Factors associated with antenatal care uptake among women living with HIV in Ndola District, Zambia

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KEY WORDS

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Gestational age

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Women living with HIV

Uptake

Utilization

Ndola District

Zambia

DECLARATION

I declare that "**Factors associated with antenatal care uptake among women living with HIV in Ndola District, Zambia**" is my personal effort and at no time has it ever been submitted for examination to any university. I have shown source of information I used through quotation and citation of the references.

Name**: Lackeby Kawanga**

Signature: 

Date: 11 November, 2021

DEDICATION

I bestow this study in memory of my brother, David Kawanga Sikazwe who made me appreciate education at a tender age, and my parents who supported my dream of getting educated even when they had inadequate resources to support it. To my husband, my two sons and other family members, this one is for your patience and sacrifice while I dedicated my time to study.

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
ART	Antiretroviral Therapy
ARV	Antiretroviral drug
HIV	Human Immunodeficiency Virus
GA	Gestation Age
MoH	Ministry of Health
MTCT	Mother to Child Transmission
PMTCT	Prevention of Mother to Child Transmission
SSA	Sub-Sahara Africa
UNAIDS	Joint United Nations Programme on AIDS
UNICEF	United Nation International Children's Fund
WHO	World Health Organization
ZDHS	Zambia Demographic Health Survey

ABSTRACT

Background: Sub Saharan Africa (SSA) single-handedly accounted for approximately two thirds (196 000) of the world maternal deaths. High maternal deaths have been attributed to high prevalence of HIV and low uptake of Antenatal Care (ANC). This made World Health Organization (WHO) to recommend integration of Prevention of Mother to Child Transmission of HIV (PMTCT) services into ANC to improve accessibility and utilization. According to Zambia Ministry of Health (MoH), every pregnant woman should have her ANC registration in the first trimester and achieve eight visits by delivery time. With the extra need of PMTCT services in the women living with HIV, early and regular ANC attendance is emphasized. However, in Zambia, there is limited information on ANC uptake and its associated factors among women living with HIV.

Aim: The aim of this study was to investigate factors associated with ANC uptake among women living with HIV in Ndola District, Zambia.

Methodology: A retrospective cohort study was conducted on pregnant women living with HIV who registered for the ANC from January to December 2019 in six health facilities that were purposely selected. Univariate analysis was used to describe utilization of ANC while binary logistical regression established association between ANC utilization and exposure variables using Statistical Package for Social Sciences (SPSS) version 26.

Results: A total of 492 ANC records of pregnant women living with HIV who registered for ANC were extracted. Out of which, 85% had first ANC visit after first trimester, 1% made full eight ANC visits and only 7% completed number of expected ANC visits based on Gestational Age (GA) at first ANC. Women staying within facility catchment area were 3 times more likely to have late ANC entry compared to those outside catchment area. Increasing gravida was associated with an increased likelihood of late ANC entry similar to increasing parity. Prior knowledge of HIV positive status at first ANC was not significantly associated with ANC entry. However, known HIV positive women were 2.7 times more likely not to complete expected number of ANC visits than newly diagnosed HIV positive at first ANC visit.

Conclusion: From these results, it is apparent that uptake of ANC by women living with HIV was below expectation and being aware of HIV infection before first ANC visit did not seem to influence early ANC entry. However, living outside catchment area was a predictor of early ANC presentation, while increasing gravida and parity, increased likelihood of late ANC presentation. Additionally, being newly diagnosed with HIV in ANC predicted completion of expected number of ANC visits.

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CHAPTER 1: INTRODUCTION

1.1 Background

Generally maternal death is excessively high. In 2017, roughly 295 000 women died during and following pregnancy and childbearing. Low resource settings, contributed the huge percentage of this mortality (94%), and most of them were preventable (World Health Organization (WHO), 2019). For example, approximately 86% of estimated worldwide maternal deaths were recorded from sub-Saharan Africa (SSA) and Southern Asia in 2017 with SSA accounting for about 67% of the deaths. According to WHO (2019), in SSA, one out of every 40 women has a lifetime risk of death through pregnancy or childbearing.

Postpartum hemorrhage, pregnancy induced hypertension and puerperal sepsis are the chief direct causes of maternal mortality. While HIV/AIDS, malaria and various chronic conditions are the principal indirect causes (Gianett *et al*., 2018). Meta-analysis findings suggest mortality amongst HIV positive pregnant or perinatal women to be eight times higher than the HIV negative women (Zaba *et al*., 2013). HIV in pregnancy also leads to poor infant outcome and vertical HIV transmission. Additionally, SSA has the biggest share of pregnant women living with HIV,amounting to 85% of the universal problem (Joint United Nations Programme on HIV and AIDS (UNAIDS), 2020).

In Zambia, according to 2018 Zambia Demographic Health Survey (ZDHS) report, maternal death proportion is at 252 maternal mortality per 100,000 live births (Zambia Statistical Agency, Ministry of Health (MoH), and ICF International, (2019). In 2017, maternal related causes were the fourth leading cause of death in Zambian women of childbearing age (Gianett *et al*., 2018). HIV/AIDS co infection was the leading indirect cause of maternal deaths in 2018, accounting for about 28% of the recorded maternal deaths (Zambia Statistical Agency, MoH & ICF, 2019). Additionally, women are mostly affected by HIV in Zambia, of the 1200 000 estimated adults living with HIV, 700 000 (58.33%) are women and HIV prevalence in pregnancy stands at 13.9% (UNAIDS, 2020).

"Antenatal care, a pillar in safe motherhood is recommended as one of the strategies to reduce maternal deaths given that it provides an opportunity for the pregnant woman to interface with the health care system to identify pre-existing conditions that may complicate pregnancy and lead to morbidity and or mortality" (WHO, 2019: 26). The World Health Organization recommends eight ANC clinic visits at the lowest and ANC entry in the first trimester for pregnancy to enhance safe motherhood and lessen maternal and infant mortality.

In 2016, Zambia adopted the WHO recommendations of comprehensive eight visits antenatal care moving from the four visit focused care (MoH, 2020). Like many countries, Zambia also approved the WHO guiding principle, which endorsed provider initiated antenatal HIV testing ("opt-out" method) and immediate offer of PMTCT services within ANC in 2006 (MoH, 2020). This makes ANC an important entry point for women to be tested for HIV. The HIV uninfected women are offered a chance to get information over ability to avoid future infections and the HIV positive are initiated on antiretroviral therapy to lessen the threat of vertical HIV transmission to the baby and to improve their health (MoH, 2020).

Nevertheless, only 78% of SSA women make at least one ANC visit, while 49% of them manage four or more visits throughout pregnancy (UNICEF, 2016). This is an indication that a low number of women benefit from ANC. In Zambia, according to 2018 ZDHS report, the fraction of pregnant women making at least 4 ANC contacts through the progression of their pregnancy is still low at 64% and only 37% register for ANC in the first trimester (Zambia Statistic Agency, MoH & ICF, 2019). Late and irregular use of ANC has been associated with high maternal mortality, high vertical HIV transmission and poor infant outcomes, such as preterm delivery, low birth weight, and small for GA newborn. "In contrast, early and frequent ANC visits provide opportunities to promote healthy pregnancies and encourage facility deliveries, thus minimizing risks for obstetric complications and maternal mortality" (Gill *et al.*, 2015: 65). Therefore, it is not unexpected that Zambia still has a high maternal mortality rate and mother to child HIV transmission rate at more than 5% given the low ANC attendance.

Sub-Sahara African region being the worst hit with maternal mortality and poor ANC attendance, studies have been conducted to determine the factors associated maternal health service usage. A systematic review done in SSA in 2015, revealed that usage of ANC services was disadvantaged by many problems comprising of client linked characteristics, cultural hindrances, inappropriate household guidance, limited laboratory amenities and inadequate community involvement (Adetokunboh & Oluwasanu, 2015). The results were similar to another systemic review that looked at primary studies reporting on determinants of ANC utilization from 2008 to 2018 studies done in SSA. A number of research results found upper economic status, residing in urban areas, older age, smaller parity, higher education level and having an educated spouse as predictors of ANC attendance and timeliness (Okedo, Akamike & Ezeanosike, 2019). Of all the 74 studies that were reviewed, no study included HIV factors as a determinant of ANC attendance despite its extensive integration in safe motherhood.

In Zambia, a cross sectional study conducted in rural and urban populations of Copperbelt province found four significant factors. The study established that lack of knowledge about ANC, unplanned pregnant, multiparous and long distance from the client's residence as being associated with late ANC initiation (Banda *et al*., 2012). The results were similar to a population based research that used Zambia demographic health survey database of 2007. It also established that low education levels, having unplanned pregnancy and multiparity as being associated with poor ANC attendance (Nyambe *et al*., 2016). However, just like other SSA studies, the Zambian studies did not include HIV factors as determinants. Additionally, the studies did not uniquely look at factors that may affect women living with HIV.

It was therefore important to conduct a study to measure level of ANC usage and understand factors affecting it including HIV related factors among women living with HIV.

1.2 Problem statement

Despite ANC services being provided free of charge in primary health care facilities in Zambia, only 37% of women attended ANC in their first trimester and 64% at least made four ANC visits in 2018 (Zambia Statistic Agency, MoH & ICF, 2019). This poor ANC attendance coupled with high HIV prevalence in pregnancy, result in delays in initiating antiretroviral drugs and offering of health promotion services. This reduces the effectiveness of PMTCT and ANC services leading to vertical HIV transmission and poor maternal and neonatal outcomes (MoH, 2020). According to the Ministryof Health (2019), every pregnant woman should have her first ANC visit in the first trimester and achieve eight visits by delivery time. With the extra need of PMTCT services, early and regular ANC attendance should be emphasized in women living with HIV (WHO, 2019). However, there is poor ANC attendance in the general population and limited information on ANC uptake among women living with HIV.

Generally, low socioeconomic status, rural residence, younger age, high parity, being uneducated and having an uneducated partner, being unemployed and being not married have been found to contribute to poor ANC attendance among women in Zambia (MoH, 2020). However, there are limited studies that have attempted to understand what factors are unique to women living with HIV in Zambia and how HIV related factors affect ANC attendance.

Therefore, this study was aimed at measuring ANC uptake and establishing factors associated with it among women living with HIV in Ndola, Zambia.

1.3 Research Question

What is the uptake of ANC attendance and what are the factors associated with it among women living with HIV in Zambia?

1.4 Study purpose

This study results were meant to provide insights into overall ANC attendance in relation to HIV positive status in Zambia. The information should contribute to the existing body of knowledge of factors associated with ANC attendance and provide new context specific information to women living with HIV. The knowledge is crucial to development of new strategies to improve ANC attendance and utilization of PMTCT services in Zambia.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In 2017 globally, the number of women who died from difficulties of pregnancy and childbearing dropped from 451,000 in 2000 to 295,000 (WHO, 2019). Nevertheless, each day about 800 women die from pregnancy and child bearing complications worldwide (UNICEF, 2020). Early and regular ANC visits has been found to reduce complication in pregnancy and childbirth in a number of writings. This literature will discuss antenatal care, WHO comprehensive ANC model, measure of ANC utilization, factors related to ANC utilization, HIV in pregnancy and Andersen's behavioural model of health care usage in relation to ANC attendance.

2.2 Antenatal care

Antenatal care is part of maternal health that is defined as the wellbeing of women throughout pregnancy, delivery, and postpartum period and has the potential to decrease maternal morbidity, mortality and improve new-borns' health (Carroli, Rooney & Villar, 2010; MoH, 2019). Antenatal care is where prenatal women are delivered with a broad variety of health promotion and preventive amenities and is vital in recognizing risk factors for unwanted pregnancy results. Skilled health professionals are required to provide antenatal care to plummet maternal mortality and morbidity rate (Barasa, Wanjoya, & Waititu, 2015). Inadequate ANC is related to poor pregnancy outcome and may lead to Mother to Child HIV Transmission (MTCT) of HIV (UNICEF, 2020).

2.3 World Health Organization comprehensive ANC model

World Health Organization (2016:13) states that "comprehensive ANC model should have a minimum of eight ANC contact during pregnancy period and first contact should take place in the first trimester (up to 12 weeks of gestation), two contacts scheduled in the second trimester (at 20 and 26 weeks of gestation) and five contacts scheduled in the third trimester (30, 34, 36, 38 and 40 weeks)". The aim of scheduling these contacts as stated, is to optimize the provision of explicit interventions in an effort to get the best of ANC. This model is an adjustment from the Focused Antenatal Care (FANC), which endorsed four contacts utmost (MoH, 2020). In 2016, Zambia adopted the WHO recommendations of comprehensive eight visits ANC moving from the four visit focused care (MoH, 2020).

2.4 Measure of ANC uptake

There are numerous indicators studies have used to assess ANC usage. They include making at least one ANC visit, trimester of the first ANC entry, ANC services received and provider category, but the quantity of ANC visits made is mostly used (Ataguba, 2018). This study defined ANC utilization using GA at ANC entry and completion of expected number of ANC visits based on GA at ANC entry (Gill *et al*., 2015). According to MoH (2019), the first ANC visit ought to be made in trimester one (GA 12 weeks and below) that is referred to as early ANC presentation, while those that present in second and third trimester are referred to as late ANC registration. Furthermore, the woman is supposed to make eight ANC visits during the whole pregnancy period. Incorporating the late ANC registration, completion of expected number of ANC visits based on the GA at first ANC can be generated (Gill *et al*., 2015).

2.5 Antenatal care utilization in Zambia

In 2018 in Zambia, women who had their ANC entry in first trimester were 37%; in second trimester were 48% and 13% in the third trimester. The median GA was 4.4 months at ANC registration (Zambia Statistics Agency, MoH & ICF, 2019). The percentage of women who had at least four ANC visits has fluctuated over the years. "The percentage increased from 69% in 1992 to 71% in 1996 and 72% in 2002 and then decreased markedly to 60% in 2007 and then decreased again to 56% in 2014 before increasing to 64% in 2018" (Zambia Statistics Agency, MoH & ICF, 2019: 132). However, the current information available on ANC utilization has limited insight over women who managed eight visits. A cross-sectional study conducted in 2012 in Zambia also established the prevalence of late ANC attendance (first ANC visit at gestational age >12 weeks) at 72.0 % in rural and 68.6% in urban areas (Banda *et al.*, 2012).

2.6 Mother to Child Transmission of HIV (MTCT)

"The transmission of HIV from a mother living with it to her child during pregnancy, labour, delivery or breastfeeding is called Mother-To-Child Transmission (MTCT) also known as vertical transmission" (MoH, 2020: 201). Without prevention measures, transmission rates lie between 15% and 45%. Conversely, with optimized interventions this proportion can be declined to beneath 5% throughout pregnancy, labour, child birth and lactation period (UNAIDS 2020). In 2015, according to Zambia Population Based HIV Impact Assessment survey (ZAMPHIA) 2016, 9.3% of the HIV exposed children contracted HIV from their

mothers (MoH, 2017). This transmission rate is above the expected rate of below 5% with effective PMTCT interventions as suggested by UNAIDS (MoH, 2020).

For effective PMTCT services, the international guiding principle endorse provider-initiated antenatal HIV testing ("opt-out" method) and provision of HIV treatment and prevention services during ANC visit (Hensen *et al.,* 2012). The HIV negative women are provided with post-test counselling, which involves discussions on prevention of future infections. Women identified to be living with HIV are treated for it to moderate the threat of transmitting HIV to a child and to recover their health.

2.7 HIV status and use of ANC services

As stated above, early initiation and longer duration of ART in pregnant women, lower HIV transmission to the child and reduces the chances of maternal complications. However, HIV positive status has emotional and mental stress and causes different types of psychological problems (Patel *et al.,* 2007). HIV/AIDS inflicts a substantial psychological affliction on most individuals. Many individuals with HIV regularly undergo depression and anxiety as they adjust to effects of HIV diagnosis and face the difficulties of living with a chronic illness. The depression and anxiety can affect ANC attendance in pregnant women living with HIV (Patel *et al.,* 2007). Therefore, understanding how HIV factors affects ANC attendance is imperative.

Generally, very few studies have assessed the effects of HIV positive status on subsequent uptake of ANC facilities. A Lesotho retrospective review of ANC records suggested that women who knew their HIV positive status at first ANC had earlier ANC entry and more regularly than women whose status were unknown (Gill *et al.,* 2015). The study established that the mean GA at first ANC visit at 21.6 weeks and mean number of ANC visits at 2.7. In this study 44% of women completed their expected number of ANC visits but there was no difference between the known HIV positive and unknown status when it came to number of subsequent ANC visits. However, the known HIV positive women before their first visit had earlier ANC first entry than the unknown HIV status (18.8 vs. 22.6 weeks, P-value = 0.001).

In Zimbabwe, similar results from retrospective study were established. The study used 2010 to 2011 Demographic Health Survey data and demonstrated that use of maternal health services and HIV status were not associated significantly (Maruva, *et al*., 2014). A Kenyan study

that looked at maternal health care uptake among HIV positive female adolescents, reported 45% of pregnancies making four and above prenatal care visits (Birungi, *et al.*, 2011).

2.8 Factors associated with ANC utilization

Okedo, Akamike & Ezeanosike, (2019) conducted a systemic review, which looked at studies reporting on contributing factors of ANC usage using multivariate analysis, conducted in SSA and published in between 2008 and 2018. The study showed that a number of researches acknowledged higher socioeconomic status, municipal area dwelling, increased age, low parity, high education levels and having an educated spouse, being employed, being married and Christian religion as predictors of ANC attendance and early entry. Cognizance of risk signs, scheduling and satisfactory antenatal contacts, mass media interaction and good attitude concerning ANC usage made turnout and commencement of ANC in first trimester apparent. Having an unintended pregnancy, post exposure to pregnancy difficult, poor autonomy, lack of partner involvement, long distance health facility and costly of ANC amenities adversely affected entry and regularity of antenatal visits (Okedo, Akamike & Ezeanosike, 2019). Of all the 74 studies that were reviewed, no study included HIV status as a determinant of ANC attendance.

In Zambia, a cross sectional study conducted in selected rural and urban communities of the Copperbelt Province found four significant factors. The study established that lack of knowledge about ANC, unplanned pregnancy, multiparous and long distance from the client's residence as being associated with late ANC initiation (Banda *et al*., 2012). The results were similar to a population based study that used Zambia demographic health survey data of 2007. It also established that low education levels, having unplanned pregnancy and multiparty as being associated with poor ANC attendance (Nyambe *et al*., 2016). However, just like other sub-Saharan studies, the Zambian studies did not state whether the results were unique to HIV negative women or not. Additionally, HIV status was not examined as a factor of ANC attendance.

2.9 Andersen's behavioral model of health care utilization

To explain the factors that are associated with ANC attendance among women living with HIV, Andersen's behavioral model of health care utilization was used. "Andersen's behavioural model of health care usage describes factors that facilitate or hinder access to health care, and how these factors are used in the course of pursuing and using health services" (Wallace *et al*., 2004: 102). The model puts forward that use of health care services is influenced by at least three sets of characteristics that is predisposing, enabling and need factors. Predisposing factors are elements that influence the need for care which includes demographic and social structural,

health-related values and attitudinal factors. Enabling factors include elements which promote or hinder use of services, for instance income, health insurance, family support and available health services. Need factors are features that inspire the need for care, they may be perceived or diagnostic need (Maruva *et al*., 2014).

HIV status branches from the need factors, which are factors that stimulate that necessity for care that is individual perceived risk because of HIV positive status. According to this model, a pregnant woman's knowledge of HIV positive status makes her extra responsive to her own and her unborn child's health threats and is adequate to arouse a substantial adjustment in her health seeking behavior (Wallace *et al.*, 2004). Consequently, she is anticipated to be better in ANC pursuing behaviour than the woman who is not cognizant of her HIV positive status. Therefore, there was need to confirm claims of this model so as to provide insight in maternal health seeking behaviour of women living with HIV.

CHAPTER 3: METHODOLOGY

3.1 Aim

This study aimed to investigate factors associated with antenatal care uptake among women living with HIV in Ndola District, Zambia.

3.2 Objectives

- To measure ANC attendance among women living with HIV in Ndola District.
- To determine socio-demographic, obstetric and HIV factors associated with ANC attendance among women living with HIV in Ndola District.

3.3 Research Design

A quantitative retrospective cohort study design was used to determine utilization of ANC facilities among women living with HIV and factors influencing utilization as experienced by the cohort. The cohort in this study was considered as pregnant women living with HIV who registered for ANC services in 2019. The records of pregnant women with end of pregnancy outcome, looking backwards to assess their ANC utilization levels, factors affecting utilization as documented in their ANC medical records were used. This retrospective review of records of a particular group in a certain period defines a retrospective cohort study (Setia, 2016).

3.4 Settings

Public urban health centres in Ndola District on the Copperbelt Province of Zambia were the study sites. The district is the third largest in Zambia with 2020 population estimated at 544 522 (Population stats, 2020). Ndola District has 37 health facilities with 24 urban public health centers, which were targeted for the research (Health Management Information Systems, 2020). The setting of choice for this study was the urban area because of the higher HIV prevalence in women 15 to 49 years old that stood at 20.3% compared to 8.9% in rural areas (Zambia Statistical Agency, MoH & ICF, 2019). The targeted urban health centers were those that provided antenatal care, delivery, postnatal and HIV prevention and treatment services free of charge with support from the government. The facilities' PMTCT services were integrated into ANC services.

3.5 Population and sampling

The population included women living with HIV who newly registered for ANC between January and December 2019 in the selected study sites Mapolo, Kaloko, Twapia, Chifubu, Ndeke and Lubuto. Three health Centers, Mapalo, Kaloko and Twapia were from the high-density informal settlement characterized by informal economic activities, while three others

Chifubu, Ndeke and Lubuto were from the formal settlement areas with mostly formal economic status. This selection was to balance the impact that economic status has on health seeking behavior. The six health facilities managed by the government were purposely selected because of the high ANC volume, large catchment population and high prevalence of maternal HIV.

All the eligible clients in the chosen facilities were part of the study. The study used all-inclusive sampling technique because the size of the population was likely to be small and allowed all clients to be in the study (Babbie, 2008).

Inclusion criteria: Only women with a documented last menstrual period date and estimated GA at all ANC visits were included in the study.

Exclusion criteria: Women were excluded, if by ANC entry, pregnancy was 36 weeks or more. Additionally, women below the age of 15 and above 49 were excluded due to extra attention they command as high-risk pregnant women (MoH, 2019).

3.6 Data collection

Quantitative data was collected from hard copy ANC registers at the facilities. Antenatal care register is a standard MoH tool used to collect longitudinal data on pregnant women on social demographic, obstetric, laboratory test results, HIV prevention and treatment. The ANC register uses a unique identifier for each individual in the whole Zambia. "The unique patient identifier is defined as a 'unique, non-changing alphanumeric key for each patient' in a health care system, which is associated with each medical record or instance of health care data for that patient" (Gliklich, Dreyer & Leavy, 2014: 230). However, the registers also have clients' names that were not used within the scope of the exchange network of health information.

The researcher extracted data on all eligible women using a data collection tool *(See appendix 1).* Variables collected included GA at each ANC visit, gravidity, parity (number of live births a woman has had), point of HIV diagnosis, CD4 cell count at first ANC, received ART status, viral load prior to delivery, ARV pharmacy appointment, age, marital status, partner involvement, and residential address. An excel sheet was used for data entry and SPSS for analysis.

3.7 Definition of variables

The outcome variable was utilization of ANC services by women living with HIV measured using two variables, which are trimester at first ANC presentation or entry and completion of expected number of ANC visits based on GA at first ANC. According to MoH (2019), visit one for ANC is supposed to be made in the first trimester (GA 12 weeks and below) and is referred to as early ANC presentation or entry, while first visits made in second and third trimester is referred to as late ANC entry.

Furthermore, the woman are supposed to make eight ANC visits during the whole pregnancy period. Incorporating the late ANC entry, completion of expected number of ANC visits based on GA at first ANC visit was established as shown in table 1 below (Gill *et al*., 2015). Therefore, the women who utilized ANC according to 2019 MoH standard in this study were the ones that presented early for ANC or that completed their expected number of ANC visit.

Table 1. Expected number of ANC visits

Gestational age at first ANC visit (weeks)	**Number of expected visits**
<12	8 and above
13 to 20	7 and above
21 to 26	6 and above
27 to 30	5 and above
31 to 34	4 and above
35 to 36	3 and above

The explanatory variables for ANC entry were social demographic factors (age, living within catchment area, partner involvement, and marital status), HIV factors (prior knowledge of HIV positive status at first ANC, received ART, initial CD4 count) and obstetric factors (gravida and parity).While explanatory variable for completion of expected number of ANC visits were social demographic factors (age, living within catchment area, partner involvement, and marital status), HIV factors (prior knowledge of HIV status at first ANC, received ART, final viral load in ANC, retention on ART) and obstetrics factors (gravida and parity) were included.

3.8 Data analysis

Statistical Package for Social Sciences (SPSS) version 26 (IBM Corporation) was used to compute descriptive and inferential statistics. Univariate analysis of all variables was conducted

initially to describe distributions and find patterns that exist within them. Descriptive statistics were presented as means, median and standard deviation and percentages were expressed.

Bivariate logistical regression analysis was used to compute odds ratios and the Confidence Interval (CI) and P-value to determine statistical significance in relation to outcome variables. Furthermore, multivariate analysis was employed to find adjusted odds ratios of risk factors that came out to be statistically significant using bivariate analysis.

Entry into ANC and completion of expected number of ANC visits were the dependent variables as stated above. The explanatory variables were social demographic factors, HIV factors and obstetric factors.

Additionally, the mean number of ANC visits and GA at first ANC between pregnant women newly diagnosed with HIV in ANC and women who had prior knowledge of their HIV positive status were compared using the independent sample T-test. The Pearson chi square test was used to conduct a hypothesis test on Andersen model. This was to confirm claims of this model that prior knowledge of HIV positive status is likely to stimulate early ANC entry. Significant results were reported at p-values of ≤ 0.05.

3.9 Validity

In this study, because it was aimed at measuring ANC attendance and related routinely documented factors, data abstractor variables were based on standardised MoH ANC guidelines for a positive pregnancy experience (MoH, 2019). The data extraction tool underwent review by the ANC experts to ensure the tool recorded what it was intended to. A standardised data extraction tool was used to reduce measurement bias and to record similar data from all the ANC records. To minimize selection bias, inclusion and exclusion criteria of the study population were clearly defined and data of all women that met the criteria was used.

3.10 Reliability

Reliability is referred to the extent to which one's research instruments procedures would reproduce consistent findings if they were to be repeated on another occasion by another researcher (Heale& Twycross, 2015).

To enhance reliability, the study population was clearly defined with discreet inclusion-exclusion criteria. Additionally, the facilities that participated were of the same level according to ANC services provision, human resource and support. The person who collected data was trained in the use of the data extraction tool.

3.11 Ethical Considerations

Ethics approval was acquired from the University of the Western Cape University Biomedical Ethics and Research Committee (BMREC) and ERES Converge IRB, 33 Joseph Mwilwa Road, Rhodes Park, Lusaka (*See Appendices 2 & 3*). Approval to access and utilize data from the six selected facilities was obtained from the Copperbelt Provincial and Ndola District Health Offices. Since this study used secondary data, upholding human dignity was involved through applying ethical principles in data collection and analysis such as de-identifying all personal data and keeping it confidential. Thus, the names of participants were not collected, but a study identifier to detect each participant. Collected data was kept confidential by storing on the researcher's personal laptop computer in a password-protected database, not availed to any third party.

Further, there was minimal harm, as the study did not involve direct contact with people nor real-time effect on their care. The most significant risk was the potential for loss of privacy and confidentiality when participants' medical record were exposed through the study. However, no patient names as stated above were required nor used in the review. Therefore, no consent was required, as routine anonymized data was used for this study. The researcher did not use the data for any potential harm and embarrassment or bring the reputation of the individuals in the data set and society into disrepute. In addition, this research is likely to bring good to the participant and society known as beneficience as defined by Robson and McCartan (2016) because it has offered new knowledge on how uptake of ANC by the women living with HIV can be improve.

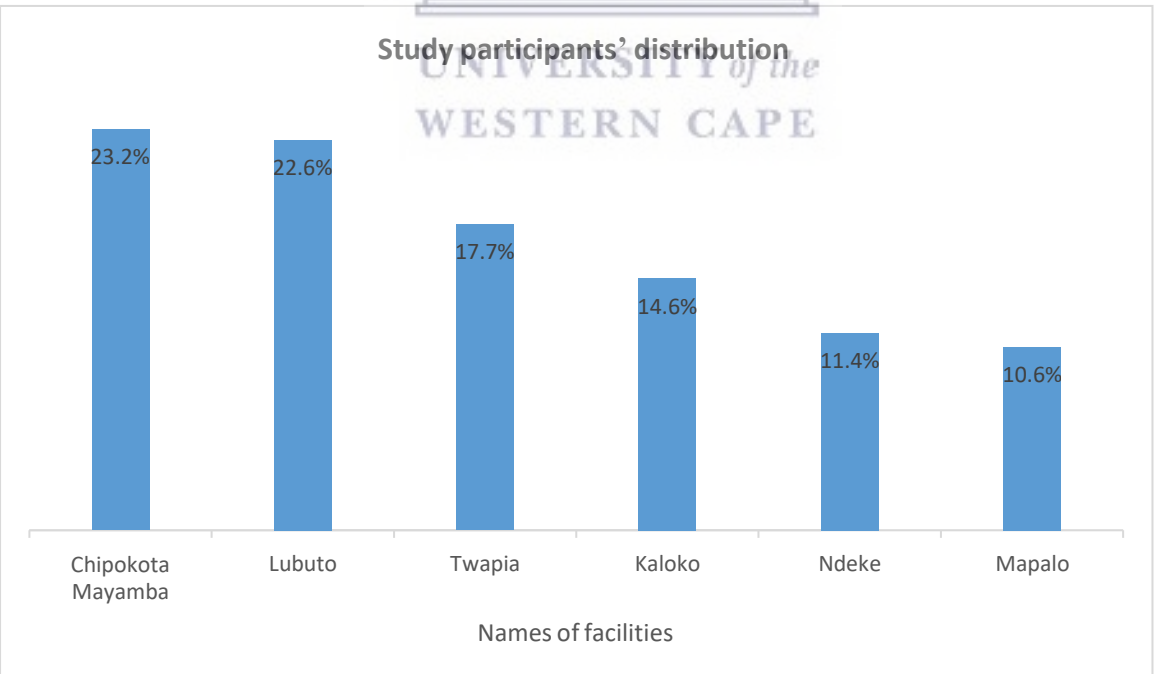
CHAPTER 4: RESULTS

The results are presented in eight parts, with the first section showing the realization of the sample and the second presenting socio-demographic features of the population. The third part illustrates obstetric factors of the participants, while section four details their HIV related characteristics. The fifth section shows the utilization of ANC services by the study population. In sixth section, possible association of ANC entry and socio-demographic, obstetric and HIV factors are presented. Thereafter, the results for association analysis between completion of expected ANC visits and socio-demographic, obstetric and HIV characteristics are presented. The last part shows the results for the independent sample T test and Pearson chi square test outcome on knowledge of HIV positive status and utilization of ANC.

4.1 Realisation of the sample

The study data was extracted from antenatal records of 492 pregnant women living with HIV who registered for ANC in 2019 in the 6 study sites. The highest number of the participants came from Chipokota Mayamba at 23.2% while lowest number was from Mapalo at 10.6% (figure 1).

Figure 1: Facility distribution of the study participants (N = 492)



4.2 Social demographic characteristics of the cohort

Table 2 shows a description of the socio-demographic features of the cohort. The majority of the participants (55.9%) were aged between 20 and 29 years, while mean age was 28.65 years (SD = 5.832). The majority of the study population (89.8%) were residing within catchment area of the study sites, while 10.2% were staying outside catchment area. Most of the women (95.5%) in the study were married while only 4.5% single. Partner involvement in ANC activities of the study population was low with only 11.4% participants having had at least one ANC visit with a partner. One participant had no details on partner involvement.

Table 2. Social demographic characteristics of the cohort (N = 492)

Characteristic	Number	Percentage
Age (Years)		
<20	17	3.5%
20 – 29	275	55.9%
30 – 39	182	37.0%
40 and above	18	3.7%
Residence:		
Within catchment area	442	89.8%
Outside catchment area	50	10.2%
Marital status		
Married	470	95.5%
Single	22	4.5%
Partner involvement		
Came with partner at least one visit	56	11.4%
Never came with partner at any visit	435	88.6%

4.3 Obstetric characteristics of the study cohort

Obstetric features of participants are shown in table 3. The study population mean gestational age at ANC entry was 18.65 weeks (SD = 5.809) and mean number of ANC visits made per woman was 3.88 (SD = 1.745).

The study participants had the mean parity (number of children a woman has had before) of 1.89 (SD = 1.385) and mean gravida (average number of pregnancies a woman has had) of 3.07 (SD = 1.444). The gravida and parity were normally distributed.

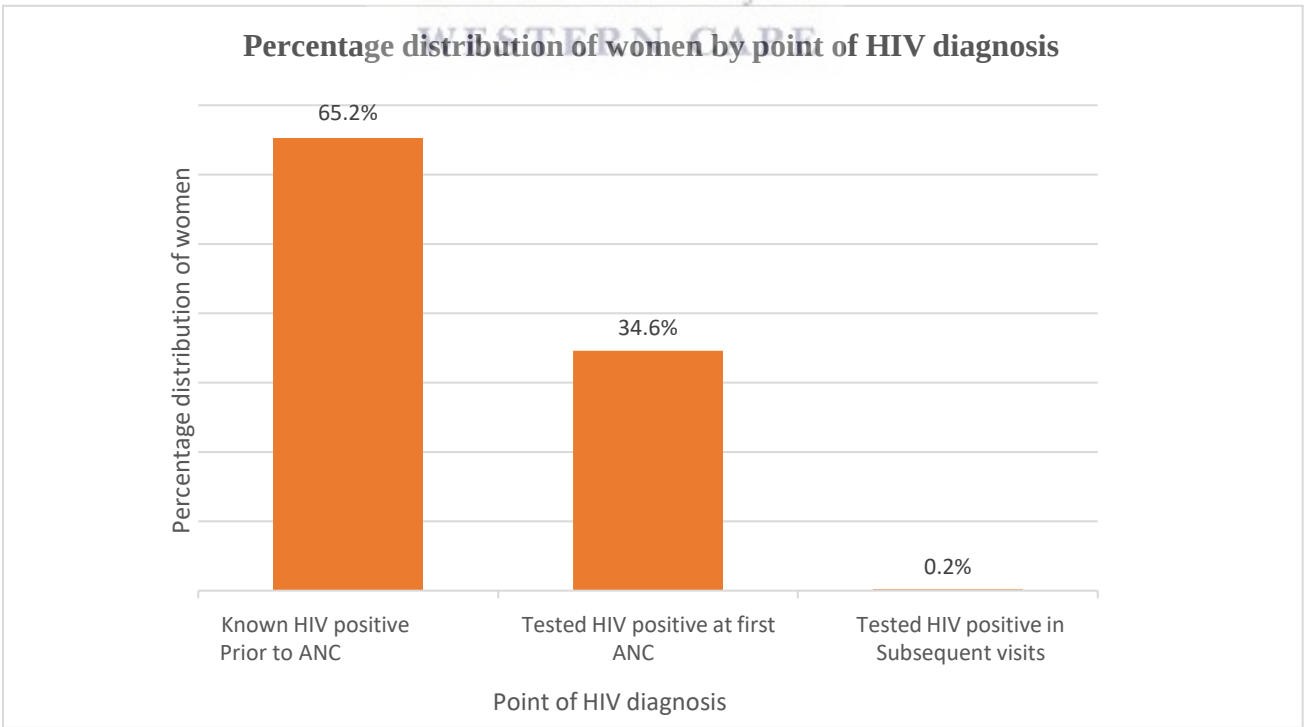
Table 3: Obstetrics characteristics of the study cohort (N = 492)

Characteristic	Mean	Std. Deviation
Mean gestation age in weeks at first ANC visit	18.65	5.809
Mean number of ANC visits made	3.88	1.745
Parity	1.89	1.385
Gravida	3.07	1.444

4.4 HIV characteristics of the study cohort

At ANC entry, majority of the participants (65.2%) already knew their HIV-positive status, while 34.6% were diagnosed during the visit and only one person tested HIV positive in the subsequent visit representing 0.2% (figure 2).

Figure 2: Point of HIV diagnosis of the study participants



Of all the women, 64.2% were already on ART prior to first ANC visit, 34.4% were initiated during first ANC visit while 1.4% did not receive any ARV during their ANC period (table 4). The results also show that of the 55 clients who had CD4 count documented, majority of them (94.5%) had CD4 count 350 cells/ml and above, while 5.5% had CD4 count below 350 cells/ml. Of the 403 women who had their HIV viral load results documented, the majority (92.1%) had their viral load suppressed (viral load less than 1000 copies/ml). The results also show that most of the women receiving ART and not transferred out were retained on treatment (never missed appointment 30 days nor more) throughout pregnancy at 84.1%, while 14.9% were once documented as loss to follow up or missed 30 days or more of their ART pharmacy appointment.

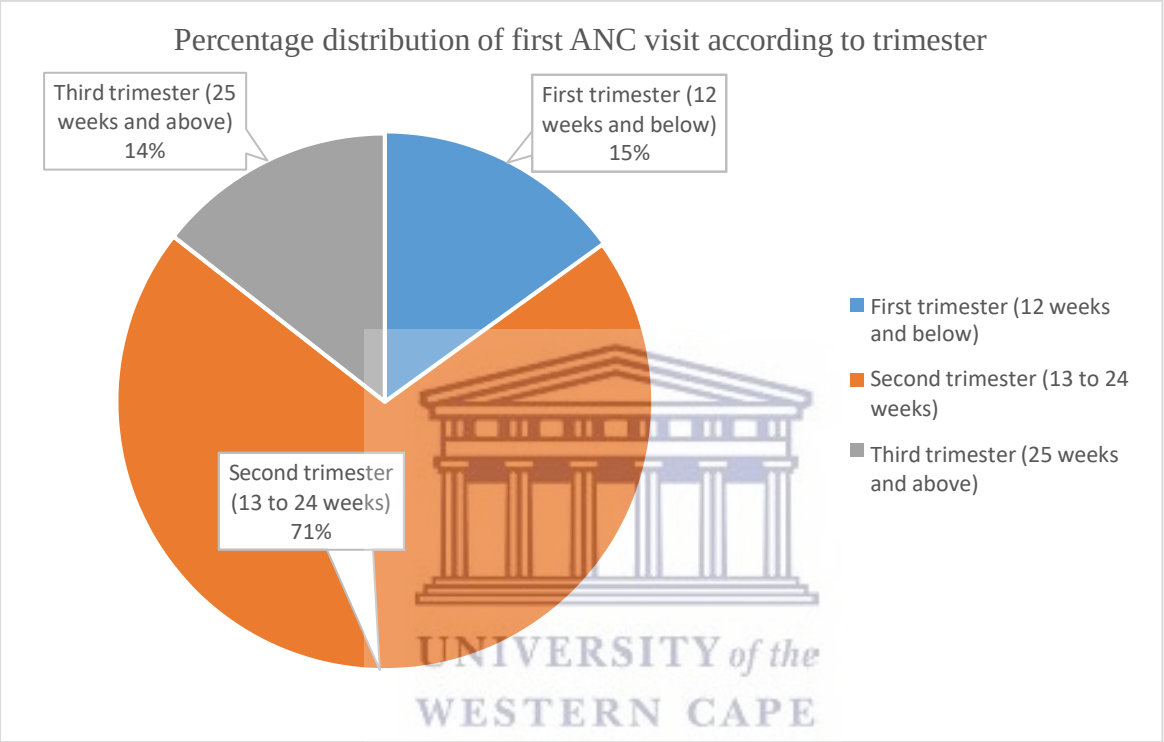
Table 4: HIV characteristics of the study cohort (N = 492)

Characteristic	**Number**	**Percentage**
Received ART		
Already on ART prior to first ANC	316	64.2%
Initiated on ART in ANC	169	34.4%
Not initiated on ART	7	1.4%
Total	492	100%
Documented baseline CD4 count in ANC		
CD4 count < 350 cells/ml	3	5.5%
CD4 count 350 cells/ml and more	52	94.5%
Total	55	100%
Women with documented VL results in ANC		
Viral load suppressed	371	92.1%
Viral load unsuppressed	32	7.9%%
Total	403	100%
Documented ART pharmacy appointment status		
Retained on Treatment	407	84.1%
Loss to Follow Up	71	14.9%
Total	478	100%

4.5 Utilization of ANC services by the study cohort

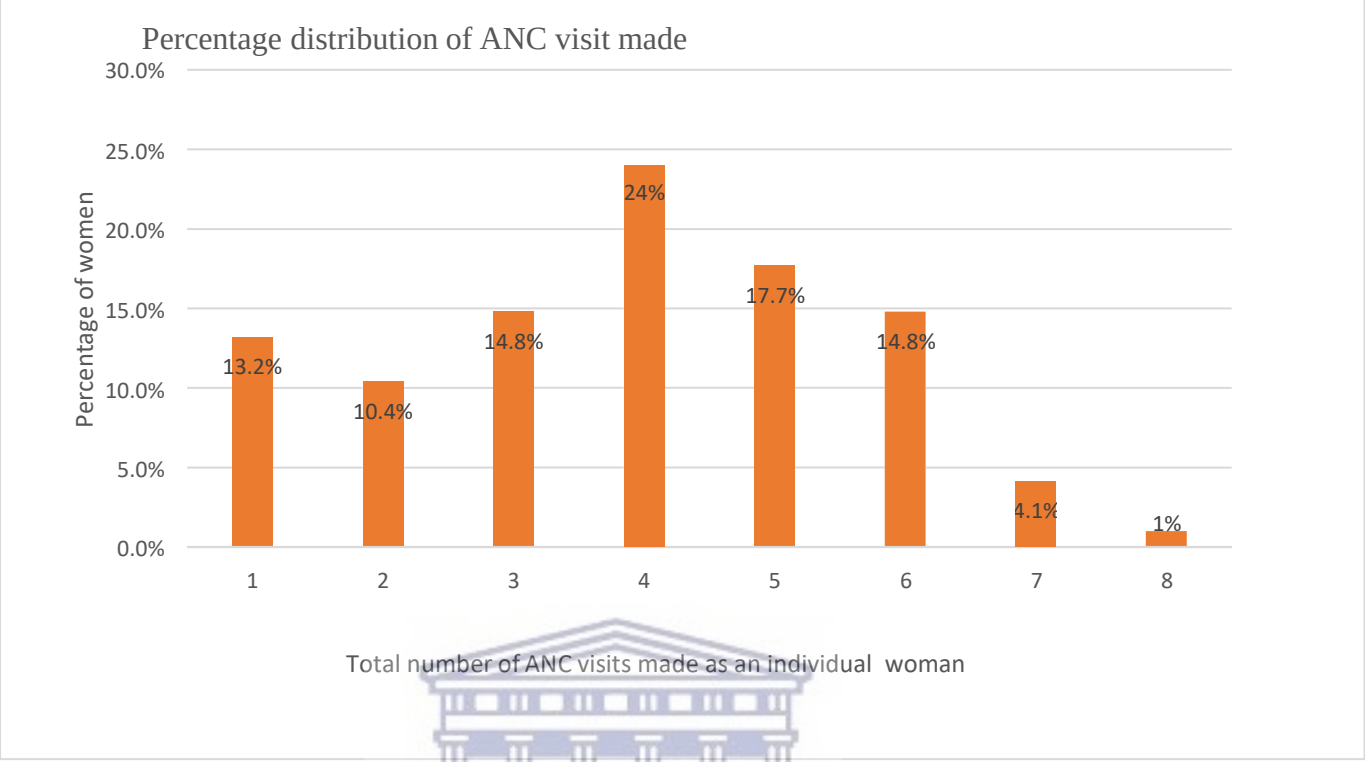
The results show that most of the participants (85%) had their first ANC visit after first trimester (GA 13 weeks and above), 71% in second and 14% in third trimester, meaning they had late ANC entry. While, a small fraction (15%) made their first ANC visit in the first trimester (12 weeks and less GA) and were categorized as early ANC presentation or entry (figure 3).

Figure 3: Entry into ANC by trimester



The highest number of total ANC visits made per woman was 4 at 24%, while 13.2% made only 1 visit and 1% made the full 8 ANC visits during pregnancy (figure 4). Women who made 4 visits and above were 61.6%.

Figure 4: Distribution of ANC visits made during pregnancy



Frequency of ANC attendance was further analysed using expected number of ANC visits based on GA at ANC entry. The results show that only 7.1% of the women managed to complete the expected number of ANC visits, while 92.9% could not manage (Table 5). Of the 74 women who managed to have first ANC visit within the first trimester only 4.1% managed to attain eight expected visits during pregnancy.

Table 5. Completion of expected number of visits based on GA at first ANC (N=492)

GA at first ANC in weeks	Expected number of visits	Total documented women	Documented women who completed expected ANC visits	% completed expected visits
≤12	8	74	3	4.1%
13 to 20	7	257	14	5.4%
21 to 26	6	115	12	10.4%
27 to 30	5	35	1	2.9%
31 to 34	4	8	4	50%
35 to 36	3	3	1	33.3%
Total	-	492	35	7.1%

4.6 Analysis of factors associated with ANC entry

A binary logistic regression analysis for ANC entry was conducted with early ANC presentation (15 %, N = 74) as the first outcome and late ANC entry defined as first ANC visit after first trimester that stood at 85% (N = 418) as another. Bivariate and multivariate analysis of possible socio-demographic, obstetrics and HIVcharacteristics associated with ANC entry was conducted with multivariate analysis only for variables with significant association.

4.6.1 Socio-demographic characteristics associated with ANC entry

Of the 74 women who presented early for ANC, 36 were aged below 20 years, 57 were aged 20 – 34 years, and 14 were aged 35 and above. Among 418 women who had their first ANC visit after first trimester, 14 were below 20 years of age, 327 were 20 – 34 years old and 77 were aged above 35 (Table 6). Comparing the percentages of those who had early ANC entry among the age groups, there was no difference between those aged 20 – 34 and 35 and above at 15%, while those aged below 20 were 18%. This difference was however, not statistically significant (P-value = 0.814). Place of residence was found to be associated with ANC entry. Women who resided within facility catchment area were 3 times more likely to present for ANC late compared to those who resided outside catchment area (AOR = 3.358, 95% CI: 1.720 – 6.557, P-value = 0.000). Marital status did not significantly influence timing of ANC entry (P-value = 0.140); despite married women scoring relatively higher at 16% compared to the single women at 5% on early ANC entry. Furthermore, ANC entry was also not associated with partner involvement (P-value = 0.169).

Table 6: ANC entry by Socio-Demographic Characteristics (N = 492)

Characteristics	Early ANC entry (n = 74, 15%)	Late ANC entry (n= 418, 85%)	Odds ratio (95% CI) AOR (95% CI)	P-values
Age group (years)				
<20	3 (18%)	14 (82%)	0.848 (0.215 – 3.34)	0.814
20 - 34	57 (15%)	327 (85%)	1.043 (0.553 – 1.969)	0.896
35 & above	14 (15%)	77 (85%)	1	1
Residence				
Within catchment area	58 (13%)	384 (87%)	3.115 (1.618 – 5.999) **AOR 3.358 (1.720 – 6.557)**	0.001 **0.000**

Outside catchment area	16 (32%)	34 (68%)	1	1
Marital status				
Married	73 (16%)	397 (84%)	4.801 (1.881 – 8.848)	0.140
Single	1 (5%)	21 (95%)	1	1
Partner involvement				
Came with partner at least on one visit	8 (14%)	48 (86%)	1.079 (0.481 – 2.421)	0.169
Never came with partner at any visit	65 (15%)	370 (85%)	1	1

4.6.2 Obstetric characteristics associated with ANC entry

Table 7 below shows parity and gravida association with ANC entry. Increasing gravida was associated with an increased likelihood of late presentation to ANC (AOR = 1.634, 95% CI: 1.429 to 1.936, P-value = 0.022) similar to increasing parity which was associated with increased likelihood of late presentation to ANC (AOR = 1.97, 95% Cl: 1.274 to 1.944, P-value = 0.002).

Table 7: Obstetric characteristics associated with ANC utilization (N = 492)

Characteristic	**Early ANC presentation**			
	OR (95% CI)	**P-values**	**AOR (95% CI)**	**P-value**
Gravida	1.675 (1.460 – 1.989)	0.044	1.634 (1.429 – 1.936)	0.022
Parity	1.805 (1.182 – 1.757)	0.006	1.97 (1.274 – 1.944)	0.002

4.6.3 HIV characteristics associated with ANC entry

Table 8 shows results for ANC entry by HIV factors. The results show that the percentage of women who had their first ANC early was more among the known HIV positive than the newly diagnosed at 16% compared to 13% respectively. However, the results were statistically insignificant (P-value = 0.703). The results also show that receiving ART was not associated with ANC entry despite women already on ANC prior to first visit relatively presenting early for ANC registration at 17% compared to women initiated on ART in ANC at 11% (P-value =

0.999). Baseline CD4 count was equally not associated with ANC entry as shown in the table below.

Table 8: ANC entry by HIV factors (N = 492)

Characteristics	Early ANC entry (n = 74, 15%)	Late ANC entry (n= 418, 85%)	OR (95% CI)	P-values
Knowledge of HIV status at first ANC				
Known Positive	52 (16%)	270 (84%)	0.105 (0.009 – 1.206)	0.703
Newly diagnosed	22 (13%)	148 (87%)	1	1
Received ART				
Already on ART prior to first ANC	54 (17%)	262 (83%)	0.00 (0.000)	0.999
Initiated on ART in first ANC	19 (11%)	147 (86%)	0.0 (0.000)	0.999
Not initiated ART	0%	7 (100%)	1	1
Baseline CD4 count				
CD4 < 350 cells/ml	0 (0%)	4 (100%)	1.724 (1.297 – 1.762)	0.476
CD4 350 cells/ml and more	6 (11.8%)	45 (88.2%)	1	1

4.7 Analysis of factors associated with completion of expected ANC visits.

A binary logistic regression analysis was conducted for completion of expected number of ANC visits with women who completed expected number of ANC visits 7% (N = 35) as first outcome and those who did not complete 93% (N = 457) as another. Bivariate and multivariate analysis of possible socio-demographic, obstetrics and HIV characteristic associated with it was conducted with multivariate analysis only for variables with significant association to get adjusted odds ratios.

4.7.1 Socio-demographic factors associated with completion of expected ANC visits.

Table 9 shows the bivariate analysis of possible socio-demographic characteristics associated with completion of expected number of ANC visits. From the results, it shows that no social demographic characteristic was associated with attaining the expected number of ANC visits.

Although women aged below 20 had a relatively higher percentage of those who completed expected number of ANC visits at 12% than those aged 20 – 34 and 35 and above at 7% and 5% respectively, the difference was statistically insignificant (P-value = 0.343). Women staying within the facility catchment area also seemed to have a higher percentage of those completing expected number of ANC visit at 8% compared to those outside the catchment area at 0%. However, the results were statistically insignificant. Marital status and partner involvement had no influence on completion of expected number of ANC visits as shown in the table below.

Table 9: Completion of expected number of ANC visit by socio-demographic factors (N = 492)

Characteristics	Completed expected number of ANC visits (%)		Odd Ratio (95% CI)	P-values
	Yes (n = 35, 7%)	No (n = 457, 93%)		
Age group (years)				
<20	2 (12%)	15 (88%)	0.934 (0.215 – 3.34)	0.343
20 - 34	28 (7%)	356 (93%)	1.011 (0.579 – 1.765)	0.971
35 & above	5 (5%)	86 (95%)	1	1
Residence				
Within catchment area	35 (8%)	407 (92%)	0.00 (0.000)	0.998
Outside catchment area	0 (0%)	50 (100%)	1	1
Marital status				
Married	34 (7%)	436 (93%)	1.905 (0.227 – 5.995)	0.553
Single	1 (5%)	21 (95%)	1	1
Partner involvement				
Came with partner at least on one visit	5 (9%)	51 (91%)	0.808 (0.297 – 2.199)	0.708
Never came with partner at any visit	30 (7%)	405 (93%)	1	1

4.7.2 Obstetric characteristics associated with completion of expected ANC visits

The table 10 below shows parity and gravida association with completion of expected number of ANC visits. The results show that neither gravida nor parity was associated with completion of expected number of ANC visit.

Table 10: Obstetric factors associated with completion of expected ANC visits (N = 492)

Characteristic	Completion of Expected ANC visits	
	Odds Ratio (95% CI)	P-values
Gravida	1.394 (0.464 – 1.761)	0.402
Parity	1.295 (0.727 – 2.307)	0.381

4.7.3 HIV factors associated with completion of expected number of ANC visits

Table 11 shows results for completion of expected number of ANC visit based of GA at first ANC visit by HIV factors. Of the 35 women who completed their expected number of ANC visits, 15 were known positive at first ANC visit while 20 were newly diagnosed HIV positive. The results showed that women who were known positive were 2.729 times more likely not to complete their expected number of ANC visits than newly diagnosed HIV positive at first ANC visit (AOR = 2.729, 95% CI: 1.359 to 5.481, P-value = 0.005). The results also demonstrated that receiving ART and viral load suppression were not associated with completion of expected number of ANC visits as shown below. With regard to retention, of the 35 women who completed their expected ANC visits, 100% were those retained on treatment. However, the results were statistically insignificant (P-value = 0.997).

Table 11: Completion of expected number of ANC visit by HIV Factors (N=492)

Characteristics	Completion of expected number of ANC visit)		Odd Ratio (95% CI) Adjusted Odd Ratio (95% CI)	P-values
	Yes (n = 35, 7%)	No (n = 457, 93%)		
Knowledge of HIV status				
Known Positive	15 (5%)	307 (95%)	4.366 (4.182 – 6.736) **AOR 2.729 (1.359 – 5.481)**	0.035 **0.005**
Newly diagnosed	20 (12%)	150 (88%)	1	1
Received ART				
Already on ART prior to first ANC	16 (5%)	300 (75%)	0.00 (0.000)	0.999
Initiated on ART in first ANC	19 (11.2%)	150 (88.8 %)	0.00 (0.000)	0.999
Not initiated on ART	0 (0%)	7 (100%)	1	1
VL suppression				
Suppressed	30 (8%)	340 (92%)	0.858 (0.160 – 4.610)	0.859
Unsuppressed	2 (6%)	30 (94%		
Retention on ART				
Retained on ART	35 (9%)	372 (91%)	0.00 (0.00)	0.997
Lost to follow up	0 (0%)	71 (100%)	1	1

4.8 Comparison of utilization of ANC between known positive and newly diagnosed

To further understand the difference in utilization of ANC between the known HIV positive and newly tested HIV positive at first ANC, independent sample T tests were conducted to compare GA at first ANC and number of ANC visits made and the results were as below. Additionally, the Pearson chi square test was used to conduct a hypothesis test that prior knowledge of HIV-positive status stimulates early ANC presentation visit as would be assumed if Andersen's behavioural model of health care utilization was considered as presented in literature.

4.8.1 Comparing mean GA between the known positive and newly diagnosed

An independent sample T test was conducted to compare the GA at first ANC visit between the women who knew their HIV positive status prior to first ANC visit to the newly tested HIV positive in ANC. There were no significant differences t (490) = 0.167, P-value = 0.867) in the GA at first ANC visit with mean GA at first ANC visits for known HIV positive at first ANC (M = 18.69, SD = 5.882) and the newly tested HIV positive (M = 18.59, SD = 5.685). The magnitude of the differences in the means (mean difference = 0.092, 95% CI: - 0.991 to 1.175) was very small. According to the results, there was no significant difference in GA at first ANC between the known HIV positive and newly tested HIV positive as shown in table 12.

Table 12: Independent sample T test; GA between the known positive and newly diagnosed

Group statistics			**t test for equality of means**						
Characteristic	**Mean**	**SD**	**t**	**df**	**Sig (2 tailed)**	**Mean difference**	**Std error difference**	**95%, CI; mean difference**	
Known Positive	18.69	5.882	0.167	490	0.867	0.092	0.551	-0.99	1.175
Newly tested positive	18.59	5.685							

4.8.2 Comparing mean number of ANC visits between known positive and newly diagnosed at first ANC

Furthermore, an independent sample T test was conducted to compare the number of ANC visits between the women who knew their HIV positive status to the newly tested HIV positive in ANC at first ANC. There were significant differences t (490) = -2.77, P-value = 0.006) in number of ANC visits made, with mean number of ANC visit for known HIV positive (M = 3.73, SD = 1.878) less than newly tested HIV positive (M = 4.18, SD = 1.832). The magnitude of the differences in the means (mean difference = - 0.456, 95% CI: - 0.778 to - 0.133) was significant. The results had shown that there was a significant difference in number of ANC visits between the known HIV positive and newly tested HIV positive as presented in table 13 below.

Table 13: Independent sample T test for number of ANC visits made by knowledge of HIV positive status at ANC entry

Group statistics			t test for equality of means						
Characteristic	**Mean**	**SD**	**t**	**df**	**Sig (2 tailed)**	**Mean difference**	**Std error difference**	**95%, CI; mean difference**	
Known HIV Positive	3.73	1.678	-2.77	490	0.006	-0.456	164	-0.778	-0.133
Newly tested HIV positive	4.18	1.832							

4.8.3 Pearson chi square test on knowledge of HIV-positive status and early ANC visit

The Pearson chi square test was used to conduct a hypothesis test that prior knowledge of HIV-positive status stimulates early entry into ANC. This was to examine an association between prior knowledge of HIV positive status at ANC entry and early presentation for ANC. There was insignificant relationship at 5% significance level between prior knowledge of HIV positive status at first ANC and early presentation for ANC (x^2 = 0.896, df = 1, P-value = 0.344). Hence, supporting the hypothesis that there was no significant association between knowledge of HIV positive status prior to ANC registration and early presentation for ANC.

4.9 Summary of Results

The results of the study were represented using twelve tables and four figures. The analysis looked at pregnant women living with HIV who accessed ANC services 2019 in Ndola district. The results explored the socio-demographic, obstetric and HIV characteristics of the population and measured utilization of ANC using pregnancy trimester at ANC entry and completion of expected number of ANC visits. A binary logistic regression model was used to assess relationship between socio-demographic, obstetric and HIV factors with utilization of ANC services. Independent sample T test and Pearson Chi-square tests were used to further explore associations between prior knowledge of HIV positive status and utilization of ANC.

From these results, it was obvious that utilization of ANC by women living with HIV was below expectation and knowledge of HIV positive status did not seem to influence ANC entry. However, living outside catchment area was a predictor of early ANC presentation, while

increasing gravida and parity increased likelihood of late ANC presentation. Additionally, being newly diagnosed with HIV in ANC predicted completion of expected number of ANC visits.

CHAPTER 5: DISCUSSION

This study aimed at investigating features related to ANC uptake among women living with HIV in Ndola District, Zambia. This was done through measuring the prevalence of ANC utilization and establishing social demographic, obstetric and HIV factors associated with ANC utilization or non-utilization. According to Ministry of Health (2019), every pregnant woman should have their first ANC visit in the first trimester and achieve eight visits by delivery time. With the extra need of PMTCT services in the women living with HIV, early and regular ANC attendance is emphasized (WHO, 2019). However, in Zambia, there was inadequate ANC utilization among the general population (all women irrespective of HIV status) and limited information on ANC uptake among women living with HIV including the association of social demographic, obstetrics and HIV factors to ANC usage unique to women living with HIV population.

ANC utilization

Overall, the study results showed that there was low ANC usage among women living with HIV in Ndola. The results demonstrated that only 15% of the participants made their first ANC visit in the first trimester with 1% attaining eight ANC visits during pregnancy. This meant that 85% of the pregnant women living with HIV only accessed ANC after the first trimester, delaying the processes of PMTCT and ANC services. To further understand regular ANC visits, the anticipated number of ANC visits to be made was estimated using the woman's GA at first ANC visit. The results show that only 7.1% of the women managed to complete the expected number of ANC visits. This meant that not only were the women not registering early but also not completing scheduled visits. The results also showed that the mean GA at first ANC visit as 18.65 weeks and mean number of ANC visits at 3.88 both worse than the expected WHO standard of below 12 weeks and 8 visits respectively (WHO, 2019).

The poor utilization of ANC visit in this study could be linked to delayed implementation of WHO comprehensive ANC model in Ndola, which required ANC registration in first trimester and eight visits during pregnancy period. This was a shift from WHO focused ANC that required a woman to have first ANC attendance at GA 20 weeks and below and attain only four ANC visits by the time of delivery (MoH, 2019). On the other hand, it reflected psychological impact that HIV positive status has had on individuals suffering from it. There is need to conduct a research which would compare utilization of ANC between women living with HIV and those not to understand the magnitude of the difference in Zambia.

The utilization of ANC services results in this study were worse than 2018 ZDHS report for uptake of ANC in general population which reported 37% women registering for first ANC in the first trimester (Zambia Statistic Agency, MOH & ICF, 2019). However, ZDHS looked was a national survey. Similarly, a cross-sectional study conducted in 2012 in Zambia also established a lower prevalence for late ANC registration than the current study results at 72.0% and 68.6% in rural and urban districts respectively (Banda *et al*., 2012).

Nonetheless, there was limited literature on ANC utilization with regard to women living with HIV and using WHO comprehensive ANC model. A Lesotho study that looked at such a population established mean GA at first ANC visit of 21.6 weeks and mean number of ANC visits at 2.7, which were worse than this study results (Gill *et al*., 2014). However, the Lesotho study had a much higher percentage of women completing expected number of ANC visit at 44% compared to the current results at 7%. The results were expected since the Lesotho study maximum number of ANC visits was four based on WHO Focused ANC while this study had eight based on WHO Comprehensive ANC model. Nevertheless, both results show that women living with HIV on average accessed ANC after first trimester and made less than four visits during pregnancy irrespective of WHO model of care used. Additionally, the current findings on number of pregnancies making four or more visits were better at 61.6% than the Kenyan study that looked at adolescents living with HIV at 45% of pregnancies (Birungi, *et al.*, 2011). This could be attributed to the model of ANC Kenya was using by then of focused ANC and the adolescent population that is fragile.

Social demographic

Social demographic characteristics associated with ANC usage considered in the findings were age, place of residence, marital status and partner involvement. The results showed that only place of residence was associated with ANC entry with women residing within the facility catchment being 3 times more likely to present late for ANC than those who resided outside catchment area. This was a unique and interesting finding, which have been reflecting the need to access health care that women living outside catchment area felt or fear of stigma for women within catchment area. The results, also showed that there was no social demographic characteristic associated with completing the expected number of ANC visits.

These were unique findings when compared to a systemic review which looked at primary studies reporting on determinants of ANC utilization that established that increasing age, staying within catchment area, being married and partner support to be predictors of ANC

attendance and timeliness (Okedo, Akamike & Ezeanosike, 2019). This systemic review was based on the general population. However, findings on age and marital status were similar to the Zambian study that found no association with early and frequent ANC attendance (Nyambe *et al*., 2016). Therefore, the results could be reflecting social demographic effects specifically on ANC in women living HIV or unique to Zambian women.

Obstetric factors associated with ANC

The research findings also show that increasing gravida was associated with increased likelihood of late ANC presentation similar to increasing parity. However, neither gravida nor parity was associated with completion of expected number of ANC visit.

The findings on ANC entry were comparable to several studies including the systemic review of primary studies in SSA that found increase in parity and gravida to predict late ANC presentation (Okedo, Akamike & Ezeanosike, 2019). However, the findings on the completing the expected number of visits was contrary to the anticipated results from several studies including a study done in Ndola that reviewed increase in parity and gravida to be associated with decreased frequency of ANC attendance (Banda *et al.*, 2012). These results could be linked to the psychological effect that HIV positive status may have on this population affecting ANC attendance.

HIV factors associated with ANC

According to these results, there was no association between awareness of HIV positive status and early ANC presentation. An independent sample T-test also reviewed that there was no significant difference in GA at first ANC between women who knew their HIV positive status before ANC entry to the newly tested HIV positive in ANC. The research findings also reviewed that being newly diagnosed with HIV in ANC was a predictor of completing number of ANC visits. Additionally, results from the independent sample T test that compared number of ANC visits made, showed that the newly diagnosed HIV positive made more visits than the known positive. This could be attributed to the extra visits a woman was required to make for HIV treatment and care when newly diagnosed with HIV. It could also be a reflection of the need to access health care that the newly diagnosed positive felt.

These results are consistent with the Zimbabwean study that found no difference in first ANC registration between ladies who knew their HIV positive status preceding to first ANC to

those who did not know (Maruva, *et al*., 2014). This study's finding and the Zimbabwean contradicts the hypothesis that prior knowledge of HIV positive status motivates usage of ANC services and might influence PMTCT programming and ultimately avert maternal mortality. On the contrary, in Lesotho a study established that women with prior knowledge of being infected with HIV had earlier ANC entry and more often ANC visits than women who were ignorant of their HIV status (Gill *et al*., 2015).

The results also showed that receiving ART was not associated with ANC entry nor completion of expected ANC visits, despite women already on ART prior to first visit relatively presented earlier for ANC registration at 17% compared to women initiated on ART in ANC at 11%. This percentage difference may be reflecting referrals to ANC for women in HIV care and treatment program identified as being pregnant. It could also be reflecting the emphasis of the importance of early ANC attendance in ART adherence counselling. Literature from the Lesotho study confirmed higher likelihood of early ANC registration from women already on ART prior to first ANC than those not and the results were statistically significant (Gill *et al.,* 2015).

The results also demonstrate that CD4 count was not associated with ANC entry while viral load suppression and retention in care are not associated with completion of expected number of ANC visits. Despite that, of the 35 women who completed their expected ANC visits, all of them were retained on treatment. However, the results were statistically insignificant (P-value = 0.997). These results could be as an effect of integration of HIV care and treatment in ANC services making women retain in care to also access ANC services too.

A study in Lesotho found women on ART to be more likely to use ANC services regularly than women on prophylaxis, but results were not significant in the adjusted analysis making them similar to current results (Gill *et al*., 2015). However, the Lesotho finding on CD4 count are not in line with the current study. The study established that increase in CD4 count was associated with increased likelihood of utilizing ANC services.

Limitation

Like any other research, this study had limitations. The study used retrospective routine MoH data, where comprehensiveness and quality were not assured. Furthermore, the paper-based facility records system, which were the source document for this research did not allow tracing individuals who accessed ANC and HIV care and treatment services in more than one facility. The study did not also take into consideration the gestation age the women gave birth or dropped out of ANC.

CHAPTER 6: RECOMMENDATION AND CONCLUSION

The study findings of low uptake of ANC demonstrated a gap in implementation of WHO comprehensive ANC model across health facilities in women living with HIV in Ndola District. Comparing with staying within catchment area, staying outside catchment area influenced ANC entry positively. Prior knowledge of HIV status was not associated with ANC entry but completion of ANC attendance was positively associated with being newly diagnosed.

Therefore, this study recommends three actions as below;

1. Provide ample orientations and monitoring of WHO comprehensive ANC model implementation to health facility staff to facilitate execution of this ANC model.
2. Pregnant women living with HIV ought to be encouraged to register for ANC at a facility of their choice even outside catchment area.
3. HIV treatment and care clinics should provide ANC services within their spaces to advance early and frequent attendance by women living with HIV already in ART care.

Zambia should desire to surge efforts to improve early and consistent ANC attendance by all pregnant women, with a specific stress on women living with HIV. An all-inclusive plan, which incorporates social demographic, obstetric and HIV factors affecting the pregnant women living with HIV is critical for reduction of maternal mortality and improved success of PMTCT interventions.

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Appendix 1. Data Abstraction Tool

Facility name	
Code number	
Questions	**Responses**
Social demographic information	
1. Stays within Catchment area	Yes____ No____
2. Marital status	Married_____ Single ___ Widowed ___ Divorced ____
3. Age	_____
4. Partner involvement (Came with partner at least on one ANC visit	Yes _____ No _____
Obstetric information	
5. Parity	____
6. Gravida	____
7. Gestation age in weeks at ANC visit	Visit 1 _____ Visit 2 _____

Facility name	
Code number	

Questions	**Responses**
	Visit 3 _____ Visit 4 _____ Visit 5 _____ Visit 6 _____ Visit 7 _____ Visit 8 _____
HIV related information	
8. Point of HIV diagnosis (Choose the most appropriate)	Known HIV positive at visit 1 _____ Tested HIV positive at visit 1 _____ Tested HIV positive in subsequent visits _____
9. Received antiretroviral therapy (ART) (Choose the most appropriate)	Already on ART prior to first ANC_____ Initiated on ART in ANC_____

Facility name	
Code number	

Questions	**Responses**
	Not initiated on ART_____
10. Baseline CD4 count (Choose the most appropriate)	CD4 <350 cells/ml _____ CD4 >350 cells/ml _____
11. Viral load results prior to delivery (Choose the most appropriate)	Target not detected_____ Viral load <1000 copies/ml _____ Viral load >1000 copies/ml _____
12. Antiretroviral therapy pharmacy appointment adherence (Choose the most appropriate)	Never missed appointment ____ Missed <30 days _____ Missed >30 days _____

UNIVERSITY of the WESTERN CAPE

60 YEARS of hope, action & knowledge

20 January 2021

Ms L Kawanga
School of Public Health
Faculty of Community and Health Sciences

Ethics Reference Number: BM20/10/17

Project Title: Factors associated with antenatal care uptake among women living with HIV in Ndola District, Zambia

Approval Period: 18 January 2021 – 18 January 2024

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report annually by 30 November for theduration of the project.

Permission to conduct the study must be submitted to BMREC for record-keeping.

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

Director: Research Development
University of the Western Cape
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Bellville 7535
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24th March, 2021.

Ref. No. 2021- Feb- 004

The Principal Investigators
Lackey Kawanga
Faculty of community and Health sciences
University of the Western Cape
South Africa.

Dear, Kawanga

RE: FACTORS ASSOCIATED WITH ANTENATAL CARE UPTAKE AMONG WOMEN LIVING WITH HIV IN NDOLA DISTRICT, ZAMBIA.

Reference is made to your protocol submission. The IRB resolved to approve this study and your participation as Principal Investigator for a period of one year.

Review Type	**ordinary**	Approval No. **2021-Feb- 009.**
Approval and Expiry Date	Approval Date: 22nd March 2021	Expiry Date: 21st March, 2022
Protocol Version and Date	Version - Nil.	21st March, 2022
Information Sheet, Consent Forms and Dates	• English.	21st March, 2022
Consent form ID and Date	Version - Nil	21st March, 2022
Recruitment Materials	Nil	21st March, 2022
Other Study Documents	Data Collection Sheet, Focus Group Discussion.	21st March, 2022
Number of participants approved for study	-	21st March, 2022

Specific conditions will apply to this approval. As Principal Investigator it is your responsibility to ensure that the contents of this letter are adhered to. If these are not adhered to, the approval may be suspended. Should the study be suspended, study sponsors and other regulatory authorities will be informed.

Conditions of Approval

- No participant may be involved in any study procedure prior to the study approval or after the expiration date.
- All unanticipated or Serious Adverse Events (SAEs) must be reported to the IRB within 5 days.
- All protocol modifications must be IRB approved prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address.
- All protocol deviations must be reported to the IRB within 5 working days.
- All recruitment materials must be approved by the IRB prior to being used.
- Principal investigators are responsible for initiating Continuing Review proceedings. Documents must be received by the IRB at least 30 days before the expiry date. This is for the purpose of facilitating the review process. Any documents received less than 30 days before expiry will be labelled "late submissions" and will incur a penalty.
- Every 6 (six) months a progress report form supplied by ERES IRB must be filled in and submitted to us.
- A reprint of this letter shall be done at a fee.

Should you have any questions regarding anything indicated in this letter, please do not hesitate to get in touch with us at the above indicated address.

On behalf of ERES Converge IRB, we would like to wish you all the success as you carry out your study.

Yours faithfully,
ERES CONVERGE IRB

Dr. Jason Mwanza
Dip. Clin. Med. Sc., BA., M.Sc., PhD
CHAIRPERSON

PHO/CB/53/2/6

All Correspondences should be addressed to the
Provincial Health Director
Telephone/ Mobile No. +260861274/ +260 978529175
Email: copperbeltpho@gmail.com

REPUBLIC OF ZAMBIA
MINISTRY OF HEALTH
COPPERBELT PROVINCIAL HEALTH OFFICE

PWD Yard, Kabompo Road
P.O. Box 70032,
Kansenshi
NDOLA

1st April, 2021

Lackeby Kawanga
School of Public Health
University of Western Cape
Private Bag X17, Bellville 7535
CAPE TOWN, SOUTH AFRICA

Dear Lackeby

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH

Reference is made to your letter dated 31st March, 2021 regarding the above subject.

I am pleased to inform you that permission has been granted for you to conduct a study entitled ***"Factors associated with Antenatal Care (ANC) uptake among women living with HIV in Ndola District, Zambia"***

Kindly adhere to the guidelines as provided for by the TDRC Ethics Committee and National Health Research Authority.

Please share the finding of your study with this office.

Yours faithfully
COPPERBELT PROVINCIAL HEALTH OFFICE

REPUBLIC OF ZAMBIA
MINISTRY OF HEALTH
COPPERBELT PROVINCIAL HEALTH OFFICE
01 APR 2021
PROVINCIAL HEALTH DIRECTOR
P.O. BOX

Dr. Robert Zulu
PROVINCIAL HEALTH DIRECTOR