 , 78.6	< 0.01

Across the health facilities, the difference between those with knowledge on TasP and those without was statistically significant with Chilenje having 35 (38.0%, 95% CI: 21.9 to 54.1) and 57 (60.0%, 95% CI: 49.3 to 74.6) with p < 0.02. While among those with unsuppressed viral load the difference in knowledge was not statistically significant having 19 (55.9%, 95% CI: 33.6 to 78.2) and 15 (44.1%, 95% CI: 18.9 to 69.2) with p > 0.49 (Table 4.6).

4.1.4. Knowledge of their HIV viral load status (test results)

There were statistically insignificant differences in knowledge on TasP across the variable 'knowledge of their viral load statuses', with those that reported 'did not know their viral load status' having 76 (60.8%, 95% CI: 49.8 to 71.8) and 164 (69.2%, 95% CI: 62.1 to 76.3) with p > 0.19. This was similar across the variables 'reasons for starting on ART' and 'would consider using TasP', with those that reported 'for their own health' having 107 (85.6%, 95% CI: 78.9 to 92.3) and 194 (81.8%, 95% CI: 76.4 to 87.2) with p > 0.39, and with those that started 'Yes' would consider using TasP having 87 (69.6%, 95% CI: 59.9 to 79.3) and 157 (66.2%, 95% CI: 58.8 to 73.6) with p > 0.59. However, there was a statistically significant difference in knowledge on TasP among that initiated ART before the 'test and treat' policy as of August 2016 having 80 (37.6%, 95% CI: 26.9 to 48.2) and 133 (62.4%, 95% CI: 54.2 to 70.6) with p < 0.01 (Table 4.6).

4.1.5. Factors associate with knowledge on treatment-as-prevention

Table 4.7 below shows results of an unadjusted and adjusted binary logistic regression using backward stepwise regression model. The adjusted model included only the statistically significant factor associated with knowledge on TasP.

The 'viral load statuses of the study respondents was the only factor that was associated with knowledge on TasP, indicating respondents with unsuppressed HIV viral load were (uOR=2.32, 95% CI: 0.98 to 6.44, p < 0.03) times likely to have knowledge on TasP as compared to those with suppressed viral Load. Similarly, in the adjusted model, knowledge was also associated with those that had unsuppressed HIV viral load, with (aOR=2.65, 95% CI: 1.30 to 5.42, p < 0.01) times likelihood of having knowledge on TasP as compared to those with suppressed viral load.

However, the association of knowledge on TasP and duration on ART was statistically significant in the unadjusted model. Those that were initiated on ART after 2016 were (uOR = 0.60, 95% CI: 0.37 to 0.99, p-value 0.04) less likely to have knowledge on TasP as compared to those that were initiated on ART before 2016. However, the association was not statistically significant in the unadjusted model (Table 4.7).

Table 4.7: Factors associate with knowledge on treatment-as-prevention

Characteristics	Full			Reduced		
Age	uOR	P	95% CI	aOR	P	95% CI
18 – 24	1.00					
25 - 34	0.81	0.62	0.35 , 1.90			
35 - 44	0.54	0.13	0.24 , 1.20			
45 - 54	0.34	0.02	13.6 , 85.1			
55 – 59	0.74	0.66	0.20 , 2.80			
Sex						
Men	1.00					
Women	1.1	0.70	0.68 , 1.80			
Education						
Primary	1.00					
Junior Secondary	0.62	0.38	0.15 , 2.14			
Senior Secondary	0.83	0.78	0.24 , 3.21			
Tertiary	1.43	0.65	0.36 , 5.10			
Religion						
Protestant Christians	1.00					
Catholic Christians	1.50	0.17	0.84 , 2.60			
Residence						
Live within facility catchment	1.00					
Live outside facility Catchment	0.67	0.12	0.41 , 1.11			
Health Facility						
Kalingalinga	1.00					
Chipata	1.58	0.17	0.81 , 30.6			
Chilenje	1.41	0.33	0.69 , 28.6			
Viral Load Status						
Suppressed	1.00					
Unsuppressed	2.32	0.03	0.98 , 6.44	2.65	0.01	1.30 , 5.42
Knew their viral load status						
Knew had suppressed viral load	1.00					
Knew had unsuppressed viral load	0.62	0.47	0.17 , 2.26			
Didn't know their viral load status	0.76	0.29	0.46 , 1.27			
Reason for starting ART						
For own health	1.00					
Treatment-as-prevention	0.68	0.66	0.12 , 3.82			
PMTCT	0.69	0.32	0.34 , 1.43			
Would consider using TasP						
Yes	1.00					
No	0.91	0.71	0.54 , 1.52			

Period Initiated on ART			
Before 08/2016 'TT' Policy	1.00		
After 08/2016 'TT' Policy	0.60	0.04	0.37 , 0.99

4.2. Qualitative findings

The qualitative findings are presented under two major themes, with sub-themes as shown by:

Facilitators to knowledge on treatment-as-prevention:

⁻   Source of knowledge on treatment-as-prevention

⁻   Symbiotic understanding HIV viral load suppression

⁻   Benefits of treatment-as-prevention

⁻   Enhanced adherence counselling

Barriers to knowledge on treatment-as-prevention:

⁻   Inadequate health literacy on viral load

⁻   Waiting time

⁻   Extended fast-track short visits

⁻   Limited interaction with health services

⁻   Perceived risks on treatment-as-prevention

4.2.1. Facilitators to knowledge on treatment-as-prevention

Sources of knowledge

There were various sources of knowledge on TasP that were mentioned. Apart from the ART health facilities, alternative sources of knowledge on TAP existed. Which included self-education on the internet. Other sources were radio, spouses, friends, parents, adolescent health clubs, and a household HIV testing and early ART initiation intervention study. Another one was an unconventional way, proxy testing through HIV negative sexual partners. Which is some participants in discordant relationships, inferred ART is treatment-as-prevention of HIV infection when their sexual partners kept on testing HIV negative despite involving in casual sex with them. A male and female shared their source of knowledge on TAP:

I have been on ART treatment for some time now [6 years], and when I go to test for HIV when am sick, it comes out HIV negative and I have a mistress and I have a child with her, her and the child are HIV negative. Therefore, I think once you are on treatment you cannot transmit HIV (Male, 50 year-old, VL 0 copies/ml)

A female participant shared:

My husband is HIV negative and he was told by his friend, a [Medical] Doctor that he cannot get infected if my viral load is undetectable, so sometimes we do not use condom, and my viral load is undetectable though it is him who insist not to use condoms most of the time (Female, 44 years-old, VL 0 copies/ml)

Symbiotic understanding of viral HIV load suppression

The understanding of knowledge on treatment-as-prevention was comprehensively demonstrated. Participants explained how undetected viral load could not transmit HIV to uninfected sexual partner. The understanding and acceptance viral load suppression by ART by HIV negative discordant partners, and its potential to avert new HIV infections were expressed. Although the knowledge on treatment-as-prevention were obtained from difference sources, it was coherent. On the other hand, concern on the mode of health literacy on treatment-as-prevention were mentioned. Two females shared their insights:

When one is adherent to the drugs, then the drug makes the virus to be weak and make it difficult to transmit the virus. My husband is HIV negative and knows about treatment as prevention because I explained to him, and he is circumcised. He has a clear conscious about it. I knew about this kind of HIV prevention from self-education from the internet, no specific website I can mention and I read widely. (Female, 28 year-old. VL 0 copies/ml).
Another one said*:*

...use of treatment-as-prevention can reduce stigma and HIV infections, although it depends with the sensitisation. How the sensitisation [is] done determines how people will receive the information and use it. (Female, 40 year-old. VL 59 copies/ml).

Benefits of treatment-as-prevention

The acquired knowledge on treatment-as-prevention motivated adherence to ART. Also it's potential to reduce perceived stigma, and to reduce tension among discordant couples were implied. Asymptomatic participants that had disrupted ART treatment for various reasons including fatigue due to drug dosages resumed ART because of it. While discordant couples that experienced failing marriages were hopeful. They were motivated and hopeful when learned ART is treatment-as-prevention of HIV infection, as explained by some of the participants:

I had stopped taking ART. I thought that I was the only one taking them. That is why I think my viral load was high. I continued disrupting treatment not until I joined the support group in 2017. That is how I learned about treatment as prevent, it motivates me to stick to treatment. (Female, 18 year-old. VL 40 copies/ml).

The other one lamented but hopeful:

My husband does not give me peace, he complains all the time… he is HIV negative when am HIV positive…he has even shifted to his girlfriend. Maybe if we knew being on ART prevents HIV infection he wouldn't have left. (Female, 30-year-old. 1 year on ART. VL59)

Enhanced adherence counselling: possible ART drug resistance

The virally unstable participants were targets for enhanced adherence counselling (EAC) to manage unsuppressed viral loads. Repeated counselling session enforced knowledge level on treatment-as-prevention. Informal observations witnessed EAC sessions discussion issues on treatment-as-prevention of mother to child transmission of HIV and through sexual transmission. Some participants were attending EAC session due to drug resistance to some ART regimen. Re-infections from HIV positive sexual partners who are not on ART stood out as a plausible cause of drug resistance, as explained by one the women.

I come here about twice a month to see the doctor and the counsellors. They are checking on me to see how am responding to the new ART treatment they put me on. Because my viral load was very high with the precious ART drug I was taking, had meningitis. Am told I could infect my sexual partner with the viral load volume I have. Though the Doctor says am responding well to the change of drug (Male, 24 year-old, VL 8170 copies/ml)

A female participant added on*:*
Doctor told my viral load is very high. It is probably high because of re-infection from my husband, he is not on ART. My husband is a stubborn man, he says he is too busy to start taking ART. So I will be back again in two weeks' time, they need to change my drugs (Female, 38-year-old. VL 303, 335 copies/ml)

Enhanced adherence counselling: sub-optimal adherence

Sub-optimal adherence to ART affected viral load suppression. During the EAC session observations and in-depth interviews, some participants shared reasons for sub-optimal adherence to ART. Apart from possible ART drug resistance, malnutrition, lack of enough

food, fatigue due to daily dosages of taking ART, financial stress, and running out of ART drugs while away from home were cited as reasons for sub-optimal adherence. However, despite sub-optimal adherence, they were knowledgeable that unsuppressed viral load is transmittable. A male participant explained his reason for unsuppressed viral loads:

With 16,000 viral load, someone can be infected with my viral load even when on treatment. But if the viral load was 0 I cannot infect a person that is HIV negative. I used to miss taking my ART drugs for about a week when I went to Chipata [eastern province], I ran out of drugs. The ART clinic are far where I was, that was in November-December there about. Again, earlier on had missed in May last year 2018, for about a week, went to work in the bush .Then my due date was later they refused to supply me with enough drugs to go with (Male, 37 year-old, VL 16809 copies/ml)

4.2.2. Barriers to knowledge on Treatment as prevention
Inadequate health literacy on viral load
There was also dearth of understanding on what viral load is. Inadequate knowledge was attributed to lack of health education. Due to limited knowledge about viral load they would not even ask the healthcare providers about it. Some participants mentioned infrequent health education sessions and inadequate information provided by healthcare providers. Informal observations confirmed assertion by the participants. However, Chipata ART facility held health education sessions discussing on nutrition, ART, and viral load daily before routine visits. The following participants expressed their understanding on viral load:

If a Doctor tells me that with my sleeping viral load [undetectable] I would be unable to sexually transmit the virus to my sexual partner then I would believe that it works. The Doctor and the people who work here …should be doing a routine sensitization on the viral load. They are no repeated sensitizations which could make the message stick on viral loads and HIV prevention, just like how we know about CD 4 cell count (Male, 34 year-old. VL 0 copies/ml)

Waiting time
ART facilities had huge track flow of patients, which deterred some participants from knowing their viral load results. Congestion restricted time to share viral load results with patients as healthcare providers were busy with routine tasks. Which discouraged participants to follow up results, and waiting time made them tired and they were in a hurry to leave. One of the participants' shared:

*They took blood before from me but never told me my viral load…Today they also drew blood, I hope they tell me next time I come here. I do not have much time to wait on the queue, stay far. Its better I join fast truck group [differentiated service delivery] (*Male, 36-year-old. VL 59 copies/ml)

Extended fast truck visits

However, all the health facilities were implementing the differentiated service delivery, which included different models. Some model entailed that patients only visit the facility to get a refill of ART drugs without waiting on the queue for three months before clinical review. Though, informal observations revealed that some patients missed viral load test appointments. Missing routine viral load tests limits exposure to know viral load suppression. Some PLHIV on ART extended their fast truck visits beyond schedule by repeatedly sending the buddies to collect drugs for them as elaborated in the observation.

Health provider: Where is the patient? She is due for long visit (to see a clinician)
Buddy: She is home busy with some chores
Health provider: she is due to see the doctor and viral load testing tell her to come or next time will not give you drugs…I have noticed an increasing number of short visits (Telling a colleague).

Limited interaction with health services

Some participants came from outside the perimetres of the ART health facilities catchment area. Geographical space to get to the health facilities limited their time to interact with health services. That is the duration to attendant ART health literacy and related discussions such as treatment-as-prevention was less. A male participant narrated:

Vital signs are taken whatever time you come here. But inadequate and restricted contact and time with psychosocial counselors and people that work here make some of us miss out on lot of information. I come far from around here but again before I come here have to go for work to get permission to come here. By the time reach here, some activities have been done. It's rare that I attend sensitisation meetings (Female, 28 year-old, VL 0 copies/ml)

Perceived risks of Treatment-as-prevention

Expanding the knowledge on treatment-as-prevention was perceived as a risk for continued spread of HIV as opposed to prevention. More so it could expose people to sexually transmitted

infections as they could become irresponsible and stop using condoms. As put here by one of the participants:

…People should not know about using ART as a form of HIV prevention because they could become careless [and] immoral. They will be sleeping around…and get other infections (Female, 37 years-old, VL 19 copies/ml)

CHAPTER FIVE: DICUSSION

5.1. Proportion on of knowledge on TasP

This study found that most PLHIV start ART to restore their health unlike for TasP. This concedes with findings from a notable qualitative formative research study which reported lack of understanding of TasP among various community members with different HIV status in Zambia and South Africa (Bond et al 2016). The findings are consistent with these findings, in that only about one-third of the PLHIV on ART have knowledge on TasP and correctly reported their HIV viral loads. Another study which was conducted in Tanzania and Mozambique prior the evidence of TasP in 2006 indicated similar proportion of knowledge on the perceived reason for taking ART. That is 35.3% in Tanzania and 22.8% in Mozambique of PLHIV intuitively reported that ART is used to prevent HIV infection and AIDS (ACORD 2007, p.8). Moreover, 67.9% and 85.9% reported all PLHIV should be initiated on ART in Tanzania and Mozambique respectively, an implication of 'test and treat'. Withal that our findings indicate acceptance of TasP as an HIV prevention measure by over two-third of the PLHIV. The insignificant difference for starting ART between those that started ART to protect sexual partner, and those that started ART for PMTCT could mean increased knowledge on TasP.

1.2. Differences in Knowledge on TasP

Furthermore, these findings indicate knowledge on TasP increasing in the age groups 18-24 and 55-59 year-old, among those with tertiary level of education, and among those with unsuppressed HIV viral loads. The reasons could be that young people are targeted with adolescent health clubs where they learn about TasP as indicated in the qualitative findings. Also through monitoring HIV negative sexual partner's status, if no conversion overtime then inferred treatment-as-prevention among older people. In the same manner, those with unsuppressed viral load are targets for EAC thus exposed to health literacy on TasP, (Haberer et al 2017). Tertiary education level attained is attributed to good capacity to absolve health literacy, hence knowledge level on TasP getting even among those with tertiary education. Thus, the need for increased knowledge level on ART (Kasumu and Balogun 2014), should include knowledge on TasP.

1.3. Knowledge of own viral load test results

The prerequisite to knowledge on TasP is the knowledge of viral load test results, of which access to results is a challenge in Zambia (Ndongmo 2016). These findings confirm the gap of knowing viral load results among PLHIV. However, the menace is among those with the unknown viral load which is unsuppressed, as it poses a possible source for new HIV infections.

Access to HIV viral load results for all PLHIV on ART is fundamental for effective utilisation of the results regardless of the amount of viral load, and for attaining viral load suppression (Ellman et al 2017).

1.4. Factors associated with Knowledge on TasP

There were various sources of knowledge on TasP that PLHIV had access to. This indicates that people are not waiting on the mainstream ART health facilities to provide information on TasP. Thus intensifying health literacy using the already existing channels that the PLHIV accessed information from would empower them with the knowledge on TasP. These findings speak to already existing evidence that there are many sources of information on ART (ACORD 2007). Also the Australia health literacy demonstrated the feasibility of conducting community level sensitisation to increase knowledge level on TasP (Bavinton1 *et al* 2016). Thus the Ending AIDS Zambia initiative ought to devise ways (Maughan-Brown *et al* 2017), to comprehensively increase knowledge level on TasP so as to counter would be wrong information as there are many sources of knowledge on TasP. Notably from the findings, and as agreed by other analysts HIV viral load results are a basis for knowledge on TasP, Hence, access to and coherence understanding of viral load should be inevitable (Das et al 2010;Ellman et al 2017; El-Sadr et al 2017; Killingo et al 2017).

Qualitative findings further review that there are various sources of knowledge on TasP among those with knowledge on TasP. Sources of knowledge on TasP included friends, radio, healthcare workers, and internet. However, knowledge level are low as indicated by the quantitative findings. One of the reasons mentioned was patients were diffident of TasP, and would only believe if their health care providers tell them about it. This also means that there is limited explicit health education on TasP and viral load provided at the health facilities. Those that access TasP knowledge through other means use their own initiative. Moreover, as indicated in the social demographic characteristics, most respondent attained primary school level of education, which spells illiteracy to comprehend concepts of TasP unless aided by healthcare providers.

However, health facilities grapple with space, time and human resource to meet the demand for health education (Haberer *et al* 2017), thus other means of providing health education on TasP ought to be devised (Maughan-Brown et al 2017). Findings from this research explicitly agree with Bavinton *et al* (2016) study in Australia where it was observed that community level campaign increased knowledge level on TasP, lessons could be learned from such a proactive intervention.

According to Schaefer (2019) knowledge is one of the factors required to decide on which HIV prevention measure one practices and that is dependent on the motivation and benefits. In a recent literature review, findings on TasP in advanced countries by Hollingdrake et al (2019) and findings by Kim et al (2018) indicated that some people were motivated to opt for TasP to prevent their partners from HIV infections. It could be obvious that the choice to use TasP as an HIV prevention measure was based on informed decision, although, the studies did not assess the knowledge level on TasP. However, these (our) findings indicate high proportions of lacking knowledge on TasP among PLHIV on ART. Choosing a conventional HIV prevention mode should be based on available information or knowledge (Schaefer 2019). Thus, low numbers of PLHIV opting for TasP could imply that less knowledge level on TasP is shared with PLHIV on ART. Despite the qualitative findings indicating that TasP is a motivation factor for adherence, and a hope for cushioning tensions among discordant couples. The high knowledge level on TasP among those with unsuppressed HIV viral loads, affirms the suitability of EAC in providing health literacy (Tsondai et al 2017). The approach of differentiated service delivery models targets those with unsuppressed HIV viral load to exposure them to more health education on ART in order to control viral load rebound

However, those with suppressed HIV viral loads are less targeted with such vital health literacy (Myer *et al.*, 2017). Mukumbang *et al* (2017) stated that differentiated service delivery are designed to promote adherence through health literacy and counselling, and Schwarts *et al* (2017) reiterates similar remarks but emphasis that proper interpretation of viral load results must be provided to all PLHIV. Tsondai *et al* (2017) also notes that differentiated service delivery give hope of offering long-term ART to stable patients and relieve health facilities of burdensome. Though, at the same time Tsondai *et al* (2017) noted that young people were likely to be lost to follow up and have a viral rebound, the same as patients from health facilities with huge cohorts implementing differentiated service delivery. This implied that vital health literacy such as TasP which motivates adherence should be intensively provided to all PLHIV regardless of the viral load status.

In view of the forgoing, the qualitative findings further indicate that some PLHIV that knew their HIV viral load results and their implication it terms of transmission were motivated to adhere to ART. Which resounds recent assertion by Horter et al (2019), that when PLHIV are communicated to effectively of their progression of HIV viral load suppression, they get motivated to adhere to ART. The motivation was observed particularly among asymptomatic clients because of the tangible and immediate benefit they obtain from taking ART to suppress

their viral load. The reason was not the restoration of health since they initiated ART while health (Horter et al 2019). These findings emphases client-centred communication to include a symbiotic explanation of HIV viral load results with regards to HIV prevention, which is vital to increase ART uptake and TasP (WHO 2017).

In the same vein, unknown HIV viral load burden (12.6%) indicated in these findings could relate to unexplained risk factor undermining the population level TasP intervention to curb new HIV incidents despite progressive records of viral load suppression (Das 2010;Baggaley 2016;Warrier 2019). Nevertheless, this study offers nascent evidence by comparing whether PLHIV on ART with suppressed or unsuppressed viral load are associated with knowledge of TasP.

1.4.1. Barriers to acquisition of knowledge on TasP

Geographical space and time limited interactions between patients and health services, of which health literacy is part of the services (Levesque et *al* 2013; Bond et al 2018). Qualitative findings show that low sensitisation and misconceptions on TasP contributed to inadequate knowledge level on TasP despite two-third attaining HIV viral load suppression. This confirms Renju *et al* (2017) observations in a study, which concluded that healthcare workers prioritised HIV viral load suppression for their clients regardless whether they had knowledge on ART medication. However, challenges affecting efficient delivery of health services in the advent of HIV/AIDS have been well documented, and congestion and waiting time as one of them (Thomas *et al* 2018;Bond *et al* (2018). The qualitative findings attest that those that resided outside the perimetres of the ART facilities catchment area had less interaction with health services. This meant having limited exposure to interact with health education on TasP, although it was infrequently offered.

Tsondai *et al* (2017) insights resonates with this research's qualitative findings and context of the health facilities. Observations made revealed that some patients were missing viral load testing and clinical appointments, instead they would ask their buddies to collect ART drugs on their behalf. Thus, others assert that even though the differentiated service delivery models capably facilitate decongesting of facilities (Banda 2019; Thomas et al 2018), there lies a potential challenge of tracking clients for routine viral load, monitoring and retention failure. Our findings are in tandem with recent observations in Zambia, recommending improvement on differentiated service delivery due to gaps in follow up and delays in viral load testing (Warrier et al 2019). In another study recorded adverse clinical outcomes among PLHIV in the long-term supply of ART model (Tsondai et al 2017). Therefore, proactive surveillance be

devised to trace occurrences of HIV viral load burden, which could be caused by clients missing scheduled viral load test and clinical appointments.

PLHIV knowing their viral load test results is the pinnacle of acquiring knowledge on TasP. However, 250 (69.0%) of PLHIV did not know their viral load test results. Schwarts et al (2017) asserts that viral load test results should be interpreted to the patients to follow through the treatment outcome. A high proportion of PLHIV who did not know their viral load stated that they had limited access to viral load testing services observed in Zambia (Ndongmo 2016). Except that our findings show that PLHIV testing for HIV viral load without knowing the results and implication on HIV transmission it's counterproductive to acquiring knowledge on TasP.

Knowing viral load test results for PLHIV does not only assist the clinician to monitor treatment outcome for patients but motivates adherence, which is the ultimate goal. If PLHIV are motivated to adhere to ART then better treatment outcome are obvious (Horter et al 2019). As noted earlier, access to health services such as health education was limited by congestion and waiting time. Therefore, suggested intensified health literacy on HIV viral load knowledge by allocating ample time to effectively share viral load results with clients, which would increase optimal adherence among ART clients (Horter et al 2019).

The qualitative findings also agree with Horter et al (2019) and Schwarts et al (2017) in that participants that had comprehensive knowledge on TasP reported that were motivated to adhere to ART. While those who did not know about their viral load did not appreciate TasP. However, echoing Tsondai et al (2017)'s observation that the longer a patient is on ART more likely they are to disrupt ART. Thus, strengthening nisus are required to increase knowledge level on TasP to motivate PLHIV on ART to sustain adhere and encourage asymptomatic PLHIV to link to care.

Besides that these findings indicated that PLHIV with unsuppressed viral load were associated with knowledge on TasP, and are targets for EAC as par standard procedure (Tsondai et al 2017). This pattern is similar to Bvochora et al (2019) observations in a study conducted in Zimbabwe where after repeated EAC session for over three months some PLHIV still had unsuppressed viral load. Thus Bvochora et al (2019) suggested other contextual factors could be associated with unsuppressed viral load, and recommended a review of the content of EAC whether it is appropriate for identifying and correcting adherence related challenges, Warrier et al (2019) resounded similar remarks.

The qualitative findings are consistent with aforementioned assertions by Bvochora et al (2019) and Warrier et al (2019) on possible factors the influencing poor adherence (UNAIDS 2016; Maheu-Giroux *et al* 2017). The findings show comparable salient factors including financial stress, food insecurity, blame, re-infection, and possible drug resistance by HIV sero-positive sexual partner not on ART. Thus a number of analyst recommend continued psychosocial and welfare support to cushion persistent socio-economic factors affecting viral load suppression (Bor et al 2011; Shubber et al 2016; Renju et al 2017; Thomas et al 2018; Bond et al 2018).

Nonetheless, reflecting on the covariates, it was unanticipated that tertiary education level was not statistically significant associated with knowledge level on TasP in the multivariate logistic analysis in this study. One study measuring knowledge on ART indicated higher education as a determinant of good knowledge level on ART (Kasumu 2014).

Another surprise is the lack of statistically significant association between knowledge level on TasP and women, because women interact with the ART services more than men. Perhaps, this could imply the general low health literacy on the prevention of sexual transmission of HIV through TasP through sexual. Because most women are knowledge on TasP as prevention of mother-to-child transmission (Hayes, Sabapathy and Fidler 2011; Han et al 2019).

Moreover, it was anticipated that those that initiated ART after 2016 post the 'test and treat' policy would be statistically significant associated with knowledge on TasP. Similar expectations were placed on PLHIV residing in Chipata community to be statistically significant associated with knowledge on TasP. Perhaps the insignificant association was due to the fact that majority of the respondents in the study resided outside Chipata community, hence did not interact with the household HIV testing and early ART initiation intervention study.

CHAPTER SIX: CONCLUSION

The HIV viral load suppression was found to be higher (90.6%) than that of Lusaka Province (63.4 %) reported in the ZAMPHIA report. This study used 63.4% prevalence for the sample size calculation of PLHIV on ART, with the assumption that attaining HIV viral load suppression would entail having knowledge on TasP. Level of knowledge on TasP was low as less than one-third of PLHIV started on ART to protect their sexual partners from infection, one-third had knowledge of their own viral load and knew about protecting sexual partner from infection if are virally suppressed. This was attributed to selected health literacy on TasP such as those with unsuppressed HIV viral loads were associated with high knowledge level on TasP because were deliberately targeted to control the viral rebound. On the other hand, they expressed acceptance of TasP as a prevention of sexual transmission of HIV. Although there were facilitators to knowledge on TasP, there is need to increase health literacy on TasP to all PLHIV as a motivation for sustained viral load suppression and curbing of new HIV infections. By and large, the findings imply that knowledge on TasP is a motivating factor for optimal adherence to ART among PLHIV, particularly among the asymptomatic ones, thereby raising and sustaining viral suppression to 90% and above by 2020 and attain an AIDS free Zambia.

6.1. Recommendations

The recommendations arising from the findings including the following:

− There is need to promote health literacy on knowledge level on sexual prevention of HIV through TasP across all the PLHIV. Which could be done by symbiotic explanation of the implication of viral loads on HIV transmission.

− The population based HIV surveys should measure knowledge on TasP such as the Zambia Demographic and Health Survey, and Zambia Population-HIV Impact Assessment.

− There is need to explicitly message the benefits of ART as TasP during health education sessions, which would promote optimal ART adherence and motivate linkage of asymptomatic HIV sero-positive individuals to care

6.1.1. Further studies:

− Future studies could look at the knowledge level and level of acceptability of using TasP as a mode of sexual prevention of HIV among negative discordant couples.

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Appendix A: Mixed Methodology Table

Assumption	Question	Positivism Paradigm	Interpretivism Paradigm
		Quantitative: Verify knowledge level on TasP	**Qualitative:** Understand Knowledge on TasP.
Ontological	**What is the nature of reality**?	Self-reported knowledge on TasP as known by Respondents according to the established facts on TasP as sensitised by healthcare providers or through other sources. Thus, was objectively assessed.	Knowledge on TasP as shared from participants' own understanding through own experiences and perceptions.
Epistemological	**How do we know that we know?**	Closed-ended question on TasP asked and No or Yes responses were marked to assess knowledge level on TasP according to established scientific facts on TasP as an HIV prevention measure.	How the knowledge on TasP is understood and interpreted by the participants in their own conscious, conviction, self-awareness, and in the context TasP is experienced.
Axiological	**What is the role of values of the researcher?**	Knowledge on TasP were assessed randomly by assigning interviewer-administered questionnaires; thus, biases were greatly reduced and data were objectively assessed.	Researcher purposively selected participants and was empathetically involved in the discussions, iteratively and reflectively. Value burden greatly reduced as the discussions bordered around the understanding of the closed-ended responses. Thus, triangulation validated the data and made it more reliable.
Methodological	**What is the process of the research**?	Cross-sectional study: Stratified health facilities by short turnaround of VL test results. Then cross-sectional study was used to assess the current knowledge level on TasP through probability selections of study respondents. Generalisable to the study and target population.	Phenomenological study: Purposively selected participants from among the randomly selected survey respondents for triangulation and validation. Contextualise closed-ended responses. In-depth interview guides were used. Transferrable to target population with similar settings to the study population.

Methods	Methods and tools of inquiry?	Questionnaires used to collected data. Data used to report counts, proportions, p-value, and 95% confidence intervals and assessed association of knowledge level on TasP with social-demographic factors. Z score test and logistic regression were used for run statistical test. Used Stata Version 14 statistical software.	Used interview guides. Discussions were handwritten into notebook and also captured on audio recorder. Observations were handwritten. Text and audio recordings were transcribed, translated and analysed Microsoft Office Word Processor Windows 2013.

Appendix B: Participants Information Sheet and Consent Form

Title: Knowledge level on treatment-as-prevention among Sero-positive adults on antiretroviral therapy in four health facilities of Lusaka district in Zambia.

PARTICIPANT INFORMATION SHEET

Information sheet and consent form for people aged between 18-59 years living with HIV on antiretroviral treatment.

Section	Statement	Understood
Introduction	You are invited to take part in this research study because you are an adult living with HIV and have been on antiretroviral (ART) treatment for nine months now or for more than nine months, and you access ART drugs from (name) _____ health facility. Please ask the study research assistant to explain any words or procedures that you do not clearly understand. This form is called a Participant's Information and Consent Form. The purpose of this form is to give you information about the research study you are being asked to join. The form describes the purpose, procedures, benefits, and risks of the research study. You may choose not to join the research study or withdraw from this study at any time. If you choose not to take part in this study, it will not in any way affect your access to health care at this health facility or anywhere else. Please read this Participant's Information and Consent Form and ask as many questions as needed. You should not sign this form if you have any questions that have not been answered to your satisfaction. If you sign this form, you will be giving your agreement to take part in the study. This study is being self-funded by *Fredrick Ngwenya*, who is a student pursing his studies in Master of Public Health in Population Studies at the University of Zambia, School of Public Health at Ridgeway campus. There are several key points that you should be aware of before signing the consent form. These key points have been separated into sections indicated on the *left side of this document,* and you have to tick *Yes* or *No* in the box on the *right side of the document* to show that you have understood the research study information provided under each section in this document.	**Ye**☐ **No**☐
Voluntary participation	You do not have to be part of this study. Taking part in this study is your own decision. If you feel you have been	**Ye**☐

	forced or unfairly pressured into participating either by us the research team or by a health care provider, then you are welcome to decline to participate now. If you decide today to take part in this research study, you may refuse to take part in any portion of the study or stop at any time without reducing or affecting any care that you receive at the health facility or anywhere else.	**No** ☐
Who is doing the Study?	A student, by the name of *Fredrick Ngwenya*, is pursuing Master of Public Health in Population Studies at the University of Zambia, school of Public Health at Ridgeway Campus. This research study is a prerequisite to fulfil his study obligation, and to add evidence-based information to the academics. The Bioethics Committee of the University of Zambia approved the research study, and permission was obtained from the National Health Research Authority Zambia, and from the Lusaka District Health Office.	**Ye** ☐ **No** ☐
Participant Eligibility – Why am I being asked to take part in this study?	You are being asked to participate in the research study because you have been on ART for nine months or for more than nine months. As you may be aware, that, there are different ways of HIV prevention including the use of 'abstinence', 'being faithful to a faithful sexual partner,' 'use of condoms', 'male circumcision', and 'prevention of mother to child transmission of HIV'. However, we would like you to share with us what you know if a person on ART who has a low HIV viral load cannot spread HIV infection to their sexual partner/s. We are talking to you as a starting point, which may lead to in-depth research to understand more on what you know on using ART as prevention and how you manage your viral load suppression. For now, we are interviewing approximately 357 adults living with HIV who are on ART and are accessing drugs and/or viral load routine monitoring from this health facility. You are also being asked to take part in the research study because you are aged between18-59 years, not pregnant, access ART drugs and care and viral load monitoring from this health facility.	**Ye** ☐ **No** ☐
What will happen during this study?	You will be asked to participate and respond to a set of questions on your knowledge about ART as prevention of HIV sexual infection and viral load suppression. You will only answer the questions if you agree to take part in the research study. You will be asked personal questions about your age, place of residence, viral load, smoking, alcohol consumption, income and other related questions. Will also ask your permission to access your health information from you ART records – information such as your viral load volume and CD 4 cell count testing history. *We will also request for your contact detail/number to arrange for an in-depth interview in*	**Ye** ☐ **No** ☐

	case you will agreeable to participate in further discussion. The interview/s will take place from this health facility during your routine visit, and *it will be a one-off interview unless you will be selected later to participate in an in-depth interview.* If you are selected you will not provide another informed consent, that is, if you do consent to this research interview today, and you will be interviewed on your subsequent routine visit to the health facility.	
What are the possible risks or discomforts?	Some of the questions that we will ask you will be of a sensitive nature. You may become embarrassed, worried or anxious when asked questions about HIV, sexual risk behaviour and other topics. Should this occur, or if you are otherwise upset by the study, the research staff can refer you to an appropriately trained person at this health facility. Another possible risk of this study is loss of confidentiality of the information you give. In particular, you may worry that responses given in the interviews will find their way back to individuals like your health care provider. Every effort will be made to protect your confidential information. For example, none of the information you give will be kept in the same place as your name or other personal identifiers. Instead, your answers will only be linked to a unique study participant number. A register linking your name to this number will be kept privately and separate from your answers. Also, to further reduce this risk, data collected on the audio recorders in case of in-depth interviews, will be downloaded to password protected secure computers under the management of the student. It will further be transcribed, the recordings will be destroyed. Both data collected using the questionnaires and in-depth interviews will be checked and cleaned by the student. The interview process and survey progress will be frequently de-briefed and closely monitored by the Student and his supervisors. Data will be stored securely at a location away from this health facility. There is also a risk that being seen to participate in this study may lead other people (for example people you know) to gossip and spread rumours about what you might have answered. While we cannot control these things, we have made every effort to explain the purpose of the research to the health care providers at this facility. We also have asked them to treat such gossiping seriously and discourage rumours.	**Ye** ☐ **No** ☐
What are the potential benefits?	There are no direct benefits to you for participating in this study. Instead, it is to facilitate the academic obligation of the student, to add knowledge to the	**Ye** ☐ **No** ☐

	academic community, and potentially to inform policy-makers and intervention implementers on HIV prevention to understand better, what adults on ART know about treatment as prevention for HIV infection. However, the information shared in the interview could be of benefit to you as you reflect on the discussion.	
Are there any alternatives to participation?	There may be other studies going on here that you may be eligible for, if you wish, we will tell you about other studies we know about.	**Ye**☐ **No**☐
How will my confidentiality and privacy be protected?	Confidentiality means, me, the student and the people helping me (research team) will protect your identity and take steps to make sure that all the information you provide is separated from your identity (name, address, phone number) as a person. We do this so that someone reading one of our reports or seeing our presentations will not know your identity. Please refer to *"What are the possible risks or discomforts?"* section above explaining in detail how we will maintain confidentiality. The interview will be held in a place or room with privacy and away from destruction or noise but within the health facility premises, or you may choose the time and place you are comfortable with to conduct the interview from. There are some people who may review the records of your data. They do this to check that we (the researchers) are treating you in the correct way and are adhering to guidelines for good scientific practice. The people who may review your records include the University of Zambia Bioethics Research Committee, the National Health Research Authority Zambia and Ministry of Health; are institutions, which may send some people to watch over the safety and rights of research participants and research practices. The data that you will provide will be used to write scientific reports, conference presentations and publication in a scientific journal but be rest assured that your name and the name of this health facility will not be mentioned in these writings, and the information will be presented in a general sense.	**Ye**☐ **No**☐
What happens if I am injured by participating in this study?	It is very unlikely that you could be injured as a result of participating in this study. Nothing that we will be asking of you should place you at risk for injury. However, if you are injured while participating in this study, you will be given immediate treatment for your injuries. You will not have to pay for this treatment. There is also no compensation as the interview will take less than 35 minutes. Although psychosocial harms due to this study are expected to be minimal, they will be monitored closely	**Ye**☐ **No**☐

	throughout the duration of the interview/s. We encourage you to report any psychosocial harm that you may experience, as and when they occur. If you do experience negative psychosocial harms such as negative impact on your emotions, every effort will be made by study staff to provide appropriate care and counselling to you, and/or to refer you to appropriate resources and care. You will not be giving up any of your legal rights by signing this Participant's Information and Consent Form.	
Costs to you	There is no cost to you for being in this study. The time you take to participate in this study will be negotiated with you and your health care provider during the time you come to access care (ART drugs or viral load testing). This means, your participation in this survey is instead of, and not in addition to, your usual healthcare management.	**Ye**☐ **No**☐
What are some reasons why I may be withdrawn from this activity without my consent?	You may be withdrawn from the study without your consent for the following reasons: • The research study, or this part of the study, is stopped or cancelled • The study staff feels that completing the study or this part of the study would be harmful to you or others. • If you as a participant are unable or unwilling to participate in the study in a way that is in compliance with the necessary study procedures.	**Ye**☐ **No**☐
Persons to Contact for Problems or Questions	If you have any questions about your participation in this research study, your rights as a research participant, or if you feel that you have experienced a research-related injury, contact: **Student** (Principal Investigator**): *Mr. Fredrick Ngwenya,* *University of Zambia, School of Public Health, Ridgeway Campus, Off Nationalist Road and John Mbita Road, P.O. Box 50110, Lusaka.* **Contact number(s):** *+260977 633 469* **Email:**fredngwny@gmail.com	**Ye**☐ **No**☐
Independent Review Board/Ethics Committee	If you have any questions or concerns about your rights as a research participant or want to discuss a problem, get information or offer input, you may contact: **Biomedical Research Ethics Committee:** *School of Medicine, Ridgeway Campus, P.O. Box 50110, Lusaka.* **Daytime Telephone Number:** *+260-211-256067*	**Ye**☐ **No**☐
Thank you for reading this information sheet. If you have any questions, please ask them now. The interviewer will be pleased to answer them. If you wish to take part, please read and sign the consent form. Please keep this information sheet in a safe place.		

Title: Knowledge level on treatment-as-prevention among Sero-positive adults on antiretroviral therapy in four health facilities of Lusaka district in Zambia.

STUDY PARTICIPANTS

Information sheet and consent form for people aged between18-59 years living with HIV on antiretroviral therapy.

SUMMARY OF THE INFORMED CONSENT PROCESS

1.	I have been given sufficient time to consider whether to take part in this study.
2.	My taking part in this research study is voluntary. I may decide not to take part or to withdraw from the research study at any time without penalty or loss of benefits or treatment to which I am entitled.
3.	The research study may be stopped at any time without my consent.
4.	I have had an opportunity to ask the study staff questions about this research study. My questions so far have been answered to my satisfaction.
5.	I have been told how long I may be in the research study.
6.	I have been informed of the procedures that may be performed during the research study.
7.	I have been told what the possible risks and benefits are from taking part in this research study. I may not benefit anything if I take part in this research study.
8.	I do not give up my legal rights by signing this form.
9.	I have been told that before any study related procedures being performed, I will be asked to voluntarily sign this Participant Information and Consent Form.
10.	I will receive a signed and dated copy of this Participant Information and Consent Form.
	If you either have read or have heard the information in this Participant Information and Consent Form, if all of your questions have been answered, and if you agree to take part in the study, please print and sign your name and write the date on the line below.

Title: Knowledge level on 'treatment as prevention' among Sero-positive adults on antiretroviral therapy in four health facilities of Lusaka district in Zambia.

Consent form for people aged between 18-59 years living with HIV on ART treatment.

PARTICIPANT CONSENT FORM

I, the undersigned agree to take part in the above named study

_____   _____

Participant's Name (print)   **Participant's Signature (or fingerprint)**

Date: _____

I, the undersigned attest that I have explained the study information accurately in _____(language) to, and was understood to the best of my knowledge by, the participant and that he/she has freely given their consent to participate* in the presence of the above named impartial witness (where applicable).

_____   _____

Name of Research Study Staff   **Research Study Staff Signature**

Conducting Consent Discussion (print)

Date: _____

_____   _____

Witness' Name (print)   **Witness' Signature and Date**

(As appropriate)

Date: _____

[*Only required if the participant is unable to read or write.]

Participant ID: | P | T | | | | | |

Appendix C: Interviewer-Administered Questionnaire

SCHEDULE INTERVIEW

SOCIO-DEMOGRAPHY

NUMBER	QUESTION	RESPONSE		SLASH
		WRITE DATE AS TOLD		
		1.	18-24	
		2.	25-34	
1_AGE	WHEN WERE YOU BORN?	3.	35-44	
		4.	45-54	
		5.	55-59	
		CONFIRM AGE IN PARTICIPANT'S (PATENT'S) RECORD FILE/SMARTCARE		

2_GEN	GENDER	1.	MALE	
		2.	FEMALE	

		0.	NO SCHOOL	
		1.	PRIMARY SCHOOL	
3_EDU	WHAT IS THE HIGHEST LEVEL OF EDUCATION YOU HAVE COMPLETED?	2.	JUNIOR SECONDARY SCHOOL	
		3.	SENIOR SECONDARY SCHOOL	
		4.	COLLEGE	
		5.	UNIVERSITY	

		0.	NO RELIGION	
		1.	CATHOLIC CHRISTIAN	
		2.	PENTECOSTAL CHRISTIAN	
		3.	ISLAM	
4_REL	WHAT IS YOUR RELIGION?	4.	BAHA'I FAITH	
		5.	BUDDHISM	
		6.	HINDUISM	
		7.	JUDAISM	
		8.	TRADITIONALIST	
		6.	OTHER	

5_RES	WHERE DO YOU LIVE?	1.	IN THIS COMMUNITY	
		2.	OUTSIDE THIS COMMUNITY	

ECONOMIC ACTIVITY AND FOOD SECURITY

6_IGA	ARE YOU CURRENTLY WORKING, OR ENGAGED IN ANY INCOME GENERATING ACTIVITIES?	0.	NO	
		1.	YES	

		1.	ONE	
		2.	TWO	
		3.	THREE	
7_HHM	HOW MANY HOUSEHOLD MEMBERS DO YOU LIVE WITH IN YOUR HOUSE?	4.	FOUR	
		5.	FIVE	
		6.	SIX	
		7.	MORE THAN SIX, WRITE NUMBER	

		1.	LESS THAN 600 ZMK	
		2.	601-900 ZMK	
		3.	901-3000 ZMK	
8_HHE	HOW MUCH MONEY DOES YOUR HOUSEHOLD HAVE TO SPEND ON AVERAGE, PER MONTH?	4.	3001- 5000 ZMK	
		5.	5001-7000 ZMK	
		9.	DON'T KNOW	
		WRITE AMOUNT IN FIGURES		

9_CAD	DO YOU CURRENTLY TAKE ANY ALCOHOLIC DRINK?	0.	NO	
		1.	YES	

10_CSC	DO YOU CURRENTLY SMOKE CIGARETTES?	0.	NO	
		1.	YES	

11_PHS	WHAT IS THE HIV STATUS OF YOUR CURRENT SEXUAL PARTNER/WIFE/HUSBAND?	0.	HIV NEGATIVE (if 'NEGATIVE' skip to question 13)	
		1.	HIV POSITIVE	
		2.	NO SEXUAL PARTNER (if 'NO SEXUAL PARTNER' skip to question 14)	
		9.	DO NOT KNOW (If don't know skip to question 13)	

12_PVL	**WHAT IS YOUR CURRENT SEXUAL PARTNER'S /WIFE'S /HUSBAND'S HIV VIRAL LOAD?**	1.	**MORE THAN 1000 COPIES PER MILLILITRES** *(write figure if told)*	
		2.	**1000 OR LESS THAN 1000 COPIES PER MILLILITRES** *(write figure if told)*	
		9.	**DON'T KNOW**	

13_CPM	**CURRENTLY, WHAT HIV PREVENTION METHOD DO YOU USE WITH YOUR SEXUAL PARTNER/S USUALLY?**	1.	**CONDOMS**	
		2.	**ABSTINENCE**	
		3.	**BEING FAITHFUL TO ONE FAITHFUL PARTNER**	
		4.	**MALE CIRCUMCISION**	
		5.	**ART (TREATMENT AS PREVENTION)**	
		6.	**WET SEX**	
		7.	**SOMETIMES CONDOMS AND SOMETIMES WET SEX**	
		8.	**NONE**	

BAT 14_DOT	WHEN DID YOU START TAKING ART?		***WRITE DATE AS TOLD***	
		0.	**BEFORE 2016**	
		1.	**AFTER 2016**	
			VERIFY DATE FROM FILE/ SMARTCARE,THEN WRITE NUMBER OF YEARS AGO	

15_PRA	**WHAT WAS THE PRIMARY REASON FOR STARTING ART?**	1.	**FOR MY OWN HEALTH**	
		2.	**TO PROTECT MY PARTNER FROM HIV INFECTION**	
		3.	**RECOMMENDED BY HEALTH WORKER**	
		4.	**TO PROTECT MY BABY (WOMEN ONLY)**	
		5.	**OTHER**	
		9.	**DON'T KNOW**	

16_SRA	**WERE THERE ANY OTHER REASONS TO START ART?**	1.	**NO OTHER REASON**	
		2.	**FOR MY OWN HEALTH**	
		3.	**TO PROTECT MY PARTNER FROM HIV INFECTION**	
		4.	**RECOMMENDED BY HEALTH WORKER**	
		5.	**TO PROTECT MY BABY (WOMEN ONLY)**	
		6.	**OTHER (Coerced)**	
		9.	**DON'T NOW**	

KNOWLEDGE ON TREATMENT AS PREVENTION: POTENTIAL KNOWLEDGE /ACQUIRED KNOWLEDGE

17_KTA	**CAN A PERSON WITH UNDETECTABLE HIV VIRAL LOAD BE ABLE TO INFECT HIS/HER HIV NEGATIVE SEXUAL PARTNER /S?**	0.	**NO**	
		1.	**YES**	
	CLARIFY! WITHOUT USING A CONDOM			

18_SVL	**WHAT IS YOUR CURRENT HIV VIRAL LOAD?**	1.	**MORE THAN 1000 COPIES PER MILLILITRES**	
		2.	**1000 OR LESS THAN 1000 COPIES PER MILLILITRES**	
		3.	**SELF-REPORTED**	
		9.	**DON'T KNOW** (SKIP TO QUESTION 20)	
			WRITE PARTICPANT'S ACTUAL VIRAL LOAD INDICATED ONTHE SMARTCARE	

KNOWLEDGE ON TREATMENT AS PREVENTION: KINETIC KNOWLEDGE OR KNOWLEDGE UTILISATION / TRANSLATION

19_IVL	**IS IT POSSIBLE TO INFECT AN HIV NEGATIVE SEXUAL PARTNER/S WITH THAT VOLUME OF VIRAL LOAD YOU MENTIONED ABOVE?**	0.	**NO** (IF THE RESPONSE IS 'NO" END INTERVIEW)	
		1.	**YES** (IF THE RESPONSE IS "YES" END INTERVIEW	
	CLARIFY,WITHOUT USING CONDOM			

20_VDT	**YOU HAVE BEEN ON ART FOR (***refer to duration on ART in question 14 response in ITALICS***) ____ MONTHS / YEARS, DO YOU THINK YOUR HIV VIRAL LOAD IS SUPPRESSED, COSIDERING HOW YOU HAVE BEEN TAKING YOUR ART DRUGS?**	0.	**NO**	
		1.	**YES**	

21_IDT	**IF NO or YES TO THE ABOVE QUESTION (***referring to question 20***), IS IT POSSIBLE TO INFECT AN HIV NEGATIVE SEXUAL PARTNER/S.**	0.	**NO**	
		1.	**YES**	
	CLARIFY,WITHOUT USING CONDOM			

This brings us to the end of the questions. Do you have any question/s or concern/s or anything you would like to say? If there are no issues, I **sincerely thank you for taking much of your precious time to share with me what you know about ART and HIV prevention. Thank you!**

Appendix D: In-depth Interview Guide

Title: Knowledge level on 'treatment as prevention' among Sero-positive adults on antiretroviral therapy in four health facilities of Lusaka district in Zambia.

<u>IN-DEPTH INTERVIEW</u>

Introduction:

Thank you so much for your time this far, now I would like to proceed asking you few more questions to seek explanations on issues standing out from the responses you gave out earlier. This will take approximately 10 minutes, however, feel free to excuse yourself if it takes longer than expected and you are free not to answer questions you feel you do not want to give further responses.

Caution! Some questions may not apply to some participants, i.e. those without knowledge on TasP, thus assess the participant's responses from the questionnaire and pick appropriate questions to ask.

Questions and probes:

- **You mentioned earlier that your sexual partner/s is/are HIV positive.**
- When did you know your partner/s' HIV status, how?
- Was it at the same time as you?
- You also said that you know your partner/s' HIV viral load is it important to know your sexual partner/s viral load, if yes/no why?
- Do your sexual partner/s know your HIV viral load?
- If yes, do they ask you occasionally to have you viral load tested?
- If they do ask you to have your viral load tested, why do they ask?
- **You mentioned earlier that your sexual partner/s is/are HIV negative.**
- When did you know your partner/s' HIV status?
- Was it at the same time as you?
- Do your sexual partner/s know your HIV viral load?
- If yes, do they ask you occasionally to have you viral load tested?
- If they do ask you to have your viral load tested, why do they ask?
- **What is the main HIV prevention method you use with your sexual partner/s?**
- If it is not TasP, is that method better than using ART as a prevention of HIV infection? Explain.

- How can using ART as a prevention for HIV sexual transmission be used effectively to help prevent further spread of HIV to HIV negative adults?
- Are your household members or those you consider to be close to you aware that maintaining a low HIV viral load is important to you in preventing the spread of HIV sexually?
- **Where/how, did you know/learn that people who are on ART and have attained a low HIV viral load cannot infect their sexual partner/s even without using a condom?**
- Was it at the health facility, a person working for an Organization, or not why?
- Which Organisation is/was that, or who told?
- Should all adults know about using ART as a form of preventing sexual transmission of HIV?
- Who deserves to know that between HIV positive and HIV negative adults? Explain.
- **What has been your experience accessing ART drugs?** Queues, shortage, three months' supply?

This brings us to the end of the questions. Do you have any question/s or concern/s or anything you would like to say? If there are no issues, **I sincerely thank you for taking much of your precious time to share with me what you know about ART and HIV prevention. Thank you!**

Appendix E: Description of Variables

Variable	Type	Operational Definition	Indicators	Analytical	Descriptive	Outcome
				Analysis Report		
Viral Load	Categorical	HIV viral load	– Suppressed – Unsuppressed – Missing	– Association with outcome (either have knowledge on tap or not) – Report odds ratio p-value and 95% confidence intervals.	– Proportion with Knowledge on TasPTasP (Either Have Knowledge on TasPTasP or Not). – Report Frequencies, Percentages and P-Value.	Dichotomy (Either Have Knowledge On Tap Or Not); Reported Odds Ratio-Value, Percentages, Frequencies, And 95% Confidence Interval.
Sex	Categorical	Male or female	– Man – Woman			
Age	Continuous	Length of time lived from birth	– Age at last birthday in years			
Marital Status	Categorical	Living as married or unmarried	– Single – Married – Separated – Divorced – Widowed			
Education	Categorical	Highest level of educational attainment	– None – Primary – Secondary – Tertiary			
Residence	Categorical	Area where participant live with household	– Within community – Outside community			
Religion	Categorical	Spiritual-social denomination	– None – Christian – Muslim			
Duration on ART	Categorical	Length of period on art nine months and above	– Started ART before 2016 – Started ART after 2016			
Income Generating Activity	Continuous	Money earned per money	– Below or above monthly national food basket	Association with unsuppressed viral load; reported frequencies, percentages, p-value and 95% confidence intervals		Unsuppressed viral load; reported frequencies, percentages, p-value and 95% confidence intervals
Household monthly expenditure	Categorical	Monthly expenditure per household member.	– Below ZMK 1,000 – Above ZMK 1,001			
Household size	Categorical	Number of household members to monthly national food basket at a household	Number of household members below/equal or above national monthly food basket.			
Alcohol intake	Categorical	Either currently takes	– No – Yes			

		alcoholic drinks or not			
Tobacco smoking	Categorical	Either currently smokes tobacco cigarettes or not.	- No - Yes		

Appendix F: Timeline

Activity	Personnel	2018					2019						
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Pre-test questionnaire	Student	■											
Pre-test Informed Consent Form	Student	■											
Printing dissertation proposal	Student	■											
Bioethics committee submission	Student	■											
Questionnaire and Interview guide design	Student/consultant	■	■										
Orientation of research assistants	Student/ RAs	■											
Data collection and cleaning	Student/ RAs		■	■	■	■	■	■	■				
Data entry and analysis	Student		■	■	■	■	■	■	■	■			
Report writing and feedback from supervisors	Student		■	■	■	■	■	■	■	■	■	■	■
Graduation Forum Presentation and feedback	Student											■	■

Appendix G: Budget

Item No.	Activity	Personnel	Unit cost	Total cost
	Data collection tools			
	Pre-test questionnaire	Student	K 10 by 10 copies	K100
1.	Pre-test Informed Consent Form	Student	K 10 by10	K100
2.	Printing dissertation proposal	Student	K 3 by 100 copies	K 300
3.	Bioethics committee submission	Student	K 1,000 for submission	K1,000
1.	Formatting electronic questionnaire	Student and consultant	K 4,000 for 2 gadgets	K 4,000
2.	Orientation of research assistants	Student and RAs	K 100 by 2 RAs	K 200
3.	Data collection and cleaning	Student and RAs	K 20 by 330 questionnaires	K6,600
4.	Data entry and analysis	Student	K 10 by 330 questionnaires	K3,300
5.	Report writing and feedback from supervisors	Student	K300 internet data bundles	K 300
6.	Printing and submitting dissertation report	Student	K 3 by 200 pages	K 600
7.	Taxi fare	RAs	K 20 by 60 days	K 1,200
8.	Fuel	Student	K 13.75 by 40 litres	K 550
9.	RA subsistence	Student	K 50 by 60 days by 2 RAs	K 6,000
10.	**Grand total**			**K 24, 250**

Appendix H: Biomedical Research Ethics Approval Letter

THE UNIVERSITY OF ZAMBIA

BIOMEDICAL RESEARCH ETHICS COMMITTEE

Telephone: 260-1-256067   Ridgeway Campus
Telegrams: UNZA, LUSAKA   P.O. Box 50110
Telex: UNZALU ZA 44370   Lusaka, Zambia
Fax: + 260-1-250753
E-mail: unzarec@unza.zm
Assurance No. FWA00000338
IRB00001131 of IORG0000774
8th November, 2018.

REF No. 038-08-18

Mr. Fredrick Ngwenya,
University of Zambia,
School of Public Health,
P.O. Box 50110,
Lusaka.

Dear Mr. Ngwenya,
RE: "KNOWLEDGE LEVELS ON 'TREATMENT AS PREVENTION' AND CRITICAL FACTORS OF VIRAL LOAD SUPPRESSION AMONG SERO-POSIIVE ADULTS ON ANTIRETROVIRAL THERAPY IN FOUR HEALTH FACILITIES OF LUSAKA DISTRICT IN ZAMBIA" (REF. NO. 038-09-18)
The above-mentioned research proposal was presented to the Biomedical Research Ethics Committee (UNZABREC) 5th

November, 2018. The proposal is approved. The approval is based on the following documents that were submitted for review:

a) Study proposal
b) Questionnaires
c) Participant Consent Form

APPROVAL NUMBER: REF. 038-08-18
This number should be used on all correspondence, consent forms and documents as appropriate.
- APPROVAL DATE **: 8th November, 2018**
- TYPE OF APPROVAL **: Standard**
- **EXPIRATION DATE OF APPROVAL : 7th November, 2019**
- After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the UNZABREC Offices should be submitted one month before the expiration date for continuing review.
- **SERIOUS ADVERSE EVENT REPORTING**: All SAEs and any other serious challenges/problems having to do with participant welfare, participant safety and study integrity must be reported to UNZABREC within 3 working days using standard forms obtainable from UNZABREC.
- **MODIFICATIONS**: Prior UNZABREC approval using standard forms obtainable from the UNZABREC Offices is required before implementing any changes in the Protocol (including changes in the consent documents).
- **TERMINATION OF STUDY**: On termination of a study, a report has to be submitted to the UNZABREC using standard forms obtainable from the UNZABREC Offices.
- **NHRA:** Where appropriate, apply in writing to the National Heath Research Authority for permission before you embark on the study.
- **QUESTIONS**: Please contact the UNZABREC on Telephone No.256067 or by e-mail on unzarec@unza.zm.
- **OTHER**: Please be reminded to send in copies of your research findings/results for our records. You're also required to submit electronic copies of your publications in peer-reviewed journals that may emanate from this study.
  Yours sincerely,

[signature]

Dr. S.H Nzala

Appendix I: National Health Research Permission Letter

THE NATIONAL HEALTH RESEARCH AUTHORITY
Paediatric Centre of Excellence
University Teaching Hospital
P.O. Box 30075
LUSAKA
T: +260 211 250309/+260 95 563276 | **E: znhrasec@gmail.com** | **www.nhra.org.zm**

23rd November, 2018

Fredrick Ngwenya
The University of Zambia
School of Public Health
P.O. Box 50110
LUSAKA

Re: Request for Authority to Conduct Research

The National Health Research Authority is in receipt of your request for authority to conduct research titled **"Knowledge levels on treatment-as prevention among Sero-positive adults on antiretroviral therapy in four health facilities of Lusaka district in Zambia."** I wish to inform you that following submission of your request to the Authority, our review of the same and in view of the ethical clearance, this study has been **approved** on condition that:

1. The relevant Provincial and District Medical Officers where the study is being conducted are fully appraised;
2. Progress updates are provided to NHRA quarterly from the date of commencement of the study;
3. The final study report is cleared by the NHRA before any publication or dissemination within or outside the country;
4. After clearance for publication or dissemination by the NHRA, the final study report is shared with all relevant Provincial and District Directors of Health where the study was being conducted, University leadership, and all key respondents.

Yours sincerely,

Dr. Godfrey Biemba
Director/CEO
National Health Research Authority
All correspondences should be addressed to the Director/CEO National Health Research Authority

Appendix J: Permission Letter from The Lusaka Provincial Health Office

Appendix K: Permission Letter from The Lusaka District Health Office

Appendix L: Poster Published in the Journal of the International AIDS Society

Facilitators and barriers to Knowledge on 'Undetectable Viral Load is Untransmittable' among sexually active adults on antiretroviral therapy in Lusaka, Zambia.

Fredrick Ngwenya[1], Melvin Simuyaba[2], Tikulirekuti Banda[3], Joseph Mumba Zulu[1], Hikabesa Halwiindi[1] Mpundu Makasa[1].

[1]The University of Zambia, School of Public Health, Lusaka, Zambia, [2]Zambart, University of Zambia, School of Public Health, Lusaka Zambia, and [3]Centre for Infectious Diseases Research in Zambia, Lusaka Zambia.

BACKGROUND

In Zambia, sub-optimal adherence to antiretroviral treatment (ART) is among the main reasons deterring attainment of the 90% viral load (VL) suppression among adults.

In order to attain at least 90% of sustained VL suppression rate, it is inevitable that people living with HIV (PLHIV) are knowledgeable about 'undetectable viral load is untransmittable' (U=U).

Thus, the study explored the barriers and facilitators on knowledge about 'U=U' among PLHIV on ART in Lusaka.

METHOD

Data were collected between December 2018 and January 2019, in three busy ART Surge facilities in Lusaka. Semi-structured interview schedules were used to explore PLHIV's perceptions and knowledge on 'U=U'.

Purposive sampling was used to select a mix of PLHIV with suppressed (n=41) and unsuppressed (n=14) VLs.

A total of (n=25) men and (n=30) women, aged 18-58 years participated in the study. All the participants were on ART for at least nine months. Data were analysed thematically.

Achieving a sustained third 90 goal requires increased knowledge of the efficacy of

U = U

Undetectable   Untransmittable
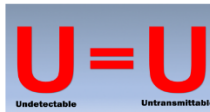
among PLHIV.

RESULTS

Facilitators and barriers to Knowledge on 'U=U'.

Facilitators:

Various sources of knowledge
– Friends on ART
– Learning by being in a discordant relationship
– Self-taught through internet
– Radio, health care providers, and
– Enhanced adherence counseling

Benefits
– Reduced stigma
– Worry-free sexual relationship
– Negligible risk to infect partner.

Barriers:

Inadequate health talk
– Viral load implication on HIV transmission
– Undetectable VL is perceived transmittable
– Emphasis on CD4 count

Waiting time
– Affected follow up of viral load test results
– Affected attending literacy sessions

Extended fast track short-visits
– Affected interaction with literacy sessions

Excerpts

"I knew about treatment as prevention at an adolescent group meeting. Everyone should know about it. At the adolescent group we are urged to ask about our viral load" **(Female, 19 years-old, VL 0 copies/ml).**

"…use of treatment-as-prevention can reduce stigma and HIV infections, although it depends with the sensitisation. How the sensitisation [is] done determines how people will receive the information and use it" **(Female, 40 year-old. VL 59 copies/ml).**

"They say many things at the adherence session but they never say about ART as a means of preventing HIV transmission. They never do, maybe they are just cautious thinking that we can became careless sexually. As for me I would be careful if I knew that for a fact. If really it woks then it is a miracle. They should explicitly explain that not to hide that kind of information. It can even help people to accept their status and disclose and reduce stigma and it would be motivating to sticky to the drugs if we know that" **(Male, 22year-old,VL 525, 432 copies/ml).**

CONCLUSION

Therefore, there is need to prioritise health awareness on 'U=U' to both virally suppressed and unsuppressed PLHIV, and to address barriers of waiting time and extended fast track short-visits.