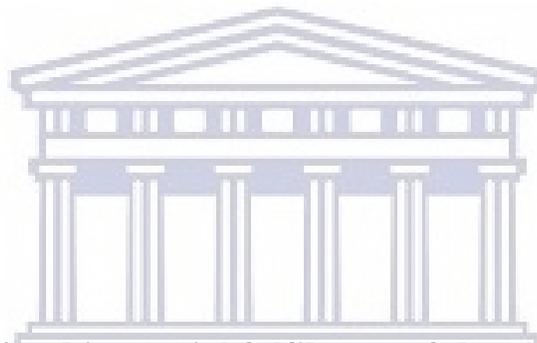


Factors affecting adherence to anti-retroviral therapy among adolescents living with HIV/AIDS in Masvingo District, Zimbabwe

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A mini-thesis submitted in partial fulfilment of the requirements for the degree of Master in Public Health at the School of Public Health, University of the Western Cape

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KEY WORDS

Adolescent
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Outcomes
Viral Load Suppression
Adherence
CD4 Count
Primary Health Care
Zimbabwe
Children



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ABSTRACT

Background: With the improvements in the effectiveness and availability of antiretroviral therapy (ART), perinatally infected children are surviving to adolescence and emerging as a significant sub-population living with HIV/AIDS in Zimbabwe. Adolescents, aged 10-19 years, face unique challenges related to adherence to chronic medication due to this period of vulnerability that is characterised by decreased parental support and supervision, decreased inhibition, increased risk-taking, and immature judgement. It is widely reported that poor adherence to ART leads to viral rebound, disease progression and drug resistance, in addition to increasing the risk of transmitting resistant strains of HIV to others. It is imperative to determine the factors that influence ART adherence among HIV positive adolescents so that effective interventions can be put in place. The current study described the factors that are associated with adherence to ART among HIV positive adolescents in Zimbabwe.

Methodology: A cross-sectional survey of 136 randomly selected adolescents (10-19 years) who were receiving ART at two referral hospitals in Masvingo District in 2019 was undertaken. A questionnaire was administered to collect data on socio-demographic characteristics, adherence and factors related to adherence such as person/patient, health system, medication, disease characteristics and social factors. Clinical data were extracted from the Electronic Monitoring Patient System. SPSS v24 was used for descriptive and inferential analysis.

Results: More than half of the participants (61%) had combined optimal adherence (dose adherence, schedule adherence and adhered to dietary instructions) in the previous three days. The most frequent reasons reported for missing HIV medications in the previous month was being away from home (50%); forgetfulness (25%); and having too many pills to take (25%). In bivariate analysis, only *duration of time since HIV diagnosis* was significantly associated with combined adherence to ART in the previous three days.

Conclusion: Tailored interventions are recommended to address low adherence amongst adolescents. These interventions should include convenient clinic appointment schedules for adolescents to pick up medication, reminders to take medication, regimen change to a single dose, and peer education and adherence clubs to improve knowledge about HIV and treatment, and curb treatment fatigue.

DECLARATION

I declare that “*Factors affecting adherence to anti-retroviral therapy among adolescents living with HIV/AIDS in Masvingo District in Zimbabwe*” is my work, has not been submitted for any degree or examination at any other university, and that all the sources that I have used have been referenced in the text and indicated in the references section.

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Date: 19 March 2021

Signature:

PKoroka



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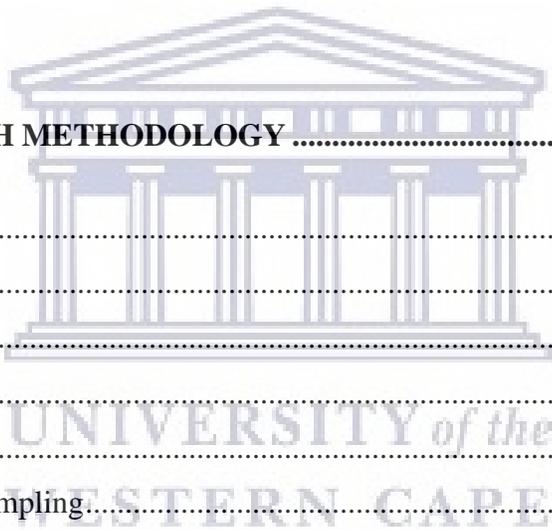


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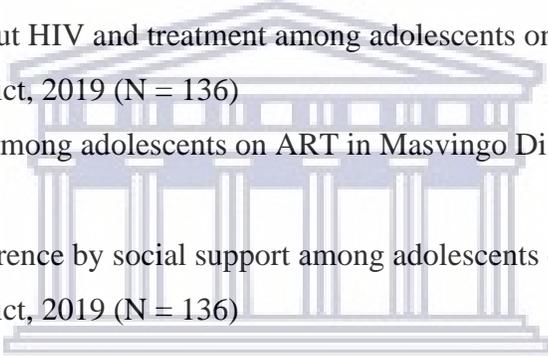
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CHAPTER ONE: INTRODUCTION

1.1 Background

An unprecedented public health crisis is facing the world at large, and more so sub-Saharan Africa, in the form of the HIV pandemic (WHO, UNAIDS & UNICEF, 2009). HIV/AIDS is one of the pandemics ever to affect humankind. HIV/AIDS is distinct from other pandemics to hit the human race because no cure or effective vaccine exist to date. UNAIDS (2016) estimates that 26.2 million people are still living with HIV; with sub-Saharan Africa bearing the brunt of the disease burden hosting 67% of HIV infected people globally. It is further estimated that there were 2.6 million people newly infected with HIV and 1.8 million HIV/AIDS related deaths in 2009 (WHO, UNAIDS & UNICEF, 2009). A high prevalence of HIV infection especially in the economically productive age group (25 to 35 years) decreases productivity and aggravates food insecurity, making HIV not just a health issue, but an economic and development challenge as well (UNAIDS, 2016).

The World Health Organization (2016) reports that adolescents account for 16% of the world's population (1.2 billion) and that of these, 1.8 million were infected with HIV in 2016. It is reported that 80% of adolescents infected with HIV reside in sub-Saharan Africa (UNAIDS, 2016). This population has acquired HIV through birth (vertically) or horizontally (behaviourally). With the recent advances in HIV care and treatment, most notably antiretroviral therapy (ART), children who were infected at birth are now surviving to adolescence (Maskew *et al.*, 2016; Johnson *et al.*, 2015). For example, more than 40% of the 25 000 children in HIV care in Zimbabwe in 2009 were age 10 years or older (Ferrand, *et al.* 2010).

Nachega *et al.* (2009) and Judd *et al.* (2016) report that adolescents on ART have poorer retention rates and lower viral load suppression rates compared to adults (20 years and older) and children (under 10 years). The SMILE study (2015) reported that 54% of the HIV positive adolescents were linked to care and treatment, 31% were retained in care, 31% started ART and 7% achieved undetectable viral load. Slongove *et al.* (2017) report that poor treatment outcomes of adolescents

are masked in routine monitoring and reporting in most countries, because health information systems report for children below 15 years, whereas older adolescents (15-19 years) are grouped together with adults. The specific needs of older adolescents may not be addressed as the HIV care and treatment programs will be catered to the needs of adults.

1.2 HIV epidemic in Zimbabwe

The Zimbabwe National Statistics Agency (2016) reports a 24% HIV prevalence amongst adolescents in Zimbabwe in 2014. The Ministry of Health and Child Care (2014) estimates that approximately 69,000 adolescents were registered on ART at the public health institutions in 2014. However, despite the reduction in overall HIV incidence and mortality, HIV-related mortality among adolescents in Zimbabwe remains high. According to the Ministry of Health and Child Care (2014), the country recorded a three-fold increase in the number of deaths among HIV-infected adolescents on ART from 302 in 2009 to 947 in 2010. In 2014, more than 1,500 adolescents died of HIV related conditions.

Adolescent HIV-related mortality therefore continues to rise in Zimbabwe, despite reduction in overall HIV incidence and mortality. The Zimbabwe Population Based HIV Impact Assessment ZIMPHIA (2016) identified that deaths among adolescents are most likely due to failure or delayed identification of adolescents living with HIV, delayed initiation of ART, poor treatment adherence, and low retention in care. This is, in turn, attributable to a range of social and psychological factors that influence uptake of HIV services and adherence among children and adolescents living with HIV (Maskew *et al.*, 2016). These factors include poverty, stigma, late disclosure, and lack of adequate information and counselling, grief and bereavement, depression, treatment fatigue, lack of treatment support at home and health system factors (Maskew *et al.*, 2016). In addition, adolescents living in rural areas are disproportionately affected by these factors compared to their counterparts in the urban areas.

1.3 Problem Statement

With the advances in the availability and effectiveness of ART, perinatally infected children are

now surviving to adolescence, therefore the population of adolescents living with HIV is increasing in Zimbabwe. HIV/AIDS is a chronic condition and therapeutic regimens are to be adhered to for life, often starting during infancy and progressing to adolescence through adulthood. Nabukeera-Barungi *et al.* (2015) states that perinatally infected adolescents run the risk of stopping medication out of fatigue as they would have started treatment at an early age. Adolescence is known to be a period of high vulnerability; characterised by decreased parental support and supervision, decreased inhibition, increased risk-taking behaviour, and immature judgement (Nachega *et al.*, 2006). Adolescents living with HIV have the burden of adhering to their medication regimen just like all adults on ART do, even though they are only learning to take responsibility for their own health (Maskew *et al.*, 2016). The Ministry of Health (2014) notes that in Zimbabwe, adolescents living with HIV have gained attention because there are the only age group where HIV related mortality is going up. Nachega *et al.* (2006) also state that adherence among adolescents has been noted to be low in Zimbabwe. It is imperative that factors affecting adherence to ART among adolescents living with HIV in Zimbabwe are explored given the limited literature on research conducted in the country.

1.4 Aim and Objectives

The aim of this study was to determine factors that are associated with adherence to antiretroviral therapy (ART) among HIV positive adolescents in Masvingo District, Zimbabwe.

The objectives of the study were:

- To describe the levels of adherence to ART among adolescents;
- To determine sociodemographic and clinical risk and protective factors of adherence to ART among adolescents.

1.5 Outline of Mini-thesis

SECTION	SCOPE
Chapter 1	This chapter introduces the thesis, outlines the background of the problem, and statement of the research problem. It also includes the aim and objectives of the study.

Chapter 2	Reviews the relevant literature on the research topic from appropriate authors, journals, periodicals, newspapers and from other related studies; and the theoretical framework that informed the study.
Chapter 3	Presents the quantitative methodology that was used in this research.
Chapter 4	Presents the results of the study.
Chapter 5	Discussion of results
Chapter 6	Focuses on the conclusions and recommendations.



CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review of the study by examining both theoretical and empirical literature from professionals and other researchers with a primary focus on factors leading to adherence to antiretroviral drugs. This chapter presents different definitions of adolescence introduced by various research scholars. It further reviews the theoretical framework.

Adolescents living with HIV encounter various factors that hinder their adherence to medication.. In this chapter, literature relating to factors that affect adherence to antiretroviral medication among HIV positive adolescents is discussed. The review of literature considers the global, regional and local perspectives.

2.2 Conceptual Definitions

2.2.1 Adolescence

World Health Organisation (2018) describes *adolescence* as a transitional phase of growth and development between childhood and adulthood, and indicates that adolescents include persons aged between 10 and 19 years. Adolescence is characterised by unique and rapid biological and psychosocial changes with evolving capacities during the transition from childhood to adulthood (World Health Organisation, 2018). The adolescence period can be divided into two phases: the lower band with the 10-14 year age group; and the upper band comprises of the 15-19 year age group. In Zimbabwe, WHO definition of adolescents has been adopted for use in policy and implementation.

2.2.2 Antiretroviral Therapy

World Health Organisation (2018) describes antiretroviral therapy (ART) as a medication regimen prescribed to HIV positive individuals. The medication regimen comprises of a combination of at least three antiretroviral (ARVs) drugs that seeks to suppress the virus and stop progression to

AIDS. ART does not cure HIV but is taken to prevent the multiplication of HIV, and progression to AIDS. ART is therefore lifelong medication taken daily and this makes the HIV condition chronic.

2.2.3 Adherence to Antiretroviral Therapy

Urquhart (1996) defines adherence to medication as the extent to which a patient takes medication as prescribed by a health care worker. Adherence rates for chronic conditions such as HIV are important as patients have to rely on medication daily to support their immune system recovery. Machtinger and Bangsberg (2006) note that adherence rates to medications prescribed for chronic conditions range from 50-75%. Adherence to antiretroviral medicine is also important in achieving viral load suppression. Machtinger and Bangsberg (2006) report that an adherence level of 95% - 100% to ART is necessary to achieve full and sustained viral suppression. HIV.gov (2021) note that adherence to ART is one of the highly effective options for preventing HIV transmission as people with an undetectable viral load have effectively no risk of sexually transmitting HIV to their HIV-negative partners. This level of adherence can only be attained if patients do not miss more than three doses of ARVs per month. Their study in San Francisco showed that a 10% decrease in adherence was found to result in doubling of the viral load.

Clinically, adherence to ART helps in preventing HIV related morbidity and mortality. World Health Organisation (2018) highlights that there is a strong correlation between adherence and clinical outcomes of patients with HIV as shown by laboratory markers such as CD4 count. Gifford *et al.* (2000) revealed that patients who reported 95-99% adherence at 6 months had an increase in CD4 count from baseline of 200 cells/mm³. Higher levels of adherence therefore reduce the chances of virological failure, drug resistance and increase the likelihood of clinical success.

2.3 Measurement of Adherence

Adherence can be measured in various ways that include self-reporting, attendance at clinic appointments, pharmacy records to indicate the number of tablets that were displaced, and pill counts.

2.3.1 Self reporting

Chalker *et al.* (2010) note that clinicians or pharmacists can measure adherence through asking patients whether they have missed any doses of pills in a number of days, and if so by how many. World Health Organisation (2018) further notes that this method is possible only if the question is asked consistently and recorded routinely. In practice, clinicians or pharmacists may ask patients about their adherence but do not record the answer routinely. This method is also subject to the recall period - which is 3 days or 7 days. Chalker *et al.* (2010) indicate that three indicators can be measured through self-reporting, namely:

- Percentage adherence for each patient;
- Percentage of patients with full adherence to ART; and
- Percentage of ARV doses patients took during the recall period.

2.3.2 Pharmacy records

Chalker *et al.* (2010) note that dispensing measures of adherence can also be utilised to measure long term adherence. This method entails counting the number of days that medication is dispensed, for example, 6 months. Chalker *et al.* (2010) also note that using pharmacy records has a disadvantage in that it overestimates true adherence as the patient may have collected medication without actually consuming it correctly.

2.3.3 Pill counts

World Health Organisation (2009) describes pill count as a method that compares a patient's actual and expected consumption since the pharmacy last dispensed the medication.

2.3.4 Attendance of clinic appointments

Records of missed (or late) appointments indicate treatment defaulters and levels of adherence. Chalker *et al.* (2010) note that most countries usually pack extra medicine for 3 days when dispensing drugs. Using this indicator, health care providers classify patients according to three categories, namely:

- those who do not appear for their appointments on the scheduled day;

- those who miss their original appointment, but come within 3 days of the missed appointment; and
- those who miss their appointment and who do not reappear at the clinic within 30 days of the missed appointment (early defaulters).

These categories can help to indicate treatment defaulters and the level of adherence among patients. World Health Organisation (2009) however notes that patients may collect their medication but not correctly consume it as prescribed by health care workers.

2.3.5 Viral load measurement

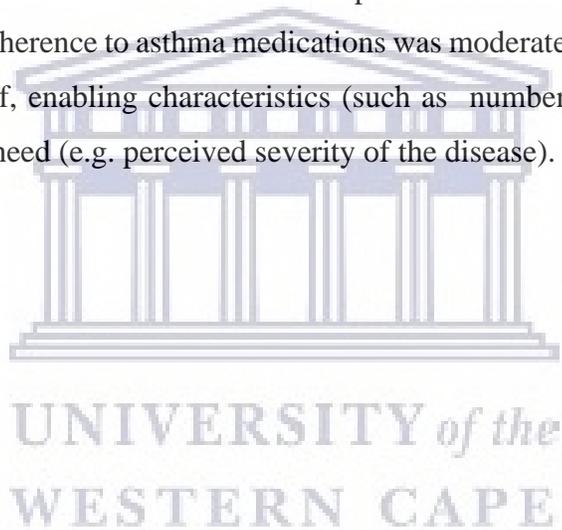
McGraw-Hill Concise Dictionary of Modern Medicine (2002) describes the viral load measurement as the quantitative measurement of the amount of human immunodeficiency virus expressed as copies per millilitre. A study by Paterson *et al.* (2002) established that up to 95% adherence is necessary for HIV viral suppression. The study linked the relationship between adherence and viral load (VL): as adherence decreased, VLs increased sharply in a dose-response effect. The study was able to conclude that greater adherence levels were associated with greater reduction in VLs.

2.4 Theoretical framework

This study was guided by two theories, namely the *Behavioral Model of Health Service Use* (Babitsch *et al.*, 2012) and Sweat and Denison's model of *HIV and AIDS Structural Factors* (Green & Murphy, 2014). The Behavioral Model of Health Service Use demonstrates how costs associated with ART, cultural and religious beliefs and social support affect Persons living with HIV/AIDS (PLWHA) adherence to ART. However, the model failed to address the effects of stigma on PLWHA's adherence to ART. Consequently, Sweat and Denison's Model of HIV and AIDS Structural Factors was used to demonstrate how stigma affects adherence to ART. These theories helped in identifying and classifying the different factors that affect adherence among adolescents living with HIV.

2.4.1 The Behavioural Model of Health Service Use

The Behavioral Model of Health Service Use was initially developed over 46 years ago (Andersen, 1995). Since then it has been subjected to considerable application, reproduction, and alteration. This model was originally developed to explain health services use and had a family-level focus. However, the model was later adapted to predict the use of health care services at an individual level. This model examines relationship between predisposing, enabling and need factors in health care utilisation (Andersen, 1995). The model has been applied to identify variables related to adherence to medication-taking (De Smet & Erickson, 2006). Murray *et al.* (2004) used this model to study adherence predictors in older adults in South Eastern United States. Wekesa (2002) also used the model to investigate compliance with prescribed drugs in Western Kenya. De Smet and Erickson (2006) used this model to examine self-reported adherence in asthma patients in Michigan; and found that adherence to asthma medications was moderately related to predisposing factors such as health belief, enabling characteristics (such as number of metered dose inhaler instructors), and perceived need (e.g. perceived severity of the disease).



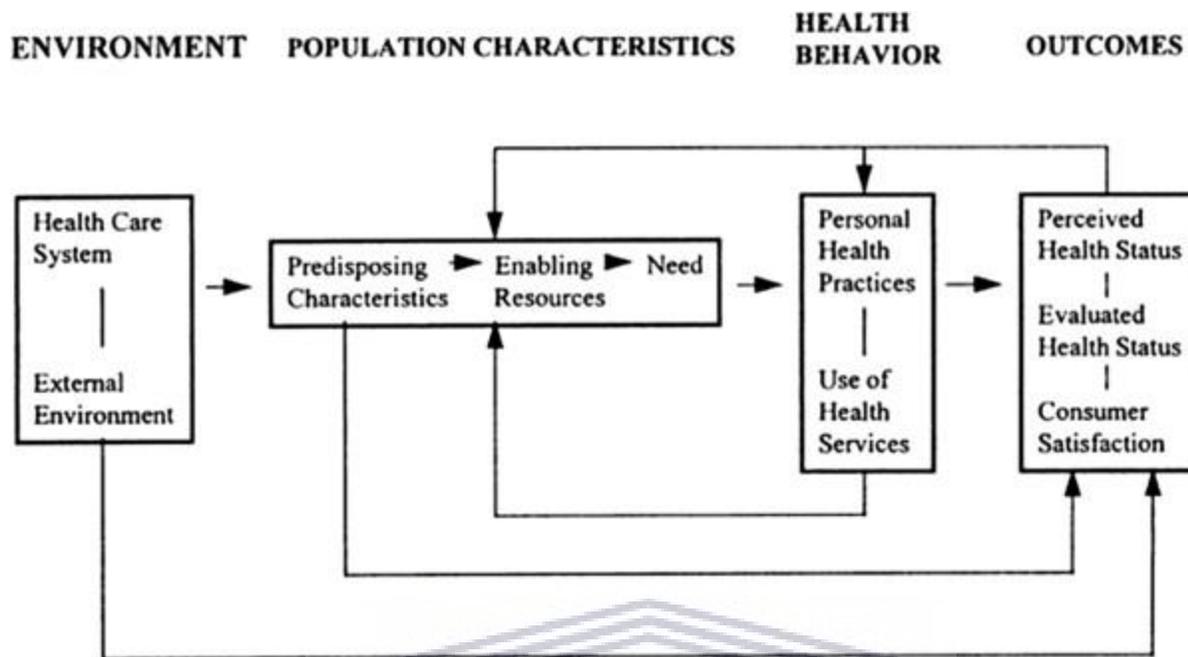


Figure 2.1: Behavioural Model of Health Use (Andersen, 1995)

The Behavioural Model of Health is a multilevel model that incorporates both individual and contextual determinants of health services use (Andersen, 1995). It has three major components and these are described in turn.

Predisposing factors are defined as those factors that exist prior to illness and they shape an individual's attitudes towards health care use. These include demographic characteristics (age and gender), social factors (education, occupation and ethnicity), and health beliefs of patients (attitudes, values and knowledge).

Enabling factors refer to resources that promote or inhibit the health care utilisation. These include personal factors (income and health insurance), and community factors (social support).

Need factors represent the individual's illness or impairment that necessitate the use of health care services. These include perceived need (perceptions of illness) and evaluated need (professional judgment about health status of patient) (Andersen, 1995).

Recent versions of the model have included new elements to reflect the role health care systems play in influencing access and retention. Ricketts and Goldsmith (2005) argue that early users of this access concept attempted to create global indicators of access that focused on both process and outcomes. The process indicators include regular source of care, travel time to health care facilities, ability to get an appointment in a reasonable time, and in-office waiting time.

2.4.2. Sweat and Denison's Model of HIV and AIDS Structural Factors

Sweat and Denison (1995) advocate a typological theoretical framework that organises structural factors of HIV and AIDS into four levels, namely individual, environmental, structural and super-structural levels. According to this model, individual factors are person-related attributes, environmental factors include living conditions and resources of individuals, and structural factors are the laws, policies and programmes that exist. Giddens and Sutton (2013) describes structural factors as those that occur at the highest level and include economic underdevelopment, sexism and racism. These influence the national cultural norms and micro political arrangements. These factors also relate to the different levels of stigma.

Giddens and Sutton (2013) conceptualized stigma as occurring at different levels, that include self-stigma, familial stigma, community stigma and organizational stigma. Each type of stigma is unique and may require different strategies to tackle it. He further posits that these stigma processes do not take place in a contextual vacuum; rather they are influenced by the wider super-structural, structural, environmental, and individual factors. These factors include gender, religion/spirituality, politics and the economy.

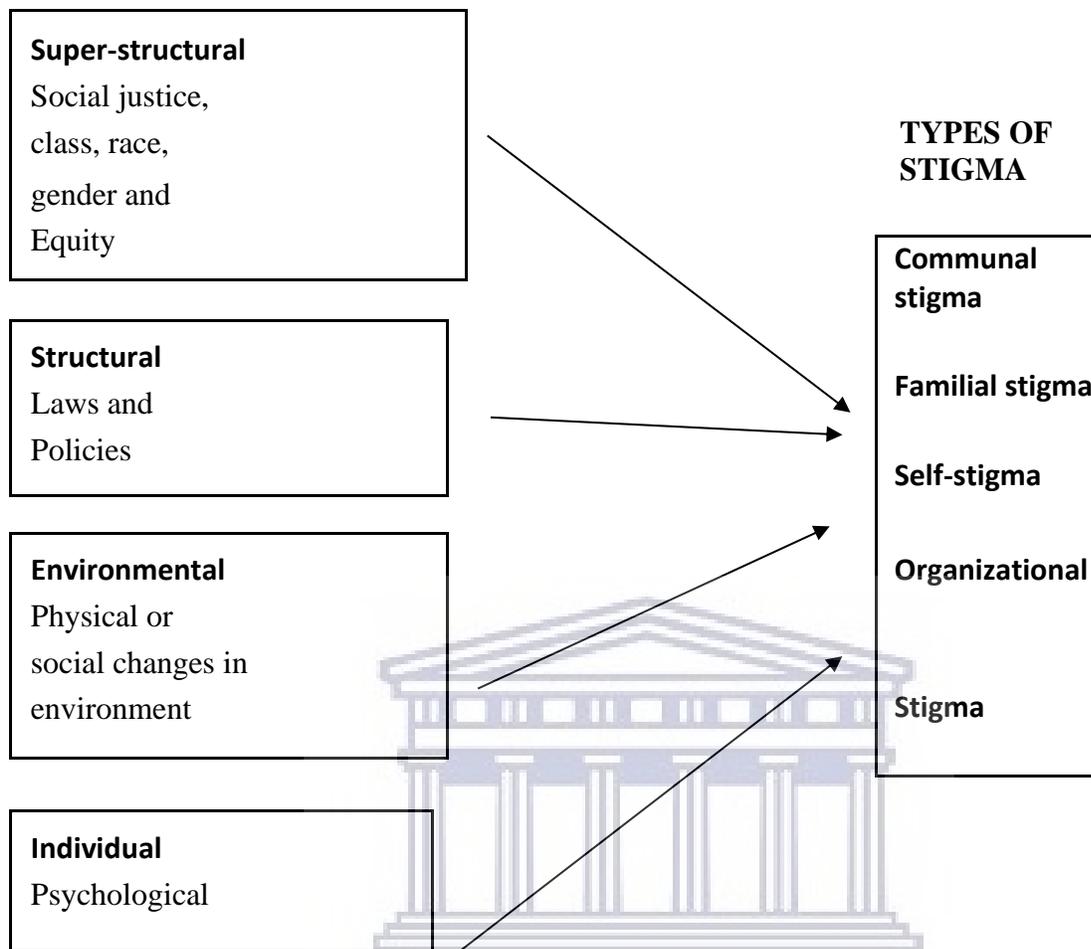


Figure 2.2 Sweat and Denison's (1995) Model of HIV and AIDS Structural Factors

2.5 Conceptual framework on factors affecting adherence

The conceptual framework developed by Gellad *et al.* (2009) to review the interrelated factors that affect adherence to medication among adolescents is presented below. The conceptual framework relates to the Behavioural Model of Health Use (Andersen, 1995) and Sweat and Denison's Model of HIV and AIDS Structural Factors which have been previously discussed in this chapter. The conceptual framework identifies both individual, environmental and structural factors that affect adherence to ART.

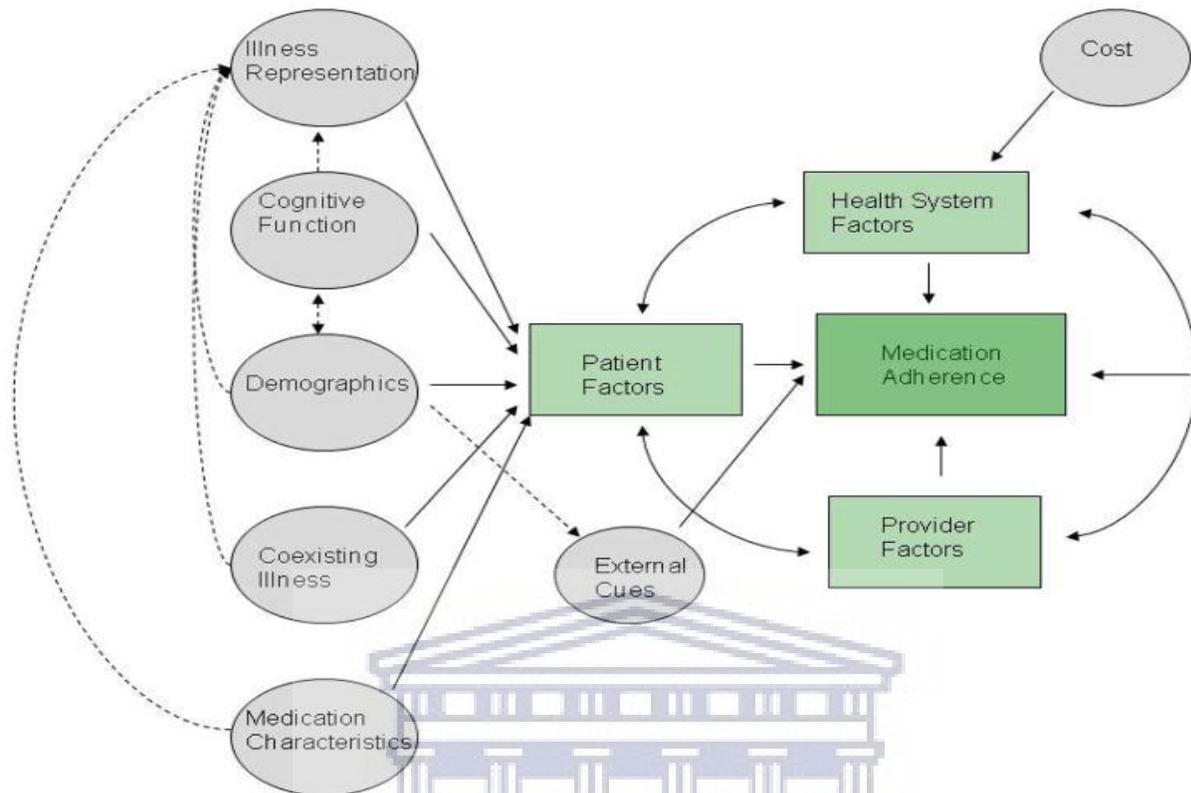


Fig 2.3: Conceptual Framework of Medication Adherence and the Interaction between Patient Factors (Gellad *et al.*, 2009).

As illustrated in the diagram, patient factors are influenced by illness representation, cognitive function, demographics, coexisting illness and medication characteristics (Gellad *et al.*, 2009). Illness representation include factors such as health beliefs and knowledge about the disease. Cognitive function include memory, comprehension and mental health. Demographics include age, gender, ethnicity as well as health literacy (education level) and living conditions. Co-existing illness includes medical and mental health conditions, as well as alcohol and substance use and smoking. Medication characteristics include regimen complexity, number of medications and side effect profiles. Gellad *et al.* (2009) note that health system factors include factors such as costs, fragmentation of care, shortage of resources and ability to access care. Provider factors encompass issues such as patient-provider relationship, time spent discussing medications and other communication issues.

2.6 Barriers to adherence

The barriers to adherence to ART can be categorised as: person/patient related, service delivery, medication and disease characteristics and social factors.

2.6.1 Person / patient related factors

Patient related factors include variables such as desire to be healthy, acceptance, isolation and depression, lack of knowledge and fear of unintended disclosure (Machtinger & Bangsberg, 2006).

2.6.1.1 Desire to be healthy

The study conducted by Mutwa *et al.* (2013) in Rwanda indicated that adolescents' adherence levels can be improved by the desire to be healthy. The personal experience of health improvement such as evidence of increased CD4 cells (immunological recovery) encouraged adolescents to remain adherent to their medication. Adolescents therefore felt the self-agency to continue adhering to their medication. Denison *et al.* (2015) also highlighted that most adolescents take ART because they do not want to fall ill or die. Most of the adolescents interviewed in a study by Denison *et al.* (2015) indicated that they were initiated on ART after prolonged illness and attributed their health improvement to ART. The desire to be healthy and avoid death can propel adolescents to adhere to their medication.

2.6.1.2 Acceptance

Studies by Mutwa *et al.* (2013) have shown that acceptance leads to better adherence among adolescents living with HIV. The study revealed that once adolescents accept their condition, they developed the will to live and they become more adherent (Mutwa *et al.*, 2013). Nabukeera-Barungi *et al.* (2015) report that HIV positive adolescents who had accepted their condition were more likely to attend clinic review appointments and find ways to manage themselves. Denison *et al.* (2015) also asserts that when adolescents accept their condition they are likely to develop self-management skills. The self-management tools included learning to keep their own medication and setting alarms as reminders. Acceptance of their HIV status by adolescents enables them to develop the will and utilise tools such as clocks to manage their own condition and adhere to

treatment.

2.6.1.3 Isolation and depression

Mutwa *et al.* (2013) highlight that adolescents' non-acceptance of their HIV status can lead to feelings of depression and isolation. In turn, depression can prevent people from taking their medication. This was augmented by Reynolds (1994), who indicate that failure to maintain long-term adherence was significantly associated with younger age and depression. Murphy *et al.* (2005) note that depressive symptoms and disorders in adolescents are often under-identified and, therefore, undertreated. Unidentified depression among adolescents therefore makes adherence to HIV treatment difficult.

2.6.1.4 Lack of knowledge about HIV status and medication

Denison *et al.* (2015) found that adolescents may not be aware of their HIV status and the reasons why they have to take medication. MOHCC (2016) recommends that primary caregivers are responsible to disclose to children their (the child's) HIV status and that health care workers should support them through counselling, and health education with the children and adolescents. WHO (2014) notes that in many settings adolescents experience late disclosure of HIV status, and are therefore left without appropriate information about their condition and support services. This makes adolescents confused about the reasons why they take chronic medication (ART). The study by Denison *et al.* (2015) revealed that most adolescents were not aware of the reasons why they take medication and would throw these away resulting in incomplete adherence. Late disclosure also hinders health care workers from delivering health education sessions to adolescents. This hampers treatment literacy and adherence to medication.

2.6.1.5 Fear of unintended disclosure

Unintended disclosure occurs when an individual involuntarily reveals their HIV status. Fear of unintended disclosure plays a vital role in adherence to ART among adolescents. The study conducted by Denison *et al.* (2015) in Zambia showed that most adolescents preferred that their HIV status be kept in the home to avoid being labelled as HIV positive and the consequent discrimination. The desire to keep one's HIV status a secret was found to be closely linked to ART

adherence among adolescents. This resulted from competing school and social events that coincided with dosing times at home. From this study, adolescents preferred to forgo taking medication if they were at risk to be seen by relatives and peers taking medication.

2.6.2 Health system factors

The service delivery factors that influence adherence include long distances to health facilities, insufficient health education provided by health care providers, and lack of services tailored for adolescents.

2.6.2.1 Long distances to health Facilities

Distance travelled by adolescents in accessing health services is a contributing factor inhibiting medication collection and subsequently adherence. WHO (2014) asserts that ideally people are supposed to access a health facility within a 5km radius. However, in reality people in less developed countries travel for more than 10km and this is a cause of concern for adolescents. A study conducted by Maskew *et al.* (2016) revealed that adolescents, like adults generally, may not come to health facilities due to long distances, and shortage of transport fares. These factors therefore impede adolescents from accessing HIV care and treatment services at health facilities, leading to missed clinic appointments and ultimately poor adherence to medication.

2.6.2.2. Insufficient health education

The study by Filho *et al.* (2008) showed that adolescents who were educated by healthcare workers (HCW) on how to take ART drugs, had better adherence. This demonstrates the importance of the patient–HCW relationship in order to guarantee better adherence to ART, and underlines the importance of health education tools in patient care. This is in accordance with the reports of Rueda *et al.* (2006) who demonstrated that interventions seeking to improve the practical skills on how to take ART medications such as a HCW teaching the patients were shown to improve adherence. Kalichman *et al.* (1998) also reported that education and health literacy were independently associated with adherence, even after adjusting for income, distress and support.

2.6.2.3 Lack of support services tailored for adolescents

Health facilities are not able to respond to the specific needs of adolescents as they grow older in resource constraint settings. Barnays *et al.* (2014) reveal that the need to invest in support services for adolescents is commonly outweighed by the competition for resources for adults and young children, particularly in the present financially constrained environment. This age group therefore risks falling between the gaps of poorly coordinated health systems. Health care workers are not specifically trained in the complex needs of adolescents and most clinics do not have psychosocial support programs for adolescents in place. Most adolescents are therefore not equipped with information to understand their condition and this results in negative outcomes for their health.

2.6.3 Medication related factors

Medication related factors include occurrence of side effects and treatment fatigue (Machtinger & Bangsberg, 2006).

2.6.3.1 Side effects

Adverse reactions to ARVs among adolescents have been reported to hinder adherence to medication (Veloso *et al.*, 2014). Maskew *et al.* (2016) found that the occurrence of side effects such as dizziness, vomiting and enlargement of breasts among boys resulting from intake of ARVs may inhibit adolescents from continuing to take their medication.

2.6.3.2 Treatment fatigue

In a study conducted by Maskew *et al.* (2016) in South Africa, adolescents who reported becoming tired of taking the medication were more likely to miss a clinic visit and not adhere to treatment. Amberbir *et al.* (2008) also highlighted that the requirement of taking medicines every day is boring and exhausting for adolescents. These findings were further augmented by MacDonell (2013), who reported that perinatally infected adolescents skip medication because of treatment fatigue – i.e. they require a break and view the medication as not palatable and of large volumes.

2.6.4 Disease characteristics

2.6.4.1 Stage of the disease

The study conducted by Murphy *et al.* (2005) in USA indicated that adolescents in the later HIV disease stage were less likely to be adherent compared with those who are in the earlier disease stage. This may be due to the fact that they are more affected physically and therefore less able to tolerate adverse effects of medication, or it may be owing to their depression over disease progression and lowered outcome expectancies that the medications can help them.

2.6.4.2 Mode of transmission

The study conducted by Xu *et al.* (2017) in Thailand revealed that perinatally infected adolescents have been increasingly recognised as a specific group with unique challenges in HIV treatment. Compared to behaviourally infected peers, perinatally infected youth have significantly more barriers to ART adherence including a more complicated clinical course, early-life adversities featuring loss of parent(s) and family instability, experiences of discrimination and trauma from disclosure of their HIV status. As they advance in age, they also face the changes from paediatric to adult care, and the critical transition from dependence on caregivers to assuming full responsibilities on their own, including the maintenance of ART adherence.

2.6.5 Social factors

Social factors are factors that are beyond the control of an individual and lie within the broader living and societal arrangements and culture. These include stigma and privacy, religious beliefs, social support, drug abuse and alcohol consumption, poverty, conformity to peer pressure, disclosure of the HIV status to adolescents and difficult social circumstances.

2.6.5.1 Stigma and privacy

Stigma, both perceived and experienced, deters adolescents from both obtaining and taking their drugs. The study conducted by Mutwa *et al.* (2013) revealed that adolescents may avoid going to the clinic to obtain their drugs because they do not want community members to see them. Family members asked to pick up the medication often refused, for fear of being seen and labelled as living with HIV. These dynamics therefore affects adolescents' retention in care and ultimately adherence to treatment schedules. Maskew *et al.* (2016) further note that a related challenge for many adolescents is lack of privacy. This entails lack of a private place to keep and take their

medication, because they often live in congested households, boarding schools and foster care. Stigma plays an important role in the adolescents' adherence even within their own homes as they do not want their siblings, friends, and others to see them take their medication.

2.6.5.2 Religious beliefs

Giddens and Sutton (2013) describe religion as the set of beliefs and values that guide human behaviour and practices. The study by Denison *et al.* (2018) in Zambia revealed that adolescents would stop taking medication after being “declared healed” at churches. Another study conducted in Tanzania indicated that 80.8% of the study participants believed that prayer could cure HIV. These findings were also corroborated by Sunday Mail (2018) in which an HIV positive adolescent from the apostolic sect in Zimbabwe testified that her church does not accept modern medicine and had witnessed her peers succumbing to HIV because her church leaders discouraged them from accessing HIV care and treatment services.

2.6.5.3 Social support

Social support has been reported to improve adherence among adolescents. Maskew *et al.* (2016) note that adolescents living with their mother as their primary caregiver were more likely to attend all clinic visits and adhere to treatment than those residing with secondary caregivers. In addition, the caregivers act as an additional reminder to adolescents for them to take their medication.

2.6.5.4 Drug abuse and alcohol consumption

Several studies reveal that substance abuse and alcohol consumption further threaten proper adherence to antiretroviral medication. In a study by Bernays *et al.* (2014), 40% of the patients surveyed indicated that there had missed a dose of their medication because of alcohol consumption. Mutwa *et al.* (2013) note that substance abuse results in intoxication and this negatively impacts on adherence to treatment. Substance abuse negatively affects psychosocial functioning and this results in non-adherence.

2.6.5.5 Poverty

What happens outside the clinic has a significant effect on the ability of adolescents to follow

clinical instructions related to their medicine. Bernays *et al.* (2014) note that adherence to treatment is complicated in the context of poverty as adolescents might have limited access to food. Most of the families are not able to provide enough food to adolescents living with HIV due to poverty. In a study conducted by Nabukera-Burungi *et al.* (2015) in Uganda, adolescents reported that they experience abdominal pain when they take the medicine on an empty stomach; so are reluctant to take the medication. This is further worsened by lack of transport to travel to health facilities, especially in the rural areas, and resulted in loss to follow up or poor adherence to treatment.

2.6.5.6 Conformity to peer pressure

Bernays *et al.* (2014) reveal that most adolescents living with HIV are often weaker and experience delayed puberty. Adolescents often express the desire to conform to their peers, which inadvertently leads them to stop adhering to treatment. In addition, the desire to conform to peers can instil in them a marked sense of social isolation by being labelled out as different to others, which creates a heavy psychological burden.

2.6.5.7 Disclosure of HIV status to adolescents

Children's knowledge about their HIV status and subsequent adherence is in turn affected by their caregivers' knowledge and attitude. Disclosure to HIV status is a gradual process starting from the health care workers to caregivers is expected to trickle down to adolescents with adequate support. Bernays *et al.* (2014) notes that late and suboptimal disclosure of HIV status to adolescents leads them to deal with their condition in secrecy and results in poor or non-adherence to medication. Caregivers silence stems from the misplaced idea of protecting their children but results in adolescents not adequately understanding their condition and the importance of adhering to treatment.

2.6.5.8 Difficult social circumstances

HIV is a household disease as most adolescents acquired the infection vertically through mother to child transmission. HIV positive adolescents are likely to be orphaned and have changing guardianship. Bernays *et al.* (2014) note that this results in neglect, social isolation and poor adherence due to lack of family support. These complex living arrangements are further

complicated by feelings of bereavement making it difficult for adolescents to manage their medical condition.

2.7 Conceptual framework of adherence to antiretroviral therapy

The conceptual framework below illustrates the relationship between the independent variables on one hand and the dependent variable on the other. The above literature that has been reviewed assisted the researcher to craft a framework that will outline the factors that cause adherence to ART among adolescents.

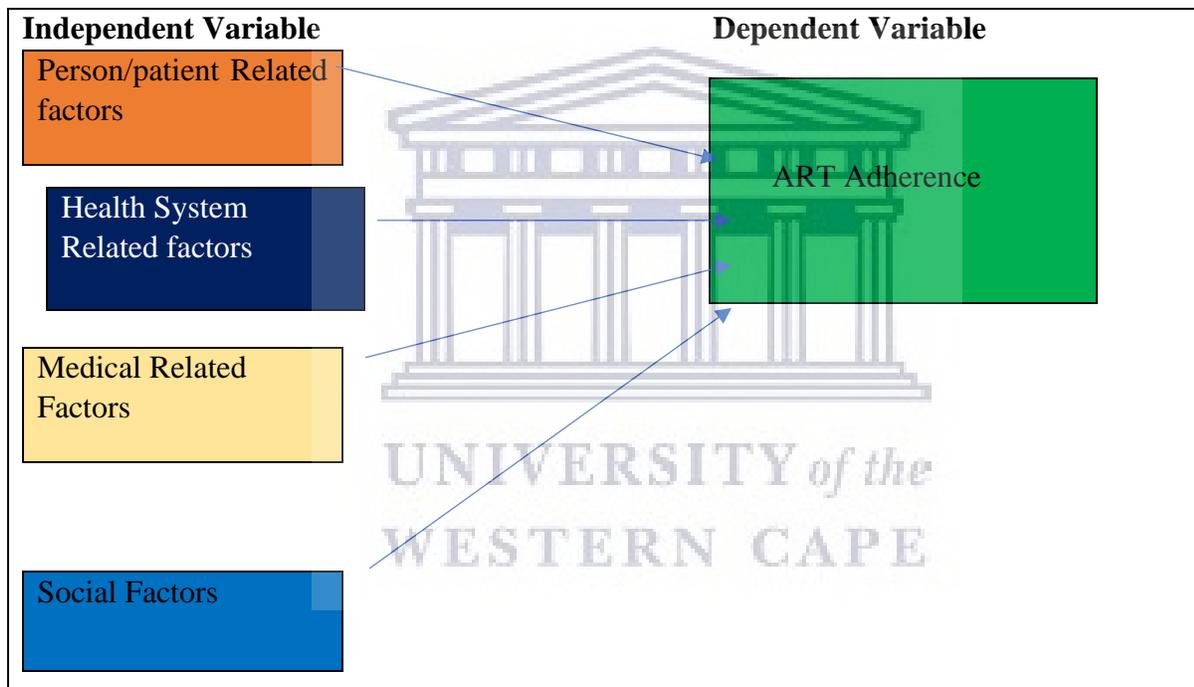


Figure 2.4: Conceptual framework of ART adherence

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

. The current chapter outlines the research methods and the criteria for use of particular methods. It also describes the research philosophy and research design used in this study. The chapter also describes the study population and sample size used in the study. The chapter further outlines data collection instruments and data collection methods used in the study. The chapter highlights validity and reliability of this study and the ethics considerations that were observed in this study.

3.2 Research Philosophy

The study is aligned with the philosophy of pragmatism. In a quantitative approach, the researchers build the knowledge on pragmatic grounds (Creswell, 2003) asserting that truth is “what works” (Howe, 1988). Pragmatism as a worldview arises out of actions, situations and consequences. As a philosophical underpinning for quantitative studies, its importance is in focusing attention upon a research problem in social science research and then using pluralistic approaches to derive knowledge about that problem.

3.3 Research strategy

Saunders *et al.* (2009:600) defined research strategy as “*the general plan of how the researcher will go about answering the research questions*”. On a similar note, Bryman (2008:698) identified research strategy as “a general orientation to the conduct of research”. Research strategy, according to Remenyi *et al.* (2003), provides the overall direction of the research including the process by which the research is conducted. This study adopted the quantitative approach.

The quantitative approach emphasises measurement, and data is analysed in a numerical form to give precise description. According to Mugenda (2008), quantitative approach, also known as the scientific method, has been considered the traditional mode of inquiry in both research and evaluation. Quantitative approach was adopted for this study because it places emphasis on

methodology, procedure and statistical measures to test hypothesis and make predictions. Moreover, following quantitative analysis, the research design in this study was explanatory in nature because the researcher sought to explain the relationship between the independent variables.

3.4 Research setting

A research setting is the specific site where the data collection actually takes place (Polit & Beck, 2003). The study was conducted at two Opportunistic Infection Clinics of two referral hospitals in Masvingo district. According to the District Health Information System (2018), there were 400 adolescents collecting antiretroviral medication across the two health facilities in 2018. The two referral hospitals have a higher enrolment of adolescents living with HIV compared to other health facilities in the district, because the two referral hospitals pioneered free antiretroviral medication delivery in the district. These hospitals also provide comprehensive HIV prevention, care and treatment services.

3.5 Study design

According to Joubert and Ehrlich (2007), a study design refers to the structured approach followed by researchers to answer a particular research question. It has been called the ‘architecture’ of the study, because the choice of the study design determines how we sample the population, collect measurements and analyse the data. This study employed the cross-sectional analytical study design. The cross-sectional analytical design was most suitable to determine the adherence patterns, socio-demographic and other factors related to adherence among HIV positive adolescents because it gathered information on what was happening past and present at one point in time. This study design enabled the researcher to measure multiple exposures. This was specifically important because this study aimed to determine the various factors associated with adherence to medication among HIV positive adolescents.

3.6 Study population and sampling

3.6.1 Study population

Research population refers to any group that is a subject of interest in a research. According to Sekaran and Bourgie (2010), research population refers to a group of individuals that have one or more characteristics in common that are of interest to the researcher. The study population of this study constituted HIV infected adolescents who were receiving antiretroviral therapy at two selected hospitals in Masvingo District and met the eligibility criteria.

Eligibility criteria

The eligibility criteria for the study were:

- HIV positive adolescents aged 10-19 years;
- on antiretroviral medication for a minimum period of 1 year; and
- collect medication at Masvingo Provincial Hospital and Morgenster Hospital.

Exclusion criteria

The study will exclude adolescents who are critically unwell, psychologically unwell (evidenced through routine mental health screening by health care workers) and not able to provide informed consent as evidenced by patient care booklets and guidance from health care providers.

3.6.2 Sample

A sample is referred to as a subset of population elements (Polit & Beck, 2012). The sample of each health facility was chosen from the sampling frame of HIV positive adolescents collecting antiretroviral medication who met the inclusion criteria. The sampling frame was developed with assistance from the health care providers. In this study, the sample was drawn from the population under study using the Raosoft sample size calculator as shown below:

$$n = N / [1 + N (e)^2]$$

where n = Sample Size,

N = Total population,

e = sampling error or precision level at 5% (95% confidence level)

Applying the formula to the study population of 400 HIV positive adolescents aged 10-19 years;

from Masvingo Provincial Hospital and Morgenster Hospital:

$$n = 400 / [1+400 (0.05)^2]$$

$$n = 400 / (2)$$

$$n = 200$$

The desired sample size for the study is therefore, 200.

3.6.3 Sampling procedure

Sampling methods are classified as either probability or non-probability. This quantitative research used quantitative probabilistic sampling methods, which were deemed more appropriate to develop a better understanding and construct meaning on complex issues relating to humans and their behaviour. Stratified random sampling is a method of sampling that involves the division of a population into smaller sub-groups known as strata (Polit & Beck 2003). Stratified random sampling was used to divide the sample into strata. The target population was divided into the 2 significant strata, in line with HIV Positive adolescents aged 10-19 years; on antiretroviral medication for a minimum period of 1 year; and collect medication at Masvingo Provincial Hospital and Morgenster Hospital. The two referral hospitals have a higher enrolment of adolescents living with HIV compared to other health facilities in the district, because the two referral hospitals pioneered free antiretroviral medication delivery in the district. Simple random sampling was then used to proportionately draw the sample from each of the given strata. Table 3.1 below shows the proportionate sample calculation from each of the identified strata.

Simple random sampling technique were employed in drawing the participants from the research population. Simple random sampling, according to Polit and Beck (2003), is the purest form of probability sampling. Each member of the population has an equal and known chance of being selected. When there are very large populations, it is often difficult or impossible to identify every member of the population, so the pool of available subjects becomes biased. Random sampling ensures that no bias is involved in the selection of the sample. Any variation between the sample characteristics and the population is only a matter of chance.

Table 3.1: Proportionate Sample Calculation

	HIV Positive adolescents aged 10-19 years	Proportion of Population (%)	Sample size
Masvingo Provincial Hospital	260	65	130
Morgenster Hospital	140	35	70
Total	400	100	200

Source: Masvingo Provincial Hospital and Morgenster Hospital, 2018

3.7 Data collection

Data sources can be primary or secondary and both are important parts of the research. Hart (2005) proposes the systematic collection of data in sufficient quality and quantity in order to conduct data analysis following identification of data sources. If a researcher does not collect and gather the appropriate data, they will not meet their research aims and objectives sufficiently to produce credible and thorough findings.

The lists of eligible candidates were compiled with assistance from data capturing clerks from the health facilities. Six data collectors were trained. Three were deployed at each health facility. The training for data collectors focused on study objectives, ethics standards such as (confidentiality, anonymity, informed consent, voluntary participation) and questionnaire sections. Health care providers provided the data collectors with rooms to interview participants in private. The list of study participants was used to identify candidates and data was collected during adolescent treatment days where they pick up their medication to ensure convenience. Nurses facilitated data collection. Data collectors first obtained consent and engaged caregivers of adolescents between the ages of 10 - 15 years as they are minors. The researcher was able to provide support to data collectors to ensure standards were met.

3.7.1 Pretesting of questionnaire

The questionnaire was first tested when the data collectors were being trained. Data was collected

through an administered questionnaire. This was done to cater for the younger adolescents (10-14 years) to ensure that they understood all the questions. Some older adolescents completed the questionnaire themselves. A translation guide was also availed to data collectors to cater for the adolescents who could not comprehend English. Pill counts were also done as adolescents bring their remaining medication during review and pick up. After questionnaires were administered, data was also extracted from the Electronic Patient Monitoring System to gather information on the clinical characteristics of the respondent.

3.8 Data collection instruments

In this study the main medium of data collection for primary data was questionnaires. A questionnaire is a formulated instrument for asking information directly from respondents concerning behaviour, demographic characteristics and level of knowledge, attitude, beliefs and feelings (Tull, 2000). Questionnaires were utilised as it corresponds with the correlation design as it allows an extensive amount of information to be collected across a large number of people in a limited amount of time.

The questionnaire was hand delivered to the participants in order to gain the highest possible response rate.. Respondents had to mark with an X on their answers which were provided according to the Likert scale.

The questionnaire was divided into three sections that are summarised as follows: Section A focused on socio demographic variables. Respondents were asked their date of birth, age, gender, orphan status, marital status, literacy status, religion and average family income.

Information required for section B was extracted from the Electronic Patient Monitoring System. This section focused on the clinical condition of the respondent. It included aspects questions on way in which HIV was acquired, date of ART initiation, clinical stage of the disease, baseline and current CD4, Viral load results, Regimen and ARV frequency. Section C focused on the level of adherence, knowledge about HIV disease and ART, social support, alcohol and drug use. (See Appendix I).

3.9 Data management and analysis

The data collected through the questionnaires and the other data collection methods mentioned above were coded and summarised into frequency distribution graphs and tabulated to enable ease of analysis (Maxwell, 2012). Statistical methods, such as regression analysis, were used to illustrate research findings (Maxwell, 2012). The questionnaires were coded and analysed using Statistical Package for Social Sciences (SPSS version 21). The level of adherence was established using a self-report method. The participants were asked to report on the number of missed ARV doses, how closely they followed their medication schedules, and dietary instructions agreed with health care providers in the past three days. The results of the level of adherence of the study participants based on three days recall to dose, schedule, and dietary instructions. The study results were presented using frequency tables from the SPSS. The study conducted both bi-variate analysis between combined adherence and socio-demographic, clinical conditions as well as knowledge about ART.

3.10 Validity and reliability

3.10.1 Reliability

Reliability refers to the ability to obtain consistent responses over a long period of time (Christensen, Johnson & Turner, 2011). Reliability is explained as random error in measurement and it indicates the accuracy of the measuring instrument (Brains *et al.*, 2011), that is, whether the instrument consistently measures whatever it aims to measure (McDaniel & Gates, 2013).

Polit and Beck (2012) describe reliability as the consistency with which an instrument measures the attribute. Reliability therefore measures whether the results are similar when the measurement is repeated on the same group. To ensure reliability, the researcher pre-tested the data collection tools before the actual research exercise. Pretesting allowed the researcher to adjust and improve the questionnaire. Data collectors were also trained on how to administer the questionnaire. This training covered aspects on ethics, child friendly language and questioning. This enabled the data

collectors to have the same interpretation of the questions and standardised procedures. The Cronbach's alpha was used to test reliability for the quantitative part of the study; where values above 0.7 are considered good (Sekaran & Bougie, 2010).

Pilot test refers to the preliminary study conducted to evaluate feasibility and statistical variability in an attempt to predict an appropriate sample size and improve upon the study design prior to performance of a full-scale investigation. The aim of the pilot study was to test the reliability of the questionnaires. According to Sekaran (2009), a pilot test is necessary for testing the reliability of data collection instruments. The pilot study was thus conducted to detect weakness in design and instrumentation and to provide accurate data for selection of a sample (Cooper & Schindler, 2008). In this study, 10% of the questionnaires were pilot tested on six adolescents that were part of the target population but not in the sample in order to get the correct feedback (Mugenda, 2008). The pilot test was done to make sure that language used for the questions was simple for clarity and that there was ease of understanding.

3.10.2 Validity

Validity is defined as “correctness and trueness of inferences made from research data” (Christensen, Johnson & Turner, 2016).

Validity of the Data Collection Instrument

According to Polit and Beck (2012), validity addresses whether there is evidence to support the inference that the methods are really measuring the abstract concepts that they purport to measure. Morgan *et al.* (2005) also state that validity is concerned with establishing evidence for the use of a particular measure or instrument in a particular setting with a particular population for a specific purpose. Validity therefore establishes whether a research instrument measures what it intends to measure. There are four types of validity namely face validity, content validity, criterion validity, and construct validity. This study utilised face validity and content validity.

Polit and Beck (2012) highlight that face validity refers to whether the instrument looks as though it is measuring the appropriate construct, especially to people who will be completing the

instrument. Face validity therefore refers to the superficial appearance of the instrument and in this study it was the questionnaire. In this study, the face value of the questionnaire was assessed by other professionals in the field of the research. These included the researcher officers at the hospitals. They evaluated whether the questionnaire was relevant to the research topic, appearance and whether it was easy to administer during pretesting.

Polit and Beck (2012) note that content validity focuses on the degree to which an instrument has an appropriate sample of items for the construct being measured and adequately covers the construct. To ensure the questionnaire covers the full content of the domain, the researcher carried out an extensive literature review on the topic.

External validity

Polit and Beck (2012) note that external validity establishes the extent to which relationships observed in a study hold true for different people, conditions, and settings. External validity focuses on whether the study findings can be generalised to the population. To ensure external validity the researcher utilised the random sampling method. All the members of the population had an equal chance of being selected. This minimised selection bias. The selection did not depend on particular characteristics and differences between the sample and the population were only due to chance alone not the researcher's preferences. The researcher also increased the sample size and encouraged a high response rate to ensure that the sample size remains bigger. Additional people were also added in the sample to cater for the non-respondents.

3.11 Ethics considerations

Adolescents living with HIV are biologically, psychologically and socially vulnerable because of their condition. It is thus imperative to abide by ethics principles when conducting research with them. Ethics clearance was obtained from UWC Biomedical Research Ethics Committee. In addition, the protocol was approved by the Head of Research at Masvingo Provincial Hospital. Permission to conduct the study was also granted by the management of the health facilities where the study was undertaken.

With regards to the study participants, the study objectives, risks associated such as upsetting negative feelings and how this will be dealt with was clearly explained prior the research. The researcher assessed the sampled participants to ascertain whether they were competent enough to understand the objectives of the study. Consent was formalised through signing an assent form. De Paula *et al.* (2015) describe an assent form as a document especially prepared for minors or for legally incapacitated persons. Double consent was also sought from the parents or guardians of the adolescents who are below 16 years. Parents and research parents were given an information sheet to assist them to fully understand the research process.

The principle of non-maleficence refers to the researcher's duty to intentionally avoid harm to research participants (Wassenaar, 2007). This was guaranteed through confidentiality and privacy, image protection, non-stigmatisation and use of adolescent friendly language. The researcher did not and shall not disclose the HIV status of adolescents to avoid harm. The principles of anonymity and confidentiality were adhered to in this study. All data was safely stored in password protected data storage devices and lockable storage controlled by the primary researcher. Paper records were shredded and recycled, instead of being carelessly tossed in the garbage. Records stored on a computer hard drive will also be erased using commercial software applications designed to remove all data from the storage device. Data will be destroyed 6 months after the study.

Adolescents with adherence problems identified through the research were linked to Community Adolescent Treatment Supporters for peer to peer counselling and referred for Enhanced Adherence Counselling sessions for further management.

3.12 Chapter summary

This chapter focused on the methodology used by the researcher. Aspects such as study design, sampling, data collection procedure, data analysis, validity and reliability, and ethical considerations were discussed. The next chapter will focus on data presentation and discussion of research findings.

CHAPTER FOUR: RESULTS

4.1 Introduction

This chapter presents the research findings of the study. The responses from the questionnaires and Electronic Patient Monitoring System were analysed and interpreted in relation to the research objectives, and the results are presented in the form of tables and narrations.

4.2 Realisation of sample

A total of 200 questionnaires were distributed to HIV infected adolescents who were registered for antiretroviral therapy (ART) at two selected hospitals in Masvingo District. Out of the 200 questionnaires, 170 were received of which 136 were valid; giving a 68% response rate. The invalid questionnaire had incomplete responses. The reasons for non-response were that some adolescents had no time or interest in participating in the study. The response rate was in line with Fowler's (2013) submission that a 60% response rate is generally considered sufficient to be representative of the study population.

Most respondents (n=90) were from Masvingo Provincial Hospital; and 46 from Morgenster Hospital. Table 4.1 below shows the response rate by site for those eligible adolescents who were recruited to the study, received questionnaires and returned valid responses.

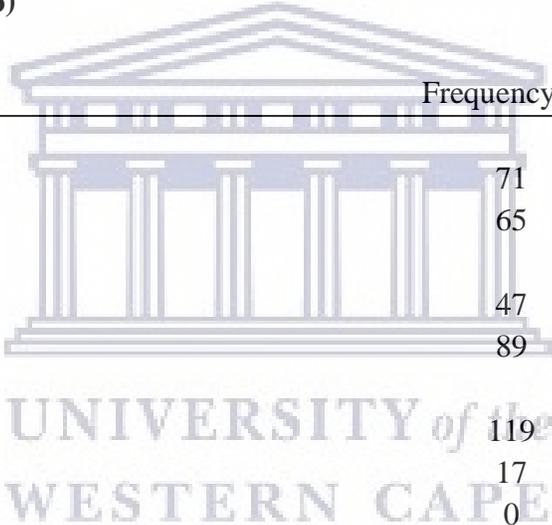
Table 4.1: Response rate of adolescents on HIV treatment in Masvingo District in 2019

	Sent	Received	Valid	Response rate (%)
Masvingo Provincial Hospital	130	115	90	69.2
Morgenster Hospital	70	55	46	65.7
Total	200	170	136	68

4.3 Socio-demographic characteristics of adolescents on HIV treatment

Table 4.2 below shows that slightly more than half of the participants were males (52.2%), and mostly in the 15-19 years range (65.4%), and single (87.5%). Most study participants (52.9%; n=72) reported an average family income of below Z\$500 which is too low to lead a reasonably decent life in Zimbabwe given that the poverty datum line is Z\$1800 (ZimStats, 2019). Slightly less than half (47.1%; n=64) had an elementary level of education (Grades 1-7), and 23.5% (n=32) had a secondary level of education (Form 1-6). A small proportion of study participants (5.9%; n=8) were illiterate, while 23.5% (n=32) were able to read and write only.

Table 4.2: Socio-demographic characteristics of adolescents enrolled for HIV treatment in Masvingo District (N = 136)



	Frequency (n)	Percentage (%)
Sex		
Male	71	52.2
Female	65	47.8
Age (in years)		
10-14	47	34.6
15-19	89	65.4
Marital Status		
Never Married	119	87.5
Married	17	12.5
Divorced	0	0
Average Household Income		
below Z\$500	72	52.9
above Z\$500	64	47.1
Literacy Levels		
Illiterate	8	5.9
Can read and write	32	23.5
Grade 1-7	64	47.1
Form 1-6	32	23.5

4.4 Clinical characteristics of adolescents on antiretroviral therapy

Just under half of the study participants (45.6%; n=62) acquired HIV vertically; and 25% (n=34) acquired HIV horizontally (Table 4.3). Most adolescent participants had been diagnosed with HIV more than one year ago; with 36.8% (n=50) between 1 to 5 years ago, and 37.5% (n=51) more than 6 years ago. The mean of duration of time since HIV diagnosis was 2.12 years, the standard deviation is 0.79. At the time of the study, the majority of study participants (72%; n= 99) had been on ART for more than two years; with 6.6% (n=9) for less than 6 months; 12.5% (n=17) between 7-12 months; and 8.1% (n=11) for 1-2 years.

Table 4.3 depicts that 45.6% of participants did not have WHO staging recorded on their medical records. For those who had WHO staging recorded, 12.5% (n=17) were on WHO stage 1; 25% (n=34) on WHO stage 2; 12.5% (n=17) on WHO stage 3; and 4.4% (n=6) on WHO stage 4.

Half (n=68; 50%) of the study participants had a low level of immunology (CD4 count below 350 cells/microlitre) at the time they commenced ART; with 12.5% (n=17) having CD4 count greater than 350 cells/microlitre. CD4 count at initiation was not recorded for 37.5% (n=51) of participants. The majority of the participants (62.5%; n=85) had a latest CD4 count of 200 cells/microlitre or above. However, most of the study participants (64.7%; N=88) were not virally suppressed (viral load above 1000 copies/ml).

Most of the study participants (59.6%; n=81) reported to have not fallen ill in the past one month. Out of the 55 who indicated that they were sick during the past month, 11(20%) indicated that the illness was severe.

The majority of the study participants either took two pills per day (53.7% n=73) or three pills per day (30.9%; n=42). Table 4.3 shows that more than half (55.9%; n=76) of participants reported no missed doses of prescribed ARV pills in the previous three days. With respect to schedule adherence, the majority (62.5%) reported to have closely followed their medication regimen schedule in the previous three days. Out of the 119 participants who received special instructions related to dietary requirements from clinicians, the majority (64.7%: n=77) reported to have

followed the instructions all of the time in the past three days. In this study the overall level of *optimal* combined adherence (dose adherence, schedule adherence, and dietary instruction adherence) to antiretroviral therapy in the previous three days was 61% (n=83). As depicted in the Table 4.3 below, 85 (62.5%) and 68 (50%) study participants had not missed any of their ARV medications in the past 7 days or past month, respectively.

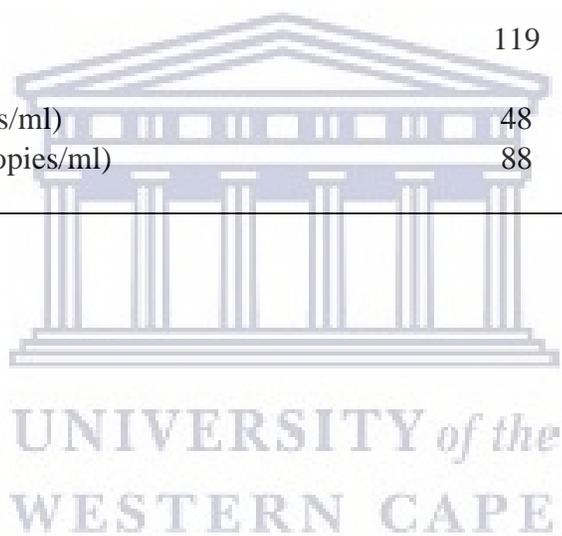
Table 4.3 shows that 87.5% (n=119) of participants had ARV regimen changes. The most common reasons mentioned by the study participants (n=68) for missing their HIV medications in the previous month were: being away from home 50% (n=34); forgetfulness (25%; n=17); and having too many pills (25%; n=17).



Table 4.3 Clinical characteristics of adolescents enrolled for ART in Masvingo District, 2019 (N = 136)

	Frequency (n)	Percentage (%)
Mode of HIV acquisition		
Vertical	62	45.6
Horizontal	34	25.0
Unknown	40	29.4
Duration since diagnosis of HIV (in years)		
<1	35	25.7
1 to 5	50	36.8
6 +	51	37.5
WHO Stage at ART initiation		
stage 1	17	12.5
stage 2	34	25.0
stage 3	17	12.5
stage 4	6	4.4
Unknown	62	45.6
Baseline CD4 Count (in cells/microliter)		
<200	17	12.5
200-350	51	37.5
>350	17	12.5
Unknown	51	37.5
Duration on antiretroviral therapy		
3-6 months	6	6.6
7-12 months	17	12.5
1-2 years	11	8.1
> 2 years	99	72.8
Latest CD4 count (in cells/microliter)		
200-350	34	25.0
>350	51	37.5
Unknown	51	37.5
Sickness in the past month		
Yes	55	40.4
Seriousness of illness in the past month		
Mild	16	29.0
Moderate	28	50.9
Severe	11	20.0

	Frequency (n)	Percentage (%)
Optimal Adherence in the previous 3 days		
Dose Adherence	76	55.9
Schedule adherence	85	62.5
Dietary adherence	77	64.7
Combined	83	61.0
Missed doses of ARV medication in previous 7 days		
Yes	88	62.5
Missed doses of ARV medication in the previous month		
Yes	68	50.0
Reasons for missing ARV medication in the previous month		
Being away from house	34	50.0
Simply forgot	17	25.0
Having too many pills to take	17	25.0
Change in ARV regimen		
Yes	119	87.5
Latest viral load		
Supressed (<1000 copies/ml)	48	35.3
Unsuppressed (>1000 copies/ml)	88	64.7



4.5 Factors associated with adherence

Table 4.4 below depicts results from bivariate analysis of combined adherence by socio-demographic and clinical characteristics. Duration of time since HIV diagnosis was significantly associated with combined adherence to ART in the previous three days ($p=0.00$). Other factors such as sex ($p=0.199$), age ($p=0.11$), marital status ($p= 0.297$), average household income ($p= 0.155$), literacy levels ($p =0.19$), mode of HIV acquisition ($p= 0.464$), clinical stage at ART initiation ($p= 0.32$), baseline CD4 count at ART initiation ($p=0.719$), latest CD4 count after at least 6 months on treatment ($p= 0.717$), latest viral load ($p= 0.63$), sickness in the past month ($p= 0.611$), and severity of illness ($p=0.455$) were not significantly associated with combined adherence to ART in the previous three days.



Table 4.4: Combined adherence by socio-demographic and clinical characteristics of adolescents on ART in Masvingo District, 2019 (N = 136)

		Optimal Adherence n (%)	Sub optimal adherence n (%)	p-value
Sex	Male	47 (56.6)	24 (45.3)	0.199
	Female	36 (43.4)	29 (54.7)	
Age (in years)	10-14	23 (27.7)	24 (45)	0.112
	15-19	60 (72.3)	29 (55)	
Marital status	Never married	72 (86.7)	47 (88.7)	0.297
	Married	11 (13.3)	6 (11.3)	
	Divorced	0	0	
Average Household Income	Below Z\$500	48 (57.8)	24 (45.2)	0.155
	Above \$500	35 (42.2)	29 (54.7)	
Literacy Levels	Illiterate	6 (7.22)	2 (3.8)	0.19
	Can read, write	20 (24.1)	12 (22.6)	
	Grade 1-7	41 (49.4)	23 (43.4)	
	Form 1-6	16 (19.3)	16 (30.2)	
Mode of HIV acquisition	Vertical	41 (49)	21 (40)	0.464
	Horizontal	18 (22)	16 (30)	
	Unknown	24 (29)	16 (30)	
Clinical stage of the patient at the time of ART initiation	Stage 1	11 (13)	6 (11)	0.32
	Stage 2	22 (27)	12 (23)	
	Stage 3	11 (13)	6 (11)	
	Stage 4	5 (6)	1 (2)	
	Unknown	34 (41)	28 (53)	
Baseline CD4 count (in cells/microliter)	<200	11 (13)	6 (11)	0.719
	200-350	33 (40)	18 (34)	
	>350	7 (8)	10 (19)	
	Unknown	32 (39)	19 (36)	
Latest CD4 count (in cells/microliter)	200-350	22 (27)	12 (23)	0.717
	>350	27 (33)	24 (45)	
	Unknown	34 (41)	17 (32)	
Time since HIV diagnosis	Less than 1 year	33 (40)	2 (4)	0.000**
	2 to 5 years	25 (30)	25 (47)	
	6 years or more	25 (30)	26 (49)	
Duration on antiretroviral treatment	3-6 months	8 (10)	1 (2)	0.062
	7-12 months	11 (13)	6 (11)	
	1-2 years	8 (10)	3 (6)	

	More than 2 years	56 (67)	43 (81)	
Latest viral load result (in copies/ml)	<1000	53 (64)	36 (68)	0.63
	>1000	30 (36)	17 (32)	
Sickness in the past one month	Yes	35 (42)	20 (38)	0.611
	No	48 (58)	33 (62)	
Severity of your illness	Mild	11 (13)	5 (9)	0.455
	Moderate	17 (20)	11 (21)	
	Severe	6 (7)	5 (9)	



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4.6. Knowledge about HIV and antiretroviral therapy

Table 4.5 below depicts the respondents' knowledge about HIV and antiretroviral therapy. The majority of study participants (75%; n=102) were knowledgeable about '*how HIV medications are supposed to be taken*', '*what to do if they miss HIV medication*', the health effects of '*skipping a few of your HIV medications from time to time*', and the '*possible side effects of each of your HIV medications*'.

Less than two-thirds of the respondents (62.5%; n=85) had good knowledge on the importance of adherence to HIV medication, as indicated by their disagreement with the statement "*as long as you are feeling healthy, missing your HIV medications from time to time was ok*", and agreement about "*how HIV medications work to fight HIV*" and "*if one does not take HIV medications as prescribed, the medications may not work for him in the future.*"

Half of the respondents (50%; n=85) believed that antiretroviral medication eradicates HIV from the body, and had no knowledge on the *interaction of HIV medications with substances such as alcohol, mbanje or bronco.*

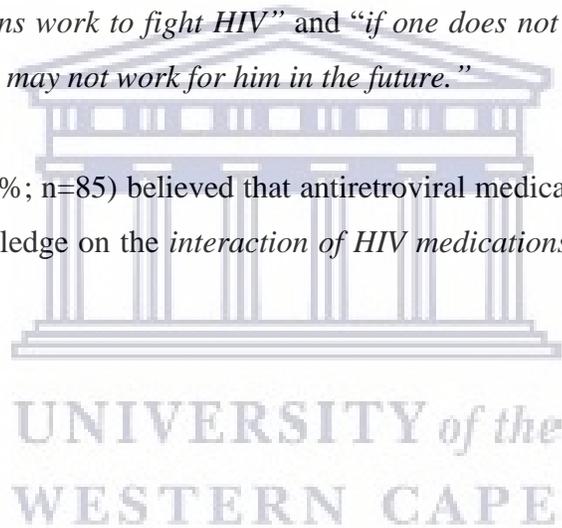


Table 4.5: Knowledge about HIV and treatment among adolescents on ART in Masvingo District, 2019 (N = 136)

Items	Knowledgeable	
	Yes n (%)	No n (%)
1. How HIV medications are supposed to be taken	102 (75)	34 (25)
2. What to do if you miss HIV medication	102 (75)	34 (25)
3. Skipping a few of your HIV medications from time to time would not really hurt your health	102 (75)	34 (25)
4. Knowledge on possible side effects of each of your HIV medications	102 (75)	34 (25)
5. As long as you are feeling healthy, missing your HIV medications from time to time is OK	85 (62.5)	51 (37.5)
6. Understanding of how HIV medications work to fight HIV	85 (62.5)	51 (37.5)
7. If you don't take your HIV medications as prescribed, these medications may not work for you in the future	85 (62.5)	51 (37.5)
8. Antiretroviral medications eradicate HIV from your body	68 (50)	68 (50)
9. Believe that if you take your HIV medications as prescribed, you will live longer.	102 (75)	34 (25)
10. How HIV medications interact with substances such as alcohol, mbanje or bronco	68 (50)	68 (50)

4.7 Social support

As indicated in Table 4.6, most respondents (75%; n=102) did not disclose their HIV status to their friends and/or family members. Those who disclosed their status (25%; n=34) were supported by their family/friends, in taking their HIV medications. Out of the 34 who had disclosed their status, 58.8% (n=20) were satisfied with the overall support from their friends and/or relatives while 41.2% (n=14) were dissatisfied. Most respondents (79.4%; n=108) claimed that they used reminders to help them to take their ARV medications properly.

Table 4.6: Social support among adolescents on ART in Masvingo District, 2019 (N = 136)

	Yes n (%)	No n (%)
Disclosed HIV status to friends and/or family members	34 (25)	102 (75)
Received Friend/Family support in taking medication	34 (25)	102 (75)
Satisfied with friend/family support	20 (58.8%)	14 (41.2%)
Use of a reminder in taking medication	108 (79.4)	28 (20.6)

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Table 4.7 below depicts results from bivariate analysis of combined adherence by social support among adolescents on ART in Masvingo district. *Satisfied with friend/family support* ($p=0.067$), *Friend/Family support in taking medication* ($p=0.143$) and *Use of a reminder in taking medication* ($p=0.627$) were not significantly associated with combined adherence among adolescents on ART in Masvingo district.

Table 4.7 Combined adherence by social support among adolescents on ART in Masvingo District, 2019 (N = 136)

	Yes	No	<i>p</i> value
	n (%)	n (%)	
Friend/Family support in taking medication	34 (25)	102 (75)	0.143
Satisfied with friend/family support	20 (58.8)	14 (41.2)	0.067
Use of a reminder in taking medication	108 (79.4)	28 (20.6)	0.627

4.8 Conclusion

This chapter presented and described the results of the study in tables and graphs. The following section, Chapter 5, discusses the research findings.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This chapter discusses the factors associated with adherence to doses and dietary instructions, knowledge about HIV and antiretroviral therapy as well as social support among adolescents on ART in Masvingo district. The analysis assisted in determining factors associated with adherence to antiretroviral therapy (ART) among HIV positive adolescents in Masvingo District, Zimbabwe as well as determining socio-demographic and clinical risk and protective factors of adherence to ART among adolescents.

5.2 Adherence among adolescents

In this study, 55% of participants reported no missed doses of prescribed medication over the previous three days. With respect to schedule adherence, 66.5% reported to have closely followed their medication regimen and 64.7% reported to have followed dietary instructions from clinicians and the overall level of *optimal* combined adherence (dose adherence, schedule adherence, and dietary instruction adherence) to antiretroviral therapy in the previous three days was 61% (n=83). The combined adherence of the respondents in this study is below the optimum recommended adherence of 90%. UNAIDS global targets stipulates that 90% of those diagnosed with HIV should be on sustained antiretroviral therapy (ART) with 90% viral suppression in those on ART. Machtinger and Bangsberg (2006) reports that an adherence level of 95% -100% to ART is necessary to achieve full and sustained viral suppression. Gifford *et al.* (2000) noted that patients who reported 95-99% adherence at 6 months had an increase in CD4 count from baseline of 200 cells/mm³. The study findings were similar to the studies conducted by Attia (2009), Alisuna-Alamo (2012) and Chandwani (2012) that found adherence among adolescents to range between 60 and 80%. HIV-infected adolescents and young adults consistently have higher rates of poor adherence and this has remained a focus of health professionals in Sub-Saharan Africa.

5.3 Factors associated with adherence

The study found that combined adherence to ART in the previous three days among adolescents

in Masvingo district was only significantly associated with duration of time since diagnosis of HIV. Poor adherence was highest among the respondents who had been on ART for more than six years. This result was supported by studies conducted by Silva *et al.* (2009) who found that the longer time that elapsed since HIV diagnosis, the greater the risk of non-adherence. This may be due to treatment fatigue. In a study conducted by Maskew *et al.* (2016) in South Africa, adolescents who reported becoming tired of taking the medication were more likely to miss a clinic visit and not adhere to treatment. Amberbir *et al.* (2018) also highlighted that the requirement of taking medicines every day is boring and exhausting for adolescents. This was however, contrary to studies by Lal *et al.* (2010) and Sarna *et al.* (2008), which indicated that the length of time since the diagnosis of HIV infection was not associated with adherence to ART among adolescents. Gari *et al.* (2013) also note that taking ART for more than two years was positively associated with adherence in high income countries such as USA. The differences can be due to the difference in societal factors, where high income countries like the USA have better health systems and interventions tailored for adolescents who are infected with HIV.

In this study, there was no statistically significant association between average household income and combined adherence to ART in the previous three days. This was in line with the study conducted by Cauldbeck *et al.* (2009) which showed that individual or family income was not associated with adherence. Similarly, another study by Sarna *et al.* (2008) showed that adherence was not associated with economic status. The results are however contrary to the findings by Tiyou *et al.* (2010) who found that in South West Ethiopia the average family income was significantly associated with adherence to ART as poverty has a significant impact on health outcomes. Bernays *et al.* (2014) note that adherence to treatment is complicated in the context of poverty as adolescents might have limited access to food. Most of the families are not able to provide enough food to adolescents living with HIV due to poverty. In a study conducted by Nabukera-Burungi *et al.* (2015) in Uganda, adolescents reported that they experience abdominal pain whenever they take the medicine on an empty stomach therefore are reluctant to take the medication. While household economic status did not directly affect adherence to ART of adolescents in this study, poverty remains a factor in the adherence to medication as families of adolescents may be lacking food and transport money to collect medication. This therefore requires innovation in how services

for adolescents are delivered.

With regards to literacy levels, the study showed no statistically significant association between the literacy level of respondents and their level of adherence to ART amongst adolescents in Masvingo district. This finding was in agreement with Birbeck *et al.* (2009) and Cauldbeck *et al.* (2009) which reported that the literacy status of HIV infected persons was not associated to adherence to medication. However, in Tanzania, Watt *et al.* (2010) found that patients with lower levels of education tended to have poor adherence compared to patients who were educated. Kalichman *et al.* (1998) also reported that education and health literacy were independently associated with adherence, even after adjusting for income, distress and support. It is important to note that education and health literacy are not the same as peer-led interventions have been implemented to improve health literacy of adolescents on ART in countries such as Zimbabwe and South Africa.

Sex was found not to be significantly associated with adherence to ART among adolescents in Masvingo district. The findings are consistent with findings from Birbeck *et al.* (2009) and Sarna *et al.* (2008) which revealed the lack of association between gender of participants and adherence to ART in high income countries. Other studies however revealed that females tended to be less adherent than males (Beer *et al.*, 2012; Fumaz *et al.*, 2008). This may be because females assume additional roles in society and this also reflects gender disparities in low income countries such as Zimbabwe.

WHO clinical stage at ART initiation in this study was found not to have a statistically significant association with adherence to ART among adolescents in Masvingo district. This was in line with a study conducted in Zambia by Chi *et al.* (2009) which emphasized that WHO clinical stage was not predictive of non-adherence. On the contrary, a study conducted in Ethiopia by Tiyou *et al.* (2010) revealed that WHO clinical stage was an independent predictor of adherence as patients who are at the asymptomatic clinical stage are more likely to have poor adherence. This was corroborated by Campos *et al.* (2010) who revealed similar findings. While the CD4 count is an indicator of immune status and treatment efficacy, viral load is arguably the more important

measure when antiretroviral therapy begins and over time in line with WHO ART guidelines of 2016.

The study found that baseline CD4 count at ART initiation was not significantly associated with ART adherence. This was in agreement with other studies (Fumaz et al, 2008; Erah & Arute, 2008), which revealed the absence of statistical difference between adherence of patients and their CD4 count. However, there were other contradictory findings by authors such as Beer *et al.* (2012) which demonstrated a significant association between CD4 count of patients and adherence to ART as patients who are symptomatic are likely to adhere to treatment in order to be get better. CD4 count is an indicator of a person's immunity and it also largely depends on the patient on whether they have the self-agency to treatment and get better.

In this study, adherence to antiretroviral therapy was not found to be significantly associated with the latest CD4 count. This was in agreement with Fumaz *et al.* (2008), who showed no difference in CD4 count of patients with adherence. However, a study by Venkatesh *et al.* (2010) indicated that participants with current CD4 count greater than or equal to 350 cells/mm³ were over two times more likely to be non-adherent compared to participants with lower CD4 cell counts. Adolescents who are clinically well may be at risk of non-adhering to medication and require continuous support to maintain positive health outcomes. Nabukera-Burungi (2015) further notes that some adolescents start ART when they are weak and at that point they have good adherence. As they improve, their commitment to taking the medication reduces. As recommended by WHO ART guidelines (2016) viral load measurement is a arguably the most important measurement of ART adherence than latest CD4 count as in this study, latest CD4 count was not associated with adherence.

The current study found that there was no statistically significant association between adherence to ART and illness in the past one month. This was however, contrary to a study by Markos *et al.* (2008), which documented that presence of symptoms in the past month was associated with non-adherence. Adherence to ART helps in preventing HIV related morbidity. WHO (2018) highlights that there is a strong correlation between adherence and clinical outcomes of patients with HIV as

shown by laboratory markers such as CD4 count. Gifford *et al.* (2000) revealed that patients who reported 95-99% adherence at 6 months had an increase in CD4 count from baseline of 200 cells/mm³. Higher levels of adherence therefore reduce the chances of virological failure, drug resistance, increase the likelihood of clinical success and positive health outcomes. Despite the results indicating that there was no statistically significant association between ART adherence and illness among adolescents, it is challenging to find relevance to this result as several studies have evidenced that ART helps in viral load suppression and reduces HIV related morbidities.

The study did not find a significant relationship between adherence to ART and viral load suppression. This is contrary to the WHO guidelines (2016) which indicates that viral load suppression is a marker of good adherence. Several studies in resource-constrained settings found a strong association between viral load suppression and complete adherence to ART medication amongst children and adolescents (Nabukeera-Barungi *et al.*, 2015; Maskew *et al.*, 2016; MOHCC 2016 and SMILE study 2015). An unsuppressed viral load may occur despite good adherence as patients may be infected with a resistant strain of HIV and ART may be interacting with other medication taken concurrently for other ailments (WHO, 2016). Despite this limitation, this study result is not relevant as viral load suppression is the preferred option for monitoring adherence to ART.

The study found no statistically significant relationship between severity of illness and adherence to ART. This confirms findings by Markos *et al.* (2008) who found no significant relationship between severity of illness and adherence to ART. This may be related to the fact that most participants had been taking ART for more than 2 years, which may have improved their immunity and clinical conditions.

5.3 Knowledge about HIV and antiretroviral therapy

Overall, the study found a statistically insignificant association between having adequate knowledge about ART and combined adherence to ART. This is in contrast to several studies by Markos *et al.* (2008) who documented that knowledge about ART was associated with adherence in Southern Ethiopia. Kalichman *et al.* (1998) also reported that education and health literacy were independently associated with adherence, even after adjusting for income, distress and support. Rueda *et al.* (2006) demonstrated that interventions seeking to improve the practical skills on how to take the ARTs, such as a HCW teaching the patients, were shown to improve adherence. This demonstrates the importance of knowledge about the ARVs in improved adherence to ART among adolescents and underlines the importance of health education tools in patient care.

5.4 Social support

The study found that most respondents (75%; n=102) did not disclose their HIV status to their friends and/or family members. This is in line with the findings by Wasti *et al.* (2012) who indicated that patients may not want to disclose their HIV status due to fear of social stigma. Fear of social stigma was also found to be associated with non-adherence by Achappa *et al.* (2013). Bernays *et al.* (2014) note that late and suboptimal disclosure of HIV status to adolescents leads them to deal with their condition in secrecy and results in poor or non-adherence to medication.

In contrast to the current study findings, other studies by Nabukeera-Barungi *et al.* (2007) and Bikaako-Kajura *et al.* (2006) revealed that good adherence to an antiretroviral regimen was associated with an adolescents' knowledge of their HIV status, valuable social support, and having a strong relationship with parents. Hodgson *et al.* (2014) report that disclosure results in positive outcomes such as improved retention and adherence. The above studies have therefore demonstrated that disclosure of HIV status is strongly associated with retention in care and adherence to medication.

The bivariate analysis in this study showed that there was no statistically significant association between ART adherence and social support. This finding is in contrast with Markos *et al.* (2008)

who reported that satisfaction with social support was associated with adherence to ART. Maskew *et al.* (2016) report that adolescents living with their mother as their primary caregiver were more likely to attend all clinic visits and adhere to treatment than those residing with secondary caregivers.

5.5 Limitations of the study

The research findings should be interpreted taking the following limitations into consideration. This study was conducted in only two health facilities in Masvingo District. This means the study findings cannot be generalised to other parts of the country. Thus, larger representative health facilities across the country should be involved to get a general picture of adherence prevalence in the country. The adherence of patients in this study was assessed with a self-report method. Since there is no gold standard adherence measurement, self-report has been a valid measure of adherence. However, self-report measure has widely been known for its subjectivity and for overestimating adherence of patients. Besides, self-report measure of adherence has been subjected to recall bias and social desirability bias. The study was also based on a small sample size. The sample size was constrained by the criteria outline and the selection of eligible respondents. Findings from a smaller sample size cannot be generalised to the rest of the population.

The study findings also contradict known factors that affect adherence to ART among adolescents such as knowledge of HIV condition, treatment literacy and social support. The WHO (2016) in the Zimbabwe National ART guidelines explains the importance of differentiated models of care for adolescents. The national guidelines highlight the importance of social support and treatment literacy and have to be included in service delivery for adolescents living with HIV.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary and interpretation of the research findings on the level of adherence and determinant factors affecting adherence to antiretroviral therapy in HIV infected adolescent patients in Masvingo Province. It also points out the contribution and limitations of the study. Finally, recommendations based on the research findings and the conclusions of the study are proposed.

6.2. Adherence to antiretroviral therapy among adolescents in Masvingo province

The first objective of this study was to describe the levels of adherence to ART among adolescents in Masvingo district. It is noteworthy that the ultimate goal of ART is to have a significant reduction in the viral load of HIV and restoration of the immune function of the body, which later results in an improved quality of life (Beer *et al.* 2012). According to Machtiger and Bangsberg (2006), adherence to treatment is a crucial and alterable factor that may determine whether patients get maximal clinical benefit from antiretroviral therapy. In this study the level of adherence to a dose of 95% and more, schedule, and instruction to dietary requirements in the past three days were found to be 55.1%; 62.5%, and 64.7%, respectively. The overall combined level of adherence to all indicators resulted in 61%. This level of adherence is lower than the findings by Tiyou *et al.* (2010) who established adherence of 72.4% in Ethiopia.

The reasons for failing to adhere to the ART program by the adolescents were identified as being away from home, forgetfulness, as well as having too many pills to take. The existence of suboptimal adherence is not good news to the authorities who have been fighting to eradicate new infections as well as suppress the viral load. It must be noted that poor adherence to HIV medications in itself leads to the emergence of drug resistance and subsequent treatment failure which works against efforts being made worldwide to reduce the spread of HIV amongst the population. Therefore, the patients who fail to adhere to the prescribed ART could be at a higher risk of developing drug resistance and treatment failure, which heralds the need to have a strategy

that helps to address the foreseeable problems of the high risk patients towards better treatment follow-up and adherence.

6.3. Risk and protective factors of adherence to ART among adolescents

The second objective of the study was to determine socio-demographic and clinical risk and protective factors of adherence to ART among adolescents in Masvingo district. Although literature suggests that adherence to antiretroviral treatment is influenced by multiple factors associated with the patient, disease characteristics, patient-provider relationship, and drug-related and clinical settings, this study established that amongst the socio-demographic variables, only *duration of time since HIV diagnosis* was found to be related to adherence among adolescents in the current study, while other factors were not related to combined adherence. The results suggest a positive relationship between adherence amongst the adolescence and duration of time since HIV diagnosis of the respondents. This meant that the level of adherence to ART improves as the duration of time with HIV diagnosis increases.

The following factors were found not to be associated with combined adherence to ART in the previous three days in the Masvingo district: sex, age, marital status, average household income, literacy levels, mode of HIV acquisition, clinical stage at ART initiation, baseline CD4 count at ART initiation, latest CD4 count after at least 6 months on treatment, latest viral load, sickness in the past month, and severity of illness. However, the lack of statistical significance could be related to the small sample size.

The study established that knowledge and information about how to take HIV medication from health care providers at the time of ART initiation and during follow-up visits was important for combined adherence amongst adolescents in Masvingo district. This is important for the participants to optimally adhere to their medications as prescribed. However, the study also established that some of the respondents did not know the side effects of each of their ARV medications. This indicates that the majority of the study participants require appropriate counselling regarding possible adverse events related to HIV medications, from health care providers while visiting the clinics.

The study further established that there was little or no disclosure amongst the adolescents in Masvingo province, a situation which contributed to the suboptimal adherence of 39% which is risky amongst the HIV patients as it could lead to drug resistance in future. The study established that while the majority of the respondents did not disclose their status to either friends or relatives, amongst those who did so, a significant proportion seem to be satisfied with the support of their close friends and relatives. This failure to disclose is possibly the result of fear of stigmatisation in the community. Disclosure of HIV status amongst the adolescents could be related to adherence of some patients to take their ART medication. Thus, health care providers have to pay closer attention to helping patients disclose their HIV status and getting their friends and/or relatives to collaborate with them as part of the team in clinical care of the patients.

6.4 Conclusions

The level of suboptimal adherence amongst the adolescents is high at around 39% and supports the existing evidence that patients in resource-constrained settings are still facing challenges in adhering to ART. The existence of suboptimal adherence is not good news to the authorities who have been fighting to eradicate new infections as well as suppress the viral load among adolescents living with HIV.

The duration of time since diagnosis of HIV infection influences adherence to the ART. Knowledge and information about how to take HIV medication from health care providers at the time of ART initiation and during follow-up visits was important for combined adherence amongst adolescents. Most adolescents did not disclose their status to friends or family as a result of the possibility of stigma which still exists in Zimbabwe and this affected the adolescents' level of adherence to the ART and lack of knowledge about the side effects of each of the ARV medications affected the adolescents' level of adherence.

6.5 Recommendations

Based on the findings of the study, the following recommendations are made:

- Government should ensure that there are proper counselling services amongst the adolescents so as to assist in ensuring that most adolescents adhere to their ART
- There is need for awareness campaigns by the Government to eradicate stigma amongst the communities. Information should be distributed to all people about the importance of ART, side effects of missing ART, as well as consequences of taking other toxic substances whilst one is on ART. This will create a conducive environment for disclosure.
- Peer education and adherence support group programmes should be further encouraged to help patients learn from one another about their life experiences, about breaking barriers of taking medications, and about dealing with common problems for treatment follow-up and adherence. Thus, adequate support from different levels of the health system would be required; and
- Patients should be encouraged to disclose their HIV status at least to someone very close to them who would provide support not only in taking medication but also in other psychosocial needs of adolescents living with HIV.

6.6 Contributions of the study

This study has documented valuable findings about the prevalence of adherence among HIV infected adolescent patients, and factors that affect adherence of patients to antiretroviral treatment in Masvingo District, Zimbabwe. This study explored factors that may influence adherence behaviour of adolescents on antiretroviral therapy in resource-limited setting. This is of importance in the design and development of targeted interventions to improve adherence of adolescents to achieve better clinical outcomes. It also pointed out important areas on which health care providers need to focus in their routine clinical practice to identify patients that are at risk of non-adherence early and provide them with appropriate counselling and educational support. It also provides some important information to policy makers, facility managers, and other partners in the development of ART and adherence related policies and strategies. Finally, it may also lay out a platform for other individuals who will be interested to work on various scientific endeavours in the field of HIV/AIDS treatment and adherence in the future.

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APPENDICES

1.2 Appendix I: Questionnaire

We would like to appreciate your willingness to participate in the study. The purpose of the study will be to explore the level of adherence to antiretroviral therapy and its determinant factors among HIV infected adolescents. You are kindly requested to provide genuine responses to the questions listed below. We need you to understand that all your responses are valuable and will be kept confidential. We need to have your patience as it will just take you about 20-30 minutes to respond to the questionnaire. Please do not hesitate to ask any question that may not be unclear.

The questionnaire is divided into three sections. Section A captures your socio-demographic information. Section B will be obtained from your patient care booklet. The participant will fill in/ or be interviewed in Section C.

Section A

Socio-Demographic Details

1.1	Date of Birth	
1.2	Age	
1.3	Sex	1= Male <input type="radio"/> 2= Female <input type="radio"/>
1.4	Orphan Status	1 = Maternal <input type="radio"/> 2 = Paternal <input type="radio"/> 3 = Double <input type="radio"/> 4= None <input type="radio"/>
1.5	Marital status: (This applies to teen mothers)	1 = Never Married <input type="radio"/> 2 = Married <input type="radio"/> 3= Divorced <input type="radio"/> 4= Separated <input type="radio"/>
1.6	Literacy status	1= illiterate <input type="radio"/> 2= literate <input type="radio"/> 3= grade 1 -7 <input type="radio"/> 4= form 1-6 <input type="radio"/> 5=Tertiary <input type="radio"/>
1.7	Religion:	1= Muslim <input type="radio"/>

		2= traditional Christian Church <input type="radio"/>
		3= Apostolic <input type="radio"/>
		4= Pentecostal <input type="radio"/>
1.8	Average Family Income	1= below \$500 <input type="radio"/>
		2= above \$500 <input type="radio"/>

Section B (This section will be extracted from the patient's records)

2. Information regarding the clinical condition of the patient

2.1	Way in which HIV was acquired	1= Vertical <input type="radio"/>
		2= Horizontal <input type="radio"/>
		3= Unknown <input type="radio"/>
2.2	How long has it been since you were diagnosed with HIV infection?	
2.3	What was the clinical stage of the patient at the time of ART initiation?	1= Stage 1 <input type="radio"/>
		2= Stage 2 <input type="radio"/>
		3= Stage 3 <input type="radio"/>
		4= Stage 4 <input type="radio"/>
		5= Unknown <input type="radio"/>
2.4	What was the baseline CD4 count at the time of ART initiation?	1 = <200 c/mm ³ <input type="radio"/>
		2= 200 – 350c/mm ³ <input type="radio"/>
		3= >350c/mm ³ <input type="radio"/>
		4= Unknown <input type="radio"/>
2.5	2.4. What is the latest CD4 count after at least 6 months of treatment?	1 = <200 c/mm ³ <input type="radio"/>
		2= 200 – 350c/mm ³ <input type="radio"/>
		3= >350c/mm ³ <input type="radio"/>
		4= Unknown <input type="radio"/>
2.6	What is your latest viral load result?	1 = below 1000cp/ml <input type="radio"/>
		2= above 1000cp/ml <input type="radio"/>

2.7	When was it taken?.....	
2.8	How long have you been started on antiretroviral treatment?	1= 3 – 6 months <input type="radio"/> 2= 7-12 months <input type="radio"/> 3= 1-2 years <input type="radio"/> 4= > 2 years <input type="radio"/>
2.9	Were you sick in the past one month?	1=Yes <input type="radio"/> 2=No <input type="radio"/>
2.10	If yes, how serious was your illness?	1= Mild <input type="radio"/> 2=Moderate <input type="radio"/> 3=Severe <input type="radio"/>

3. Questions related to the type of current ARV regimen and level of adherence

3.1. The type of current ARV regimen and frequency

Name of ARV Regimen	Number of Pills each time	
	Morning	Evening

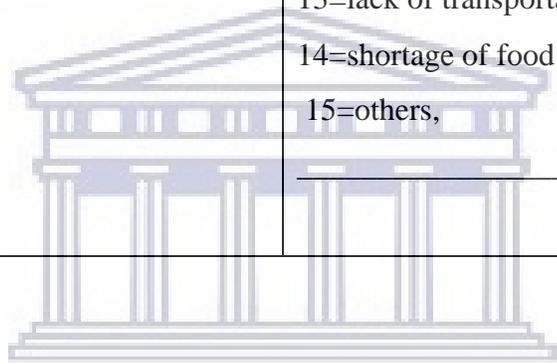
Section C (participants to complete/ be interviewed in this section)

3.2. The next section of the questionnaire asks about the ARV medications that the patient may have missed taking over the last three days. IF HE/SHE TOOK ONLY A PORTION OF A DOSE ON ONE OR MORE OF THESE DAYS, PLEASE REPORT THE DOSE(S) AS BEING MISSED

Names of your ARV medications	HOW MANY DOSES DID YOU MISS		
	Yesterday	2 days ago	3 days ago

	_____doses	_____doses	_____doses
3.3	ARV medications need to be taken on a schedule, such as “2 times a day” or “3 times a day” or “once a day.” How closely did you follow your specific schedule over the last three days?	1=Never 2=Some of the time 3=About half of the time 4= Most of the time 5= All of the time	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
3.4	Does any of your ARV medication have special instructions from a clinician, such as “take with food” or “on an empty stomach” or “with plenty of fluids?”	1=Yes 2=No If „no“ please skip to Qn. 3.6.	<input type="radio"/> <input type="radio"/>
3.5	How often did you follow those special instructions over the last four days?	1=Never 2=Some of the time 3=about half of the time 4= Most of the time 5=All of the time	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
3.6	Did you miss taking any of your ART medications in the past 7 days?	1= Yes 2=No	<input type="radio"/> <input type="radio"/>
3.7	Did you miss taking your ART medications in the past one month?	1= Yes 2=No	<input type="radio"/> <input type="radio"/>
3.8	Has your HIV medication been changed?	1= Yes 2=No	<input type="radio"/> <input type="radio"/>
3.9	People may miss taking their medications for various reasons. What were your reasons for missing any of your ART	1=being away from home 2=being busy with other things 3=simply forgot	<input type="radio"/> <input type="radio"/> <input type="radio"/>

<p>medications within the past month? (It is possible to give more than one response.)</p>	4=having too many pills to take	<input type="radio"/>
	5=wanted to avoid side effects	<input type="radio"/>
	6=do not want others to notice taking medication	<input type="radio"/>
	7=a change in daily routine	<input type="radio"/>
	8=felt like the drug was harmful	<input type="radio"/>
	9=felt sick or ill	<input type="radio"/>
	10=felt depressed	<input type="radio"/>
	11=ran out of pills	<input type="radio"/>
	12=felt good	<input type="radio"/>
	13=lack of transportation	<input type="radio"/>
	14=shortage of food	<input type="radio"/>
	15=others, specify	<input type="radio"/>



4. Knowledge about HIV disease and antiretroviral therapy

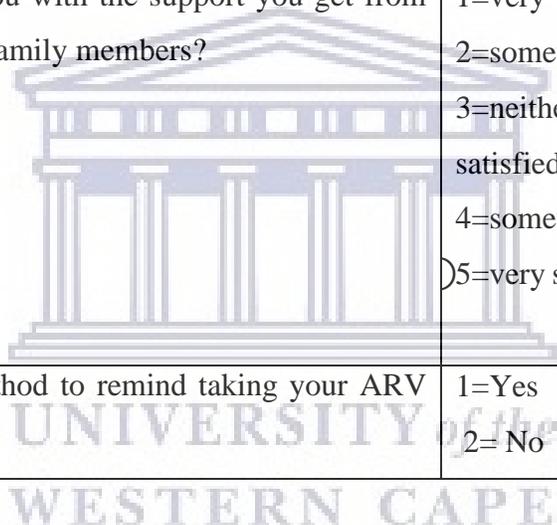
Questions	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
4.1. You know how each of your current HIV medications is supposed to be taken.					
4.2. You know what to do if you miss a dose of any of your HIV medications.					

4.3. Skipping a few of your HIV medications from time to time would not really hurt your health.					
4.4. You know what the possible side effects of each of your HIV medications are.					
4.5. As long as you are feeling healthy, missing your HIV medications from time to time is OK.					
4.6. You understand how your HIV medications work in your body to fight HIV.					
4.7. If you don't take your HIV medications as prescribed, these kinds of medications may not work for you in the future.					
4.8 Antiretroviral medications eradicate HIV from your body.					
4.9. You believe that if you take your HIV medications as prescribed, you will live longer.					
4.10. You know how your HIV medications interact with substances such as alcohol, mbanje or bronco					

5. The following questions ask about your social support.

5.1	Have you disclosed your HIV status to your friends &/or family members?	1=Yes	<input type="radio"/>
		2=No	<input type="radio"/>

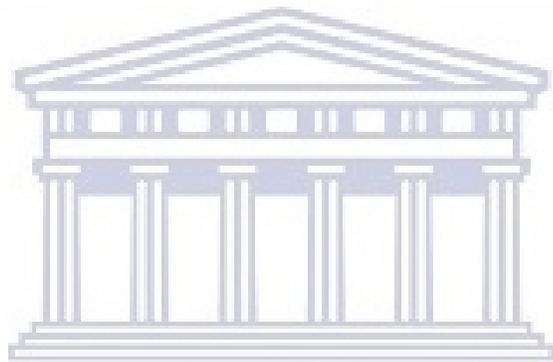
5.2	<p>Do you have a family/friend that supports taking your medications?</p> <p>If no, please skip to question no. 5.5 & 5.6.</p>	<p>1=Yes <input type="radio"/></p> <p>2=No <input type="radio"/></p>
5.3	<p>How often do your friends and/or family members help you remember to take your medication?</p>	<p>1=Never <input type="radio"/></p> <p>2=Sometimes <input type="radio"/></p> <p>3=Most of the time <input type="radio"/></p> <p>4=Always <input type="radio"/></p>
5.4	<p>How satisfied are you with the support you get from your friends and/or family members?</p>	<p>1=very dissatisfied <input type="radio"/></p> <p>2=somewhat dissatisfied <input type="radio"/></p> <p>3=neither dissatisfied or satisfied <input type="radio"/></p> <p>4=somewhat satisfied <input type="radio"/></p> <p>5=very satisfied <input type="radio"/></p>
5.5	<p>Do you use any method to remind taking your ARV medication?</p>	<p>1=Yes <input type="radio"/></p> <p>2= No <input type="radio"/></p>



1.3 Appendix 2: Approval Letter from Medical Research Council of Zimbabwe



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UNIVERSITY *of the*
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1.4 Appendix 3: UWC Ethics Approval letter



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14 January 2019

Ms P Koroka
School of Public Health
Faculty of Community and Health Science

Ethics Reference Number: BM18/9/18

Project Title: Factors affecting adherence to antiretroviral therapy among adolescents living with HIV/AIDS in Masvingo District, Zimbabwe.

Approval Period: 14 January 2019 – 14 January 2020

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 in good time for annual renewal.

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

A handwritten signature in black ink, appearing to read 'P. Josias'.

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

BMREC REGISTRATION NUMBER -130416-050

FROM TOPIC TO ACTION THROUGH KNOWLEDGE