Medicine treatment patterns of HIV/AIDS patients at a rural district hospital in the North-West Province

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Abstract

TITLE: Medicine treatment patterns of HIV/AIDS patients at a rural district hospital in the North West Province.

KEYWORDS: HIV/AIDS, antiretroviral drugs, HAART, prevalence, clinical stages, weight, CD4 counts, viral loads, rural district hospital, South Africa.

Globally an estimated 33.4 million people were living with HIV/AIDS by 2008 (UNAIDS, 2009a:7). One of the main challenges facing the Republic of South Africa (RSA) today is the HIV/AIDS epidemic (NSP, 2007:17). By mid-year 2011 an estimated 5.38 million people (10.6% of the total population) were living with HIV/AIDS in the RSA (Statistics South Africa, 2011:2). Currently South Africa has the largest number of people enrolled in the Highly Active Antiretroviral Treatment programme (HAART) in the world (WHO, 2008:59). The objective of this study was to determine retrospectively the medicine treatment patterns of HAART at a district hospital in the North West Province of South Africa.

The study was conducted at Thusong hospital in the Ditsobotla sub-district of the North West Province of South Africa. A non-experimental, retrospective, cross-sectional, drug utilisation research methodology was used to obtain the data. The target population included patients of all ages who visited Thusong hospital pharmacy during the data collection period, which commenced on 01 February 2012 and ended on 31 March 2012.

The data of three hundred and ninety nine (N=399) adult and one hundred and sixty one (N=161) paediatric patients on HAART were used. The adult female patients accounted for almost 70% (n=276, 69.17%) and the adult male patients for only 30% (n=123, 30.83%). The male paediatric patients represented just over 60% (n=97, 60.25%), whereas the female paediatric patients comprised less than 40% (n=64, 39.75%). The majority of adult patients were unmarried (n=323, 80.95%) and this group of patients were also the youngest group (μ=36.38 ± 8.98 years) on ARV treatment. Almost 86% (85.96%, n=343) of adult patients were registered as unemployed. Ninety two (n=92, 23.06%) adult patients and fifty eight (n=58, 36.03%) paediatric patients defaulted treatment during the defined period.

The investigation into the adult medicine treatment patterns revealed that more than half (52.38%, n=209) of all the adult patients were receiving regimen 1atn (EFV, TDF and 3TC), followed by 20.80% (n=83) on regimen 1a (EFV, D4T and 3TC). Most paediatric patients (n=73, 45.34%) were on regimen P1c (EFV, D4T and 3TC) and the second most (n=45, 27.95%) were on regimen P1a (D4T, 3TC and LPV/r).

The average weight of adult female patients was 57.18kg (± 15.78kg) and the average adult male patient weighed 55.87kg (± 10.17kg) on initiation of HAART. The average adult male patient was initiated on HAART with a CD4 count of 130cells/mm^3 (± 99.45cells/mm^3), while for adult female patients it was 160cells/mm^3 (± 96.52cells/mm^3). The average male child was initiated with a CD4 count of 509.1cells/mm^3 and the average female paediatric patient with 477.3cells/mm^3. The average viral load for adult female patients on initiation of HAART was 103046copies/mm^3 (± 189146copies/mm^3) and for adult male patients it was 416600copies/mm^3 (± 439746copies/mm^3). The difference between the viral load of adult female and male patients were described as statistically (p=0.0006) and practically (d=0.713) significant. The average viral load for female paediatric patients on initiation of HAART was 242207copies/mm^3 (± 709133copies/mm^3) and for male paediatric patients it was 329734copies/mm^3 (± 674532copies/mm^3).

Adult patients that received HAART at more than 12 consultations revealed an average weight gain of 3.43kg (± 8.11kg) from initiation of treatment. This group also showed an average increase of 214.71cells/mm^3 (± 248.24cells/mm^3) in CD4 count and an average reduction in viral load of 170944copies/mm^3 (± 191854.69copies/mm^3) from the day they started HAART up to the last date of receiving treatment. The paediatric patients on treatment for more than 12 consultations showed an average weight gain of 6.56kg (± 3.75kg) from initiation of ARV treatmentup to the last date of receiving treatment. They also showed an average increase in CD4 count of 396.63cells/mm^3 (± 594.53cells/mm^3) and a very encouraging average decrease of 538369.37copies/mm^3 (± 948634.46copies/mm^3) in the viral load.

Opsomming

TITEL: Medisinale behandelingspatrone van HIV/VIGS pasiënte by ‘n landelike distrikshospitaal in die Noordwesprovinsie.

SLEUTELWOORDE: HIV/VIGS, antiretrovirale middels, HAARB, voorkoms, kliniese stadia, gewig, CD4-tellings, virale ladings, landelike distrikshospitaal, Suid-Afrika.

Wêreldwyd was daar teen 2008 na beraming reeds 33.4 miljoen mense wat met HIV/VIGS saamleef (UNAIDS, 2009a:7). Die HIV/VIGS epidemie is een van die grootste uitdagings wat die Republiek van Suid-Afrika (RSA) vandag in die gesig staar (NSP, 2007:17). Teen die helfde van 2011 was daar ‘n beraamde 5.38 miljoen mense (10.6% van die totale populasie) wat met HIV/VIGS saamleef in die RSA (Statistics South Africa, 2011:2). Op die oomblik het Suid-Afrika die grootste hoeveelheid mense wat aan die Hoogs Aktiewe Antiretrovirale Behandelingsprogram (HAARB) deelneem ter wêreld (WHO, 2008:59). Die doelwit van hierdie studie was om retrospektief vas te stel wat die medisinale behandelingspatrone op HAARB is by ‘n distrikshospitaal in die Noordwesprovinse van Suid-Afrika.

Die studie is uitgevoer by Thusong hospitaal in die Ditsobotla sub-distrik van die Noordwesprovinsie van Suid-Afrika. ’n Nie-eksperimentele, retrospektiewe, deursnee geneesmiddel gebruiksnavorsings-metodologie is gebruik om die data in te samel. Die teiken populasie het pasiënte van alle ouderdomme ingesluit wat Thusong Hospitaal apteek besoek het gedurende die data-insamelingsperiode, wat begin het op 01 Februarie 2012 en geëindig het op 31 Maart 2012.

Die data van drie-honderd-nege-en-negentig (N=399) volwasse en een-honderd-een-en-sestig (N=161) pediatriese pasiënte op HAARB is gebruik. Die volwasse vroulike pasiënte het amper 70% (n=276, 69.17%) van die totaal uitgemaak en die volwasse manlike pasiënte slegs 30% (n=123, 30.83%). Die manlike pediatriese pasiënte het net oor 60% (n=97, 60.25%) verteenwoordig, terwyl die vroulike pediatriese pasiënte minder as 40% (n=64, 39.75%) uitgemaak het. Die meerderheid van die volwasse pasiënte was ongetroud (n=323, 80.95%) en dit was ook die jongste groep (μ=36.38 ± 8.98 years) op Anti-retrovirale (ARV) behandeling. Amper 86% (85.96%, n=343) van die volwasse pasiënte is geregistreer as werkloos. Twee-en-negentig (n=92, 23.06%)

volwasse pasiënte en agt-en-vyftig (n=58, 36.03%) pediatriese pasiënte het behandeling versuim gedurende die gedefinieerde periode.

Die ondersoek na die volwasse medisinale behandelingspatrone het getoon dat meer as die helfde (52.38%, n=209) van al die volwasse pasiënte ARV kombinasie 1atn (EFV, TDF en 3TC) ontvang het, gevolg deur 20.80% (n=83) op ARV kombinasie 1a (EFV, D4T en 3TC). Meeste pediatriese pasiënte (n=73, 45.34%) was op ‘n ARV kombinasie van P1c (EFV, D4T en 3TC) en die tweede grootste groep (n=45, 27.95%) was op ARV kombinasie P1a (D4T, 3TC en LPV/r).

Die gemiddelde gewig van volwasse vroulike pasiënte was 57.18kg (± 15.78kg) en die gemiddelde volwasse manlike pasiënt het 55.87kg (± 10.17kg) geweeg ten aanvang van HAARB. Die gemiddelde volwasse manlike pasiënt het HAARB begin met ‘n CD4 telling van 130selle/mm^3 (± 99.45selle/mm^3), terwyl dit vir volwasse vroulike pasiënte 160selle/mm^3 (± 96.52selle/mm^3) was. Die gemiddelde manlike kind het by aanvang van HAARB ‘n CD4 telling van 509.1selle/mm^3 gehad en die gemiddelde vroulike kind ‘n telling van 477.3selle/mm^3. Die gemiddelde virale lading van volwasse vroulike pasiënte ten aanvang van HAARB was 103046kopië/mm^3 (± 189146 kopiëe/mm^3) en vir volwasse manlike pasiënte was dit 416600kopiëe/mm^3 (± 439746kopiëe/mm^3). Die verskil tussen die virale lading van volwasse vroulike en volwasse manlike pasiënte is bevind as statisties (p=0.0006) en prakties (d=0.713) betekenisvol. Die gemiddelde virale lading van vroulike pediatriese pasiënte ten aanvang van HAARB was 242207kopiëe/mm^3 (± 709133kopiëe/mm^3), en vir manlike pediatriese pasiënte was dit 329734 kopiëe/mm^3 (± 674532kopiëe/mm^3).

Volwasse pasiënte wat HAARB vir meer as 12 konsultasies ontvang het, het ‘n gemiddelde gewigstoename van 3.43kg (± 8.11kg) getoon vanaf die begin van die behandeling. Hierdie groep het ook ‘n gemiddelde toename van 214.71selle/mm^3 (± 248.24selle/mm^3) in hulle CD4 telling getoon en ‘n gemiddelde verlaging in virale lading van 170944kopiëe/mm^3 (± 191854.69kopiëe/mm^3) gehad van die begin van ARV behandeling tot op die datum van die laaste behandeling. Pediatriese pasiënte op behandeling vir meer as 12 konsultasies het ‘n gemiddelde gewigstoename van 6.56kg (± 3.75kg) gehad van die begin van ARV behandeling tot op die datum van die laaste behandeling. Hulle het ook ‘n gemiddelde toename in CD4 tellings gehad van 396.63selle/mm^3 (± 594.53selle/mm^3) en ‘n baie belowende gemiddelde daling van 538369.37kopiëe/mm^3 (± 948634.46kopiëe/mm^3) in hulle virale lading getoon.

List of Abbreviations

3TC	Lamivudine
ABC	Abacavir
ADRs	Adverse Drug Reactions
AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral treatment/therapy
ARV	Antiretroviral
AZT	Zidovudine
BMI	Body Mass Index
CCMTS	Comprehensive Care Management, Treatment and Support programme
CDC	Centre for Disease Control and Prevention
CTL	Cytotoxic CD8 T-Lymphocytes
d4T	Stavudine
ddI	Didanosine
DHHS	Department of Health and Human Services
DMP	Disease Management Programmes
DNA	Deoxyribonucleic acid
DOH	Department of Health
EI	Entry Inhibitor
ELISA	Enzyme-Linked Immunosorbent Assay
EFV	Efavirenz
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
HTLV-III	Human T-cell Lymphotropic virus type III
IDU	Intravenous/injecting Drug Use/User
INSTI	Integrase Strand Transfer Inhibitor

IPT	Isoniazid Preventive Therapy
IRIS	Immune Reconstitution Inflammatory Syndrome
INH	Isoniazid
JCSMF	Joint Civil Society Monitoring Forum
JHTTT	Joint Health and Treasury Task Team
LAV	Lymphadenopathy-associated Virus
LPV/r	Lopinavir/ritonavir
MCC	Medicine Control Council
MDG	Millennium Development Goal
MTCT	Mother to Child Transmission
NACOSA	National AIDS Coordinating Committee of South Africa
NNRTI	Non-Nucleoside Reverse Transcriptase Inhibitors
NsRTI	Nucleoside Reverse Transcriptase Inhibitors
NtRTI	Nucleotide Reverse Transcriptase Inhibitors
NSP	National Strategic Plan
NVP	Nevirapine
NWDOH	North West Department of Health
NWP	North West Province
PCP	*Pneumocystis jirovecii* pneumonia
PCR	Polymerase Chain Reaction
PEP	Post Exposure Prophylaxis
PEPAR	President's Emergency Plan for AIDS Relief
PHC	Primary Health Care
PI	Protease Inhibitor
PMTCT	Preventing Mother to Child Transmission
RNA	Ribonucleic acid
RSA	Republic of South Africa

SA	South Africa
SIV	Simian Immunodeficiency Virus
STD	Sexually Transmitted Diseases
STI	Sexually Transmitted Infections
TB	Tuberculosis
TDF	Tenofovir
UN	United Nations
UNAIDS	United Nations and Aid
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VCT	Voluntary Counselling and Testing
VTP	Vertical Transmission Prevention
WHO	World Health Organization

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Chapter 1: Introduction, Problem Statement and Scope of Study

1.1 Introduction

The Human Immuno-deficiency Virus, commonly known only as HIV, is a retrovirus that causes progressive deterioration of the human immune system by infecting the cells of the immune system and destroying or impairing their ability to fight off diseases and other infections (UNAIDS, 2008:1). Acquired Immunodeficiency Syndrome (AIDS) is a term used by the United States Center for Disease Control and Prevention (CDC) to describe the most advanced stages of the HIV-infection. Though HIV/AIDS was still unknown only three decades ago, the epidemic had already claimed the lives of an estimated 25 million people globally by the end of 2007 (WHO, 2008:31).

1.2 Background

Since there is no cure, nor any vaccine for this virus, it rapidly became a complex global challenge resulting in an epidemic the magnitude of which mankind has never seen before. In 2008 an estimated total of 33.4 million people were living with HIV/AIDS globally (UNAIDS, 2009a:7). According to the 2008 report of the World Health Organisation (WHO, 2008:15) there has been some gains in the fight against this global epidemic in the last couple of years. One example of this is the decline of HIV/AIDS related deaths from 2.2 million people globally in 2005 to 2.0 million people in 2007. The report also states that the annual global number of new HIV-infections has gone down from 3.0 million people in 2001 to 2.7 million people in 2007 and it seems that the prevalence has stabilised since the year 2000. This trend is also recognised and supported in the UNAIDS 2009 update on the AIDS epidemic (UNAIDS, 2009a:7). In this report, published in December 2009, the estimated HIV/AIDS related deaths and the number of people newly infected with HIV/AIDS in 2008 was the same as it had been for 2007, which also indicates a stabilisation in these statistics. To complete the picture of progress made during the past decade, the WHO just recently released their 2011 report (WHO, 2011:17), indicating that the number of people newly infected by HIV further decreased to 2.6 million in 2009 and the number of HIV/AIDS related deaths in the same year dropped to less than 1.8 million. However, the overall number of people living with HIV/AIDS globally is still increasing because more people are newly infected annually than HIV/AIDS deaths occurring.

Another key finding of the 2008 WHO report is that statistics revealed that the lifelong treatment of HIV/AIDS infected patients with highly active antiretroviral therapy (HAART) has clearly increased the life expectancy of these patients (WHO, 2008:138). People living with HIV/AIDS during the 1980's were not likely to live more than a few years, while since 1996 many people who were able to access safe and effective antiretroviral (ARV) drugs have been shown to live much longer and healthier lives. Although there is no cure as yet, using HAART, which is a combination of three or more ARV drugs, helps to slow down or even halt the spread and progression of the virus. According to Dr. John G Bartlett (2004:29) the primary goal of HAART is to reduce the viral load of a patient to a level as low as possible and for as long as possible. He also states the following five secondary goals for treatment:

- Preventing complications associated with HIV
- Avoiding ADRs (adverse drug reactions) associated with ARV-drugs in the short-term, as well as in the long-term
- Helping to prevent transmission of HIV
- Avoiding HIV-resistance to these drugs
- Preserving other options of HIV-treatment

Together, all of these goals can only be achieved through universal access to HAART.

According to the WHO there have been significant changes in the accessibility of these drugs even in countries with a lack of finances and inadequate health care infrastructure. This is mainly due to member states of the United Nations unanimously endorsing the Declaration of Commitment at the 2001 General Assembly's Special Session on HIV/AIDS (WHO, 2008:13). This declaration promotes the engagement of both generic and research-based pharmaceutical companies in the response to HIV/AIDS.

In low- and middle-income countries 42% of the 9.5 million people in need of HAART by the end of 2008 were accessing treatment (UNAIDS, 2009b:57). Although this clearly indicates that universal access has not yet been reached, it is still a vast improvement on the only 33% of people who were in need accessing treatment in 2007.

Universal access to HIV/AIDS treatment has numerous benefits for individuals, as well as their communities and even the countries in which they live. Not only will a patient accessing treatment benefit by prolonging life or improving his/her quality of life, but it also immediately relieves some of the adverse economic effects that the epidemic might have on the household, community and country (WHO, 2008:162).

1.3 Problem statement

According to the National Strategic Plan for HIV/AIDS and STIs (NSP) (2007:17), one of the main challenges facing the Republic of South Africa (RSA) today is the HIV/AIDS epidemic. By mid-year 2011 in RSA alone an estimated 5.38 million people were living with HIV/AIDS, which is an approximate HIV/AIDS prevalence of 10.6% of the total population (Statistics South Africa, 2011:2). The estimated prevalence for all adults aged 15-49 years during 2011 was 16.6% (Statistics South Africa, 2011:5). SA's 2010 Antenatal Survey Report (Department of Health, 2011a:38) released in 2011 shows an HIV/AIDS prevalence of 30.2% in pregnant women attending antenatal clinics in the public health sector. The prevalence for all women aged between 15-49 years was 19.4% (Statistics South Africa, 2011:5). This means that in RSA almost one in every five women of child bearing age is HIV-positive.

The highest prevalence among the South African people is the female population aged 25-29 years where 32.7% or one in every three women is HIV-positive (Department of Health, 2010a:22). The highest prevalence for males is in the 30-34 year age group where 25.8% of this group is infected. All of these statistics show that there is a disproportionate distribution of HIV/AIDS between males and females. Prevalence of HIV/AIDS in South Africa, however, also varies considerably throughout the country with some provinces having a much higher burden than others. Take for example the difference in prevalence among pregnant women attending antenatal clinics, where the lowest estimated prevalence was 16.1% for the Western Cape, while the highest prevalence was in KwaZulu-Natal with 38.7% of this group being infected (Department of Health, 2010a:10).

In 2003, as part of the Operational Plan for the Comprehensive HIV and AIDS Care, Management and Treatment for South Africa (Department of Health, 2003:14) the South African government took the decision to roll-out antiretroviral treatment in the public sector. When looking at the mid-year estimates report published by Statistics South

Africa in July 2009 (Statistics South Africa, 2009:6) it is clear that largely because of the ARV roll-out the life expectancy of people living in South Africa is slowly increasing. Obviously, with an endeavour as big as this roll out there would be new challenges, especially for the resources of the public health sector. South Africa has the largest number of people enrolled on HAART in the world (WHO, 2008:59). By mid-year 2009 approximately 800 000 adults and 70 000 children were receiving treatment (Statistics South Africa, 2009:5). However, the estimates for 2009 were that 1.5 million people aged 15 years and older will be in need of HAART, while an estimated 106 000 children younger than 15 will need HAART. This means that only 56% of those in need of treatment were already receiving it by 2009 (Department of Health, 2010a:43).

The focus of this study is to determine retrospectively the medicine treatment patterns of antiretroviral drugs at the district hospital. This will give a clear indication of how the district hospital is doing when compared to the national progress report on the declaration of commitment. The report states that one of the main purposes of the Operational Plan for the Comprehensive HIV and AIDS Care, Management and Treatment for South Africa was to strengthen the whole National Health System by improving laboratory services, information systems, human resources and capacity development, drug procurement and distribution (Department of Health, 2004:2). Equally important then would be to look at the health profile, education and employment rates of the study population to determine the financial impact of procuring and redistributing the increasing amount of medication needed in RSA.

1.4 Research questions

The following questions arise from the preceding discussion:

- What is the prevalence of HIV/AIDS patients receiving HAART at the hospital in this rural population?
- How is this prevalence distributed between different ages, genders and employment status groups?
- What are the treatment guidelines available to these patients in a rural setting?
- What are the prescribing patterns of antiretroviral drugs or HAART at this hospital?
- What is the importance of adherence to HAART?

- What is the impact of HAART on the weight, CD4 T-cell counts and viral loads of these patients?

1.5 Research objectives

The research objectives include general and specific research objectives.

1.5.1 General research objectives

The general research objective of this study is to investigate the medicine treatment patterns of HIV/AIDS patients at a rural district hospital in the North West Province.

1.5.2 Specific research objectives

The specific research objectives are divided into objectives for the literature review and objectives for the empirical investigation.

1.5.2.1 Specific research objectives for the literature review

The specific research objectives for the literature review include:

- To attain a certain degree of clinical knowledge regarding the concept of the HI-virus and AIDS, including the pathogenesis of HIV and the pathography of AIDS, as well as a thorough explanation of CD4 T-cell counts and viral loads.
- To briefly explain the modes of transmission, the risk factors that contribute to the epidemic, the signs and symptoms of HIV/AIDS and the diagnosis of HIV-infection.
- To explain the different stages of HIV/AIDS according to the WHO.
- To describe and classify the ARV drug classes, supply the SA treatment guidelines, as well as to provide some insight regarding adherence to treatment and to describe the most common side-effects of these drugs.
- To summarise the prevalence of the HIV/AIDS epidemic in the world and to then focus on the HIV/AIDS prevalence in South Africa, and more specifically the burden of disease on the North West Province.
- To investigate very briefly the cost implications of the fast growing number of HIV/AIDS patients on specifically pharmaceutical resources in the public health care

sector and to present a look at the estimated cost of providing ARV drugs in RSA over the next five years.

1.5.2.2 Specific research objectives for the empirical investigation

The specific research objectives for the empirical investigation include the following:

- To analyse the prevalence of HIV/AIDS patients receiving HAART according to gender, age and other demographic factors.
- To determine the number of both adult and paediatric patients that have defaulted ARV treatment during the data period, as well as to provide a glance at the periods of defaulting.
- To investigate the medicine treatment patterns of HAART at a district hospital.
- To examine the vigilance with prescribing prophylactic treatment such as Co-trimoxazole and Isoniazid.
- To compare body weight, CD4 T-cell counts and viral loads between genders.
- To briefly assess the influence of HAART on patients' body weights, CD4 T-cell counts and viral loads.

1.6 Research methodology

The research methodology consists of two phases, namely the literature review and the empirical investigation.

1.6.1 Phase one: Literature review

The literature review consists of two main sections. The first section is a broad clinical overview of what exactly the concept of HIV entails, how the virus works and how it is transmitted. An explanation will also be provided regarding the four different stages of HIV/AIDS and what treatment regimes were available during the data collection period.

The second section focuses more extensively on the scope of this study. This includes demographic details and profiles of South Africa and the North West province, as well as an overall view of the social and economic conditions of the population for this province.

1.6.2 Phase two: Empirical investigation

The empirical investigation comprises several selection processes, including selection of the research design, selection of the study population and the institution, selection of the research instrument or data collection tool and selection of the data collection period. The ethical considerations of this study are also discussed in the paragraphs to follow.

1.6.2.1 Selection of the research design

A non-experimental, retrospective, cross-sectional drug utilisation review method was used to obtain the data and achieve the specific objectives of this research project.

1.6.2.2 Selection of the study site and population

The researcher is an employee of the North West provincial government and has been stationed at the selected hospital for a number of years. The study site and population were therefore selected based on convenience.

1.6.2.2.1 Study site

The study site selected for this study is the pharmacy at Thusong Hospital. This institution is a rural district hospital in the Ditsobotla sub-district in the North West Province of South Africa.

1.6.2.2.2 Study population

The target population for this study included patients of all ages who visited the pharmacy at Thusong Hospital during the defined data collection period, which commenced on 01 February 2012 and ended on 31 March 2012. From this population, data were collected retrospectively for one year for all patients that received ARV treatment every month at Thusong Pharmacy.

Inclusion criteria:

- Patients of all ages on HAART receiving treatment at the hospital during the defined period from 01 February 2012 to 31 March 2012.
- From the retrospective data only patients who received monthly treatment at Thusong Pharmacy were included.

Exclusion criteria:

- Patients on HAART who receive treatment at a PHC (Primary Health Care) institution and who had only returned to hospital during the collection period for a six monthly review of their CD4 T-cell count, viral load or prescription.
- Patients who defaulted for more than one year before or passed away before 01 February 2012.
- Patients who received more than two months' treatment prior to 01 February 2012.
- All patients transferred to other facilities of care before 01 February 2012.

1.6.2.3 Data collection method

1.6.2.3.1 Data sources

Patient hospital records/files

The hospital records/files for each patient who had been selected according to the inclusion criteria was used as the only data source.

1.6.2.3.2 Survey instruments

1.6.2.3.2.1 Data collection tools (Refer to appendices 1 & 2)

Two separate survey forms were created by the researcher, one for adults and one for paediatric patients. These survey forms are Excel® spread sheets used to capture all the details directly from the patient file. The data collected included the following:

- Employment status
- Geographical area
- Age
- Gender
- Marital status
- Weight
- Dates of visits to hospital
- Whether the patient is an initiation, down-referral or repeat hospital patient

- CD4 T-cell count and viral load
- HAART regimen and exact dosages
- Other related acute medication, including prophylaxis
- Only certain side-effects relating to this chronic condition or the treatment

1.6.2.3.2.2 De-coding lists for data collection tool (Refer to appendices 3 & 4)

The other instruments used in the survey were two de-coding lists for the two data collection tools explaining the short codes and abbreviations used in these survey forms.

1.6.2.4 Data analysis

Data analysis was done by using the Statistical Analysis System®, SAS 9.3® (SAS Institute Inc., 2006-2007). This program was used to extract and analyze data from the Excel® spread sheets (data collection tools).

1.6.2.5 Reliability and validity of the research instruments

All the data captured on the data collection tools were obtained directly from the patients' hospital records and no data collected was altered or manipulated by the researcher. The researcher has extensive experience in managing these hospital records and has, together with his research supervisor, assessed the face and content validity of the data collection tools and amended any inadequacies to obtain a representatively valid final data collection tool. The hospital file number was used to ensure that all prescriptions and other data from these records correlate and indeed apply to the specific patient researched. However, the patient was not identified during the data analysis. The data captured directly from the patient file can thus be assumed to be correct and accurate.

1.7 Ethical considerations

Permission to conduct the study was granted by the North-West University's Research and Ethical committee under approval number: NWU-000049-11-S5 (see appendix 5). Permission to access patient records for the data collection and approval to conduct the study at the specific hospital was obtained from the hospital management (see

appendix 6) and the North West Provincial Policy, Planning and Research Department (see appendix 7).

No interviews were conducted with patients. The data collected from the patient records were treated with strict confidentiality and anonymity was respected and maintained by the researcher throughout the study. To ensure that patient names were not used at all, only the hospital file number appeared on the survey forms and all data collected was stored electronically and only accessible to the researcher and his supervisor. The analysis of data from the research instruments did not reveal any patient-specific information that can compromise the anonymity of any patient.

1.8 Division of chapters

The chapters in this study are as follows:

Chapter 1: Introduction, problem statement and scope of study

Chapter 2: HIV/AIDS: Clinical concepts and treatment guidelines, global, national and regional statistics.

Chapter 3: Empirical investigation

Chapter 4: Results and discussions

Chapter 5: Conclusions, recommendations and limitations.

1.9 Chapter summary

The introductory chapter identified the problem, and discussed the research objectives and methods. The chapter also provides a division of the chapters of the dissertation. In Chapter 2 the literature review will discuss all global statistical and clinically important aspects of HIV/AIDS, including transmission, treatment currently available and global burden of disease. Chapter 2 will then focus more on the South African statistics of HIV/AIDS and provide a clear picture of the national prevalence, as well as the statistics and demographics of the research population.

Chapter 2: HIV/AIDS: Clinical Concepts and Treatment Guidelines, Global, National And Regional Statistics

2.1 Introduction

HIV (previously also known as HTLV-III or LAV) is the causative agent of AIDS (Sweetman, 2011:944). There are two subtypes of HIV, of which HIV-1 is by far the most common and occurs all over the world. HIV-1 is divided into three main groups in the human population named Group M, N and O. According to De Cock and Weiss (2000:A3) it is group M, representing all the subtypes or "clades" A-H that have spread and caused the worldwide pandemic. In contrast, however, are groups N and O, which are largely confined to Gabon, Cameroon and bordering countries (Peeters *et al.*, 1997:493). Subtype HIV-2 seems to be much less virulent (Whittle *et al.,* 1994:1617), has a much slower progression to AIDS than HIV-1 and is found mainly in West Africa (Sweetman, 2011:944). Although HIV-1 and HIV-2 have similar *in vitro* sensitivity to anti-retroviral drugs, HIV-2 is more closely related to the simian immunodeficiency virus (SIV) and where for example non-nucleoside reverse transcriptase inhibitor (NNRTI) drugs are HIV-1 specific, it has no effect on HIV-2. HIV forms part of the genus lentivirus, which is a family of mammalian retroviruses (Retroviridae). It causes persistent infection with gradual onset of clinical symptoms that typically result in chronic, progressive, sometimes fatal disease. The only natural hosts for these viruses are either humans or non-human primates (Brunton *et al*., 2011:1623; Dorland's illustrated medical dictionary, 2012:1022).

According to the fact sheet published by the UNAIDS in 2008 (UNAIDS, 2008:1) HIV infects cells of the human immune system, destroying or impairing its functions. An infected person's immune system is considered impaired or deficient when the virus has managed to progressively destroy the immune system to a point where it is unable to fight off infection and disease. Such an infected person then goes through the stages of infection from being asymptomatic up to clinical stage 4 where the person could have a list of opportunistic infections and symptoms. Patients in stage 4 are considered to have AIDS. However, the time it takes to develop AIDS differs between individuals with a number of factors influencing the progression of the disease.

Chapter 2 focuses on the cytophysiology of the virus, explains exactly how it works clinically and how infection spreads causing disease progression. The discussion furthermore indicates routes of transmission, briefly looks at the signs and symptoms of the associated diseases and possible treatment options for patients infected with HIV. Terms like CD4-positive T-cells, macrophages and plasma HIV-RNA concentration will be discussed for clarification. The background to these terms is very important in understanding some of the outcomes of this study. The chapter includes global as well as South African National statistics on HIV/AIDS and in the last instance shifts the focus to the burden of disease and other demographics of the study population.

2.2 Pathogenesis of HIV and pathography of AIDS

2.2.1 Structure of the HI-virus

HIV is an RNA virus that, like other retroviruses, uses its reverse transcriptase enzyme to allow reverse transcription from RNA to DNA. This is a unique feature of retroviruses since all non-retroviruses only cause transcription of a DNA strand to new RNA (Department of Health, 2005:4-3)

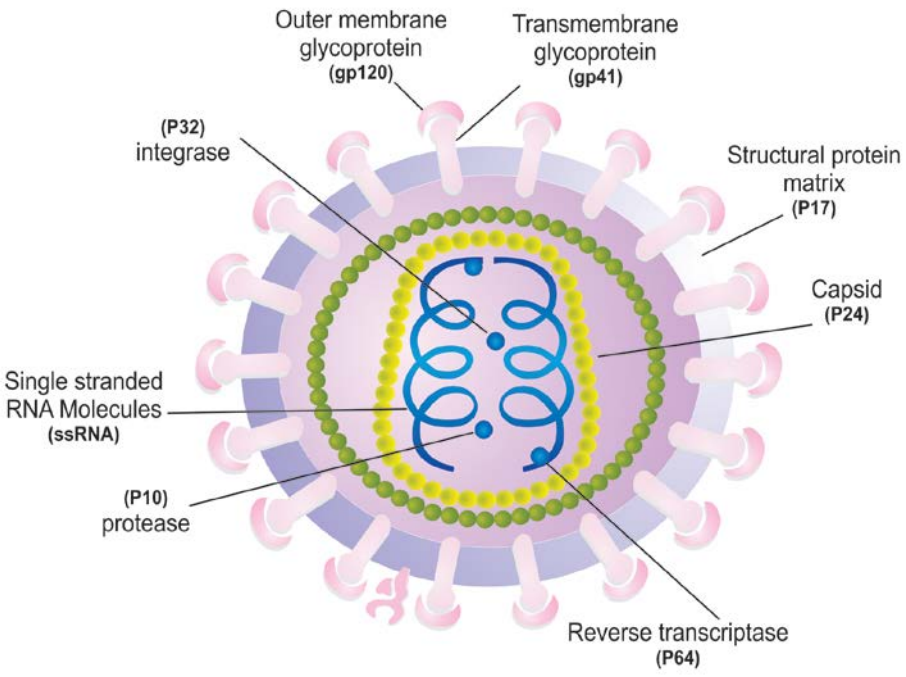

Figure 2-1: Schematic structure of the HIV virion

(Adapted from: Department of Health, 2005:4-3)

The basic structure of the HIV virion consists of the envelope or membrane containing the very important outer membrane glycoprotein (gp120) and the transmembrane glycoprotein (gp41). These specific glycoproteins are responsible for attachment to the host cell and the subsequent entry of the virus into the host cell. More specifically, it is the extracellular envelope protein gp120 that binds to the CD4 receptor on the surface of the host cell and it is the transmembrane gp41 protein that mediates the fusion of the viral envelope (lipid bilayer) with the host cell membrane. The inside of the envelope is lined with a structural protein called the matrix (Department of Health, 2005:4-3). A cone shaped protein called the capsid surrounds the core of the virion. Inside this core are the two single stranded RNA molecules, as well as the enzymatic proteins reverse transcriptase, integrase and proteases.

2.2.2 Life cycle of HIV

The main targets of a mature extracellular virion are the CD4 receptors and CCR5 or CXCR4 chemokine co-receptors on T lymphocytes cells (T helper cells) and monocytes/ macrophage lineage cells (Greene & Peterlin, 2002:674; Brunton *et al*., 2012:1624). These co-receptors also assist in determining the cellular tropism (affinity) of the HIV-1. The T-tropic HIV-1 strains bind to CXCR4 co-receptor cells, like the T-helper cells and the M-tropic strains bind to CCR5 co-receptor cells like the macrophages.

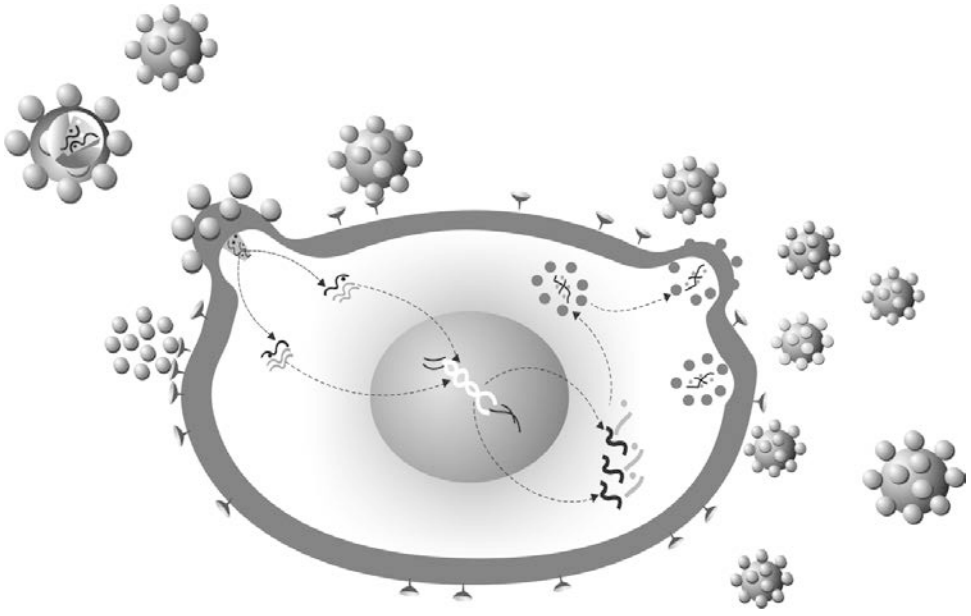

Figure 2-2: Schematic representation of the replication cycle of HIV

(Adapted from: SPS, 2010:17)

The following is a short step-by-step description of the replication cycle of HIV (Department of Health, 2005:4-5; Weiss, 2000:A11):

Step 1: The mature virus uses its gp120 protein to bind to the CD4 receptor of the targeted host cell.

Step 2: Fusion of the virus envelope and the host cell membrane is then mediated by the gp41 protein and the two single stranded RNA molecules are inserted into the host cell.

Step 3: Viral RNA now undergoes replication to form a short-lived RNA-DNA duplex. The reverse transcriptase enzymatic protein then creates a full-length double stranded viral DNA.

Step 4: Virus DNA translocates to the nucleus where it is integrated into the host cell genome via another viral enzyme called integrase.

Step 5: After integration the proviral DNA can remain latent (inactive) in the nucleus and replicate only during chromosomal replication and when the host cell divides (Weiss, 2000:A11), otherwise when the cell is activated they will form genomic viral RNA or mRNA.

Step 6: The HIV mRNA forms viral proteins.

Step 7: The genomic RNA, HIV proteins and enzymes then assemble at the host cell surface (close to the host cell membrane) and buds through the host cell membrane, in the process forming an envelope for the new HIV particle that is released.

Step 8: The third viral enzyme protease then matures the non-infectious, immature particle to yield a mature virus particle that is able to infect a new cell. This last step can happen during or just after budding from the host cell.

2.2.3 Immunopathogenesis of HIV

The result of this viral replication is immune activation and progressive depletion of CD4-positive helper cells (CD4 T-cells). From the above discussion we can already gather that these helper cells are crucially important to the body’s immune response.

Infected persons unable to control the virus replication may develop AIDS in a period as short as 2-3 years (Paranjape, 2005:240, Berkow *et al*., 1997:927).They show a fast increase in the plasma HIV-RNA concentration with rapid depletion of CD4 cells. However, according to the article published by the National AIDS Research Institute in India on the Immunopathogenesis of HIV infection, it is important to note that there are in fact some patients infected with HIV known as “long term non-progressors (LTNP’s)”. These are individuals infected by HIV, but their immune system is able to successfully control the replication of the virus, which results in them having a very low or even undetectable viral load with minimal loss of CD4 T-cells (Paranjape, 2005:240).

Most HIV-infected T-cells only have an *in vivo* half-life of 12 to 36 hours (Paranjape, 2005:241). As the main aim of HIV is the replication of itself and the destruction of CD4 T-cells, a short description of a few possible causes or mechanisms for the destruction of CD4-positive T lymphocytes and other factors in the pathogenesis of HIV is important. These causes are usually divided into host factors, viral factors and other co-factors. Some important host factors that influence the pathogenesis of HIV include:

- Programmed cell death known as apoptosis, which is the natural mechanism for cell deletion in the regulation of cell populations in the body, is used by HIV proteins to destroy both infected and uninfected cells. Cross-linking of the CD4 molecule with gp120 is thought to be the method of preparing the uninfected cell for apoptosis.
- A single HIV-infected cell can fuse, also through CD4-gp120 interaction, with several uninfected cells to form a usually short-lived giant multinucleated cell called a syncytium.
- Another mechanism for single cell killing is simply through continuous viral budding from the host cell plasma membrane. This causes loss of membrane integrity and results in the death of the cell.
- The accumulation of unintegrated viral DNA increases the cytotoxicity of the HIV infection and causes cell death.
- Natural killer lymphocyte cells (NK cells) have specific antibodies against HIV antigens and are directed at killing HIV-infected cells.

- When activated, Cytotoxic CD8 T Lymphocytes (CTL) become cytotoxic to both infected as well as uninfected CD4 cells (so called innocent bystander cells) with similar MDC class 1 molecules or envelope proteins like gp120.

Nevertheless, Paranjape (2005:242) asserts that HIV-specific immune responses are the most important host factors in the progression of HIV from infection to disease outcome.

The ability of the virus to mutate and escape the immune response of the host is one of the well-known characteristics of the virus itself that affects the pathogenesis of the disease. Increased pathogenicity and disease progression is associated with the progression of the M-tropic virus to the T-tropic virus. The tropism of the virus will thus also influence the progression of the disease. Virus thinning or weakening (Dorland's illustrated medical dictionary, 2012:178), called viral attenuation, causes a reduction in virulence and can slow the disease progression. Furthermore, the subtype of HIV will show diverse virulence and transmissibility.

The most commonly known other co-factor contributing to the pathogenesis of HIV is the effect of co-infections, for example the Human Herpes virus and Epstein-Barr virus, which can up-regulate the expression of HIV. Another very familiar example if not the most well-known example, especially in developing countries, is the TB microbe *Mycobacterium tuberculosis*, which has a similar effect on the HI virus as these other co-infections (Department of Health, 2005:4-11).

2.2.4 History and development of AIDS

The Merck Manual of Medical Information (Berkow *et al*., 1997:926) states that in the early 1980's an abrupt increase in two basically uncommon conditions led epidemiologists to the discovery of what was later to be known as AIDS. These were *Pneumocystis* pneumonia, which is a type of pneumonia found only in patients with an impaired immune system, and a rare type of cancer called Kaposi's sarcoma. This phenomenon was first discovered among homosexual men in America. Soon afterwards this same severe immune deficiency was recognised in injecting drug users (IDU), recipients of blood products, hemophiliacs and also bisexual men. In 1983 a retrovirus was isolated from a patient with the typical signs and symptoms of AIDS (Barrè-Sinoussi *et al.*, 1983:868). The virus belonged to the same family of retroviruses as

HTLV, which was by then only recently discovered, yet obviously different from the original isolates. According to Serwadda *et al.* (1985:849) it was in 1985 that it was first out in the open that 'slim' disease in the African setting was in fact AIDS and caused by HIV.

Even though the virus itself had not yet been identified in 1981 it was already clearly evident that AIDS was caused by the selective depletion of CD4-positive T-helper cells (Gottlieb *et al*., 1981:1425). It was thus obvious from the beginning that these helper cells were and will continue to be of great significance in the development of AIDS.

The amount of CD4-positive T-helper cells per microliter of blood (CD4 T-cell count or simply CD4 count) and the plasma HIV-RNA concentration (viral load) is seen as vital instruments in the prognosis of an infected individual (Sweetman, 2011:945). The aim of ARV treatment at this point in time is still to completely suppress viral replication and obtain a lower than detectable plasma virus level. In practice, viral load is then used primarily to monitor the success of ARV treatment, but a higher viral load is also associated with rapid CD4 cell loss and a faster disease progression. In view of the fact that the primary function of CD4-positive T-helper cells is to assist CD8-positive cytotoxic T-lymphocytes in eliminating other cells expressing foreign antigens, it is directly associated with the immune system of the host. The CD4 count can thus be utilised as an indicator for determining the susceptibility of an infected person to opportunistic infections. The CD4 count of a normal healthy person is between 800 and 1300 cells per microliter of blood (Berkow *et al*., 1997:926). Without treatment this CD4 count may decrease with 40 to 50 percent within the first few months after infection. After the initial rapid increase in virus particles in the host blood the viral load stabilizes roughly at around six months. Once the CD4 count drops below 400/µL (cells per microliter of blood) a person becomes much more vulnerable to opportunistic infections (Weiss, 2000:A13). The percentage of CD4 cells as a total of all lymphocytes is commonly referred to as the CD4 percentage and is used in children to indicate the extent of immunodeficiency. For a child older than one year a CD4 percentage of less than 15% would indicate severe immunosuppresion, 15-24% moderate suppression and more than 25% only minimal immunosupression (Department of Health, 2010b:9).

According to Coutinho (2000:A22) there are a number of factors that influence the incubation period of HIV/AIDS that must be studied to fully understand the natural

history of the disease. Such an understanding assists decision makers in establishing when to initiate ARV therapy. In view of the fact that many, if not most, of the ARV drugs available have substantial toxic side effects and treatment is continued for life, the decision of when the best time is to start treatment is quite significant.

A collaborative study done on 38 follow-up studies from Europe, North America and Australia with data on 13030 patients infected with HIV-1 showed that age has a strong influence on the progression of the disease (Coutinho, 2000:A23). The study found that the survival period from seroconversion to death for the age group 15-24 years was 12.5 years (95% CI: 12.1-12.9), and for those aged 45-54 was 7.9 years (95% CI: 7.4-8.5). These participants seroconverted before the availability of HAART in the period 1977-1996. Shortly after infection there is a large amount of HIV in the peripheral blood and it is at that stage of infection that the immune system of the host starts to respond to the imposing virus by producing HIV antibodies and cytotoxic lymphocytes (Trotter *et al.*, 2008:328). This process is known as seroconversion.

Another study examined whether gender differences in CD4 cell counts matters in eight ongoing cohort studies comprising of 221 female and 443 male patients (Coutinho, 2000:A23). The study found that although both the male and female groups were around the same age with a median age of approximately 25 years, the men had a more rapid decline in CD4 count when reaching AIDS than the women. This also meant that women died at higher CD4 counts than the men, which tell us that gender should probably be taken into consideration when developing guidelines on when to start ARV treatment.

Injecting drug users (IDUs) infected with HIV is another group of interest known for diverse results in studies and high mortality rates. A study population of 664 HIV-positive IDUs with documented intervals of seroconversion was used to study the pre-AIDS mortality among this group of patients. During the study period 107 participants died, but 57 died from causes other than AIDS. These other causes included overdose/suicide for half of the deaths (49%), natural causes such as bacterial infection (40%) and unknown or unintentional injuries (11%). They concluded from this study that there is a large number of HIV-positive IDUs that die before they even get to developing AIDS (Prins *et al*., 1997:1747-1756).

Genetic factors of the host certainly play an important role in the immune response the host will be able to initiate and have an important impact on disease progression (Cohen *et al*., 1997:31-33). Aspecific mutation in the gene encoding for CCR5 receptor can result in reduced CCR5 expression at the cell surface level. This is one example of a genetic characteristic that can cause delayed disease progression in individuals with this genetic mutation.

Weiss (2000:A12) points out that macrophages are another type of cell that also expresses low levels of CD4 antigen. Macrophages are cells derived from hematopoietic stem cells that developed until the cells became monocytes. These enter the blood stream and finally enter tissue where they increase in size, phagocytic activity and lysomal enzyme content to become macrophages (Dorland's illustrated medical dictionary, 2012:1093). Weiss (2000:A12-A13) continues by stating that macrophages are scavengers and as they are antigen expressing they also become infected with HIV. Because macrophages are able to act as reservoirs for HIV in the host body, it is possible that the infection of macrophages causing abnormal signaling of cytokines and chemokines that travel between different tissue cells and different types of blood are responsible for the so-called wasting syndrome in AIDS. Microglia, which is a type of macrophage located in the brain, can cause dementia due to this abnormal signaling after infection. Langerhans and dendritic cells are two more examples of macrophages and can be early targets of HIV after infection through sexual transmission (Weiss, 2000:A13).

2.3 Transmission, risk factors, pathognomy and diagnosis of HIV/AIDS

2.3.1 Transmission

There are a number of ways in which HIV can be transmitted. However, because HIV is effortlessly destroyed outside of the human body (WHO, 2000a) all of these modes of transmission need direct contact with some kind of body fluid that contains virus particles and/or other infected cells (Berkow *et al*., 1997:927). Body fluids that typically contain larger quantities of HIV include blood, semen, vaginal secretions, breast milk and cerebrospinal fluids. Although HIV can also be present in tears, urine and saliva it is usually in much lower concentrations.

Transmission of HIV can occur through unprotected sexual intercourse, transfusion of contaminated blood, sharing of contaminated needles and from a mother to her child (WHO, 2012a). With sexual relations it is the mucous membrane lining of the mouth, vagina or rectum that is exposed to contaminated body fluids from an infected person which causes infection of the uninfected partner. Transmission of the virus through blood transfusions occurs when an uninfected individual receives an infusion of contaminated blood. Sharing of needles frequently causes infection between IDUs, especially in developed countries. An accidental needle prick from a contaminated needle can cause infection in for example a healthcare worker. An infected mother can transfer the virus to her child during pregnancy, childbirth or by breastfeeding her infant (Berkow *et al*., 1997:929).

Vernazza *et al*. (1998:155) state that vertical transmission (from mother-to-child) and blood borne transmission are highly predictable and efficient modes of transmission. Their study revealed that approximately 25% of newborns from HIV-positive mothers are infected through vertical transmission. A person transfused with a unit of contaminated blood almost always becomes infected, while only about 0.3% of people pricked with a large hollow needle get infected with HIV. The probability of transmission during sexual contact in a steady partnership ranges from 0.1-0.5% per contact (Vernazza *et al*., 1998:156). However, transmission through sexual contact is considered highly variable and factors influencing the probability of infection are discussed in more detail in the section on risk factors.

The trends in mode of transmission seem to differ significantly across the world. In Latin America and the Caribbean the majority of patients infected with HIV are men who have unprotected sex with other men and IDUs sharing needles. By 1999 most of the 420 000 patients living with HIV/AIDS in Eastern Europe and Central Asia were people who had been infected through needle sharing among IDUs. Due to the availability of antiretroviral treatment there has been a decrease in for example Mother-to-child transmission of HIV in industrialized countries such as North-America, Western Europe and the Pacific (WHO, 2000b). The pattern of transmission is thus far more blended in these industrialized countries than in for example sub-Saharan Africa, where around 90% of reported AIDS cases had been transmitted through heterosexual transmission (WHO, 2000b).

2.3.2 Risk factors

Worth mentioning first of all is the fact that sexual transmission of HIV is a relatively inefficient way to infect a person and usually requires repeated unprotected exposure, as seen in the above section on transmission. What is so interesting is that although this is such an ineffective method, it is still the main driver in the spread of the global HIV epidemic (WHO, 2000a). The question that begs to be asked then is: how can this be?

Objective number two of the National Strategic Plan (NSP, 2011:39) states that much attention will be given to prevention efforts in areas of high-transmission and to key populations where the campaign can have the greatest impact on preventing new infections.

Many studies have shown that there is a much greater risk of transmission of the virus when for e.g. the skin or mucous membrane is damaged or torn. Sexually transmitted diseases often cause torn or broken skin (Berkow *et al*., 1997:929). It is therefore clear that there are certain factors within a community or between individuals that influence the probability of transmission (or risk of transmission) and infectiousness of HIV; as well as factors that determine the probability of exposure to HIV infection and even factors that influence the disease progression. The latter has already been discussed in the section on the development of AIDS. Now, depending on several different risk factors, the prevalence and HIV incidence can vary remarkably between countries and even within countries and that is what strategic objective number two of the NSP is all about.

To answer the question on how it can be that sexual behaviour is still the leading cause of new infections I must briefly summarise the factors that contribute to this. Dr. Vernazza and colleagues (1998:155) describe the chance of transmission as a function of the infectiousness of the index case, the mode of the sexual contact and the susceptibility of the individual that is exposed to the virus. Although their study focused on sexual transmission it is in many instances also applicable to some other modes of transmission. They conclude that infectiousness is higher in the later stages of disease, during periods of higher blood viral levels and during episodes where there is local inflammation of the genital tract. Disease stage and sexually transmitted diseases thus seem to be the key drivers affecting the infectiousness of HIV. Different sexual behaviours have been pointed out as considerable factors that influence the probability

of transmission. The answer could thus very well be that sexual transmission is very closely linked to the level and intensity of risk behaviours (even beliefs), as well as knowledge of prevention strategies in a given country or community. This means that besides the factors already mentioned, such as the presence of STIs (sexually transmitted infections), other factors like the level of condom use or number of circumcisions also contributes much to the probability of transmission and should be regarded as major risk factors within a community.

Factors that may determine the probability of exposure to HIV infection are often connected to or result from the factors that influence transmission. These factors would include the prevalence of HIV infection in the community and again the level and extent of risk behavior. Considering the factors mentioned, stakeholders should probably spend a little more effort at looking at behavioral surveillance studies to assist in explaining epidemic curves. For example, an increase in IDUs in a certain area could explain an increase in HIV prevalence. The British Medical Journal (Loveday *et al*., 1989:419) stated that there is a need for more appropriate education programmes and intervention strategies for heterosexuals (remember that in 1989 more attention was given to the homosexual spread of HIV). In fact, a lot of articles in that edition of the British Medical Journal were regarding risk factors and this article should have already alerted decision makers to the importance of surveillance studies in determining specific risk factors for any given community.

2.3.3 Pathognomy (signs and symptoms) of HIV/AIDS

Due to the profound suppression of the immune system, patients infected with HIV are ultimately rendered vulnerable to numerous opportunistic infections. The problem, however, is that a person may have been infected with HIV for years before developing the distinctive infections or tumors that are indicative of AIDS. People who have been infected with HIV can experience many symptoms and these can occur due to HIV disease and progression or due to co-morbidities and secondary complications of co-morbidities. It is nevertheless important to identify symptoms, because effective management and control of symptoms do improve the quality of life for patients infected with HIV/AIDS (Holzemer, 2002:49).

Shortly after HIV infection many patients develop symptoms similar to those of infectious mononucleosis (kissing disease). These include normal flu-like symptoms

such as fever, but also swollen lymph nodes and a rash (Berkow *et al.*, 1997:929). These symptoms appear during the first stage, which is called primary HIV infection and can be identified shortly after infection by the sudden appearance of HIV anti-bodies or the identification of viral products (WHO, 2007:10).

The most effective way to describe or define the signs and symptoms of HIV/AIDS, however, is by using the revised WHO clinical staging model. In this model there are four distinctive stages of HIV/AIDS. The clinical staging system is only used after HIV infection has been established. There should thus be serological or virological evidence of HIV infection. The clinical staging model is widely used as a very important tool in assessing patients at baseline, making decisions regarding when to implement life-long ARV treatment, monitoring patients at follow-up visits and even to determine the prognosis and progression of clinical HIV disease in patients not on any treatment (WHO, 2007:11).

The subsequent table shows simplified terms for each stage described symptomatically:

Table 2-1: WHO clinical staging of established HIV infection

Associated HIV symptoms	WHO clinical stage
Asymptomatic	Clinical Stage 1
Mild Symptoms	Clinical Stage 2
Advanced Symptoms	Clinical Stage 3
Severe Symptoms	Clinical Stage 4

(Adapted from WHO 2007:11-Table 1)

It is furthermore very important to know the exact defined symptoms of the different stages. Many countries, including South Africa, use the clinical symptoms to determine the disease stage and to make decisions regarding the initiation of ARV treatment.

The WHO Clinical Staging of HIV/AIDS in adults and adolescents with confirmed HIV infection follows below (WHO, 2007:11). The description of stages is according to clinical events including symptoms and opportunistic infections.

Clinical Stage 1

- Asymptomatic
- Persistent generalized lymphadenopathy

Clinical Stage 2

- Unexplained persistent hepatosplenomegaly
- Papular pruritic eruptions
- Extensive wart virus infection
- Extensive molluscum contagiosum
- Fungal nail infections
- Recurrent oral ulcerations
- Unexplained persistent parotid enlargement
- Lineal gingival erythema
- Herpes zoster
- Recurrent or chronic upper respiratory tract infections (otitis media, otorrhoea, sinusitis or tonsillitis)

Clinical Stage 3

- Unexplained moderate malnutrition not adequately responding to standard therapy
- Unexplained persistent diarrhea (14 days or more)
- Unexplained persistent fever (above 37.5°C intermittent or constant for longer than one month)
- Persistent oral candidiasis (after first 6–8 weeks of life)
- Oral hairy leukoplakia
- Acute necrotizing ulcerative gingivitis or periodontitis
- Lymph node tuberculosis
- Pulmonary tuberculosis
- Severe recurrent bacterial pneumonia
- Symptomatic lymphoid interstitial pneumonitis
- Chronic HIV-associated lung disease, including brochiectasis
- Unexplained anaemia (< 8 g/dL), neutropaenia (< 0.5 × 109 per litre)

- And/or chronic thrombocytopaenia (< 50 × 109 per litre)

Clinical Stage 4

- Unexplained severe wasting, stunting or severe malnutrition not responding to standard therapy
- Pneumocystis pneumonia
- Recurrent severe bacterial infections (such as empyema, pyomyositis, bone or joint infection or meningitis, but excluding pneumonia)
- Chronic herpes simplex infection (orolabial or cutaneous of more than one month's duration or visceral at any site)
- Extrapulmonary tuberculosis
- Kaposi sarcoma
- Oesophageal candidiasis (or candidiasis of trachea, bronchi or lungs)
- Central nervous system toxoplasmosis (after one month of life)
- HIV encephalopathy
- Cytomegalovirus infection: retinitis or cytomegalovirus infection affecting another organ, with onset at age older than one month.
- Extrapulmonary cryptococcosis (including meningitis)
- Disseminated endemic mycosis (extrapulmonary histoplasmosis, coccidiomycosis)
- Chronic cryptosporidiosis
- Chronic isosporiasis
- Disseminated non-tuberculous mycobacterial infection
- Cerebral or B-cell non-Hodgkin lymphoma
- Progressive multifocal leukoencephalopathy
- Symptomatic HIV-associated nephropathy or HIV-associated cardiomyopathy
- HIV-associated rectovaginal fistula

(Adapted from WHO 2007:11-Table 3)

The list for children with established HIV infection is the same as the above adult list of clinical events. The WHO does recommend that the list may have some additions for regional classifications. The only addition in South Africa for both the adult and paediatric lists that is not standard on the normal WHO clinical staging document, is HIV-associated rectovaginal fistula which is more endemic to the African setting. The paediatric ARV treatment guidelines in South Africa (Department of Health, 2010b:13) goes further in listing and highlighting the following as signs and conditions that are very specific to an HIV-infected child:

- Pneumocystis jirovecii pneumonia (PCP)
- Oesophageal candidiasis
- Extrapulmonary cryptococcosis
- Invasive Salmonella infection
- Lymphoid interstitial pneumonitis (LIP)
- Herpes zoster affecting several dermatomes
- Kaposi sarcoma
- Lymphoma
- Recto-vaginal or recto-vesical fistula

2.3.4 Diagnosis

The most common current practice is to use an ELISA test. ELISA is short for Enzyme-Linked Immunosorbent Assay (Dorland's illustrated medical dictionary, 2012:605), which is a test that utilizes an enzyme-labeled immunoreactant (antigen or antibody) and an immunosorbent (antigen or antibody bound to a solid support). It is a highly accurate and relatively simple test. The only problem is that it may take several weeks or even months after infection for enough antibodies to develop (Berkow *et al*., 1997:931). If an HIV-antibody test is done before seroconversion is complete, then it will not be positive (Cichocki, 2007). During the time before seroconversion a test like the highly sensitive P24 antigen test could detect the virus. In certain developed countries an even more accurate and more expensive test called the Western blot test can be used to confirm the diagnosis of HIV infection. In resource poor settings however, a

rapid test will be done initially and the ELISA test is considered as the confirmation of HIV infection.

2.4 Treatment

Treatment strategies are regularly updated or changed in most countries. This has been happening since the beginning of the epidemic and will most probably continue for as long as new developments are taking place and more evidence of clinical benefits of newer drugs become available. Guidelines are therefore constantly changing, which means that there are sometimes slight and occasionally significant differences between the guidelines of different countries.

Limited clinical data is available for the treatment of acute HIV infection, but confidence is growing that early treatment could reduce the symptoms experienced during seroconversion, limit damage to the immune system, reduce viral mutations, decrease the risk of transmission to sexual partners and reduce the viral set point once treatment is stopped (Sweetman, 2011:945). At this point in time the most common short course (acute) use of ARV treatment is post-exposure prophylactic (PEP) treatment and PMTCT (Prevention of Mother-To-Child Transmission). The US treatment guidelines state that treatment of acute HIV infection is optional, while the UK guidelines do not advocate routine use of treatment in early HIV infection (DHHS, 2012). The current US guidelines strongly recommend starting therapy in all individuals with a CD4 count of ≤350 cells/mm^3, all HIV-infected pregnant women, patients with HIV nephropathy or any AIDS-defining illness and those co-infected with Hepatitis B virus (DHHS, 2012). The UK guidelines, on the other hand, still states that patients with a CD4 count less than 200cells/mm^3 for more than three months and patients with neurological involvement or any AIDS-defining condition should be initiated on ARV treatment.

According to the guidelines for the use of antiretroviral agents in HIV-1-infected adults and adolescents published by the Department of Health and Human Services in the US (DHHS, 2012), the primary goals of ARV therapy is:

- To reduce HIV-associated morbidity and prolong survival
- Restore and maintain immunologic function
- Suppress the viral load optimally and keep it undetectable for as long as possible
- Prevention of HIV transmission

These are very similar to the goals of Dr. Bartlett (also the co-chair of the DHHS panel) mentioned in Chapter 1, with the exceptions of avoiding adverse drug reactions and preventing HIV-associated complications. Together with the fact already mentioned that most of the drugs available to treat HIV have substantial side-effects and are taken for life, it becomes clear that guidelines had to be developed on when the appropriate time is to start ARV treatment.

Again there are numerous discussions around the benefits or detrimental effects of earlier initiation of treatment. Even the DHHS panel that compiles the recommendations in the US guidelines for the use of antiretroviral agents was divided concerning the importance of starting treatment at higher CD4 levels. Although the panel agreed that treatment can be started at CD4 counts of between 350 and 500 cells/mm^3, 55% of members felt that it should be strongly recommended and 45% voted for only a moderate recommendation. Half of the panel voted that treatment should also be started for patients with CD4 counts of >500 cells/mm^3 and 50% voted that it should be optional (DHHS, 2009:22). One of the biggest concerns in starting therapy at higher CD4 levels (>500 cells/mm^3) seems to be the fact that a patient will then spend a longer period of time on treatment. A longer period of exposure to ARV treatment equals a greater risk of developing toxic side-effects or drug resistance. Another challenge is that many patients with CD4 levels above 500cells/mm^3 do not yet experience symptoms of HIV disease and thus probably have a good quality of life (DHHS, 2009:111). It then stands to reason that if most of the current first-line regimens of HAART can cause side-effects and reduce quality of life, then why initiate therapy at higher CD4 counts? The conclusion that most countries made in their guidelines was that there should be criteria for conditions that favour more rapid initiation of therapy.

2.4.1 Antiretroviral therapy in chronic HIV infection

Both the primary and secondary goals of antiretroviral therapy have already been stated. It has also by now been concluded that to achieve goals such as preventing or restoring immunodeficiency, a patient will have to take an ARV drug. The challenge, however, is that one of the secondary goals is to avoid resistance to antiretroviral drugs. To try and solve this, the use of antiretroviral drugs in combination therapy was developed to prevent or delay drug resistance (Sweetman, 2011:945). This combination therapy quickly proved to be very effective in slowing down, stopping and even

reversing the progress of the virus, as well as minimising drug resistance. The combination of three antiretroviral drugs, as mentioned in Chapter 1, is called HAART (Highly Active Antiretroviral Therapy) and usually consists of a combination of two Nucleoside/Nucleotide Reverse Transcriptase Inhibitors (NsRTI/NtRTI) and either a Protease Inhibitor (PI) or a Non-Nucleoside Reverse Transcriptase Inhibitor (NNRTI). Unfortunately even the development of HAART has a number of problems, of which the high cost of combination therapy, especially in developing countries, is probably the biggest issue.

2.4.2 Drug classes

According to Powderly (2010:2485) it was during the late 1980's that three HIV-specific, virally encoded enzymatic processes were identified and became clear targets for antiviral therapy. Antiretroviral drugs have since been classed according to their ability to interact with these processes, and only one other drug class has been added. The following is a short description of the five main drug groups.

2.4.2.1 Nucleoside and Nucleotide Reverse Transcriptase Inhibitors

Drugs in this class are commonly only referred to as NRTIs (NsRTI/NtRTI). Both nucleoside and nucleotide reverse transcriptase inhibitors, like all other available ARV drugs, can only prevent the infection of susceptible cells and cannot destroy the virus in cells that already contains integrated proviral DNA (Brunton *et al*., 2011:1631). This class of drugs works by inhibiting the reverse transcriptase enzyme that converts viral RNA into proviral DNA, preventing the virus from making new copies of itself. The NRTI drugs are active against HIV-1 and HIV-2. Some of the drugs (AZT) are active against HTLV I and II (Human T-cell Lymphotropic virus type I and II), and even used in treating chronic Hepatitis B infection (3TC, FTC, TDF). All drugs in this class are nucleoside reverse transcriptase inhibitors, with Tenofovir being the only nucleotide reverse transcriptase inhibitor.

Current, globally available drugs in this class include (Brunton *et al*., 2011:1631):

[Known active ingredient name, with commonly used abbreviation in brackets]

- Zidovudine / 3'-azido-3'-deoxythymidine / (AZT)
- Stavudine / 2',3'-didehydro-2',3'-dideoxythymidine / (d4T)

- Lamivudine / (-)2',3'-dideoxy, 3'-thiacytidine / (3TC),
- Abacavir / (ABC),
- Tenofovir (TDF),
- Emtricitabine (FTC),
- Didanosine (ddI),
- Zalcitabine (ddC) - Not marketed anymore due to toxicity and the need for three times a day dosing.

2.4.2.2 Non-Nucleoside Reverse Transcriptase Inhibitors

The group, abbreviated as NNRTIs, also works on the reverse transcriptase enzyme, but they act as non-competitive inhibitors. The NNRTI group is active against HIV-1, but unlike the NRTI group, they are not active against HIV-2 or other retroviruses. Although these drugs are potent and highly effective, they are very susceptible to high-level drug resistance (except Etravirine). Even a single dose of Nevirapine administered as monotherapy has shown resistance mutations in up to 30% of patients (Eshleman *et al*., 2004). Worth mentioning is that the pharmacokinetic properties of Nevirapine (NVP) in pregnant HIV-positive women differ from non-pregnant HIV-positive women and could according to Schafer *et al*. (2011:358) contribute to the high incidence of NVP resistance in this group. For example, the median half-life of NVP is 61.3 hours in pregnant women and only 20 hours in non-pregnant women. Keep in mind that this high chance of resistance is only when given as monotherapy and not when given in combination therapy.

Current, globally available drugs in this class include (Brunton *et al*., 2011:1631):

[Known active ingredient name, with commonly used abbreviation in brackets]

- Nevirapine (NVP)
- Efavirenz (EFV)
- Etravirine (ETV)
- Rilpivirine (New drug)

2.4.2.3 Protease Inhibitors

Protease Inhibitors (or PIs) competitively inhibits the HIV-aspartyl protease. Inhibiting the protease enzyme prevents the maturation of the HIV-virus particles to their mature infectious form. Only immature and non-infectious virus particles are then released from the host cell (Hughes *et al*., 2011:332). Protease Inhibitors have strong action against HIV-1 and can be used to treat both acutely and chronically HIV-infected cells. Most of these drugs are considered potent with favourable resistance profiles (Brunton *et al*., 2011:1648).

Current, globally available drugs in this class include (Brunton *et al*., 2011:1631):

[Known active ingredient name, with commonly used abbreviation in brackets]

- Atazanavir (ATV)
- Darunavir (DRV)
- Fosamprenavir (FPV)
- Indinavir (IDV)
- Lopinavir (LPV)
- Nelfinavir (NFV)
- Ritonavir (RTV)
- Saquinavir (SQV)
- Tipranavir (TPV)

2.4.2.4 Entry Inhibitors

To date there are only two drugs available in this class, Maraviroc and Enfuvirtide. Although both these drugs are Entry Inhibitors (EI), their methods of action are different. Maraviroc targets the host protein, then binds to the CCR5 receptor of the host cell and blocks the binding of the HIV-envelope protein gp120 (Brunton *et al*., 2011:1656). Maraviroc is therefore only effective against CCR5-tropic strains of HIV. Enfuvirtide blocks the fusion that takes place between the host cell membrane and the virus membrane lipid bilayer. This is done by inhibiting the mediation of the HIV-fusion protein gp41 and the CD4 receptor.

2.4.2.5 Integrase Inhibitors

Although the first Integrase Strand Transfer Inhibitor (INSTI) has only relatively recently been approved for clinical use, results already seem to show that it would be a valuable and lasting part of HIV treatment in the future (Powderly, 2010:2485). The process of integration where the viral DNA transfers into the host cell chromosome is divided into three steps. The last step, called strand transfer, is inhibited by the INSTI drug and thus prevents the formation of covalent bonds between the host and viral DNA, preventing the viral DNA from entering the host chromosome. The only available drug in this class is Raltegravir (Powderly, 2010:2485). Worth noting is that due to its distinctive mechanism of action, Raltegravir could still be active against virus mutations that have become resistant to other ARV drugs.

2.4.3 Treatment adherence, resistance and adverse drug reactions

For a long time, much of the world's attention was on increasing access to treatment. However, times are changing and as access to treatment is improving, increased attention is now paid to adherence to treatment. Adherence has especially become a renewed focus point in treating HIV-infected patients with the advent of triple-drug regimens (HAART). After the initiation of multidrug regimens, it seemed as if the greater number of medications, the complexity of the regimen and the occurrence and severity of side-effects were influencing long-term adherence to treatment (Abellàn *et al*., 1999:202). The study that Abellàn and colleagues (1999:203) performed in Spain shows a number of interesting results. Noteworthy first of all, is that in their study no differences were found in the degree of adherence between different ages and gender. However, to further highlight the suspicion that the burden of taking pills regularly was an important factor in adherence, they found that patients on a regimen that required taking medication twice daily were more adherent than the patients on regimens that needed administration three times a day. Their study also found that after four months of monitoring, the patients with good adherence had a higher CD4 cell increase and a greater viral load decrease than the patients with poor adherence. In fact, according to their study 75% of adherent patients had a viral load of <500 copies/ml after four months, whereas only 40% of non-adherent patients reached this level.

Resistance to ARV treatment can either be classified as transmitted resistance, in which case a previously uninfected person is infected with an already drug-resistant virus, or

as acquired resistance, where resistant mutations (due to viral replications) develop in a person who receives ARV treatment (WHO, 2012b:5). According to Tang and Shafer (2012) it is the activity of each of the individual drugs in a regimen and the number of mutations needed to develop resistance to each drug that determines the efficacy of an ARV treatment regimen. Mutations can consequently modify the response to antiviral agents (Balint, 2001:23). The reason for collaborating adherence andresistance in this section is because in many instances almost perfect adherence to ARV drugs is needed to avoid the development of drug resistance and to actually achieve reduced mortality and morbidity (Department of Health, 2010b:28). The agreement seems to be that at least 95% adherence to treatment is needed to avoid viral resistance and produce the best possible effects from ARV treatment (Paterson *et al*, 2000; Department of Health, 2010b:28). With the increase in access to ARV treatment over the past few years it became clear that if knowledge on the importance of good adherence to treatment is not widely known, the danger exists that because more and more patients are put on treatment, we could also see an increase in the transmission of resistant viral strains. In Japan, Australia, the United States of America and in Europe 10-17% of ARV treatment naïve patients are infected by a virus already resistant to at least one ARV drug (WHO, 2012b:5).

There are numerous reasons for poor adherence to treatment, which as discussed above could lead to drug-resistance. Reda and Biadgilign (2011:4) summarized the factors that influenced adherence in their open access article as shown in the table below:

Table 2-2: Factors that influences patient adherence to HAART

Patient adherence to ART			
Patient-and family-/caregiver related factors	**Medication related factors**	**Health care delivery systems related factors**	**Social/ environmental related factors**
Disclosure of HIV status	Too many pills	Limited availability of and accessibility to ARV's	Living conditions
Sex of the patient	Side-effect of the drugs	Healthcare facilities for diagnosis and treatment of HIV	Stigma and discriminations
Age of the patient	Scheduling problems	Healthcare providers experienced in HIV treatment	Multiple caregivers
Active drug and alcohol use by patient or	Access to medication	Patient-provider relationship, availability	Financial problems

Patient adherence to ART			
Patient-and family-/caregiver related factors	**Medication related factors**	**Health care delivery systems related factors**	**Social/ environmental related factors**
caregiver		of counseling services	
Substance abuse	Access to medical care	Health education/ information	Structural social support
Perceptions of the medication	Frequency of daily doses	Provision of privacy	Income
Presence of anxiety, depression	Length of the treatment		
The presence of HIV infection in another family member	Administration of the drug		
Family disruptions	Child refusal/vomiting		
Psychosocial factors	Self-discontinuations		
Education	Need for daily administration		
Cognitive impairment	Dietary restrictions		
His/her own knowledge about ART, belief in ART	Drug interactions		

(Adapted from Reda & Biadgilign, 2011:4-Figure 1)

According to this research, medication related challenges including issues such as the characteristics of drug formulations, for instance the taste, palatability, availability of liquid dosage forms, size of the capsules or tablets and side-effects of the drugs, can considerably affect adherence (Reda & Biadgilign, 2011:4). The side-effects to a drug are also commonly referred to as Adverse Drug Reactions (ADRs). From time to time a Serious Adverse Event (SAE) can occur. The seriousness of adverse events is graded from Grade 1 to 4 and then death. In South Africa all grade 4 to death SAEs must be reported to the Medicine Control Council (MCC) within 48-72 hours (Department of Health, 2010b:35). The following is a combined summary of the common and uncommon side-effects or adverse drug reactions as noted in the South African adult and adolescent as well as paediatric guidelines on ARV treatment:

Table 2-3: Summary of side-effects or adverse drug reactions by ARV drug and drug class

Drug class	ARV Drug	Side-effect or ADR
NRTI	Abacavir	Hypersensitivity reaction that can present with or without a rash. Could be fatal for adults and children.
	Didanosine	Abdominal pain, nausea and vomiting, pancreatitis, lactic acidosis, peripheral neuropathy, hyperlactataemia
	Emtricitabine	Generally well-tolerated.
	Lamivudine	ADR's uncommon and generally well-tolerated, especially in adults. Uncommon symptoms include: Headache, fatigue, abdominal pain, pancreatitis, peripheral neuropathy, lactic acidosis.
	Stavudine	Abdominal pain, nausea and vomiting, lipoatrophy, lipodystrophy, peripheral neuropathy, lactic acidosis, pancreatitis, hepatic steatosis, hyperlactataemia
	Tenofovir	Neprotoxicity
	Zidovudine	Headaches, GIT symptoms, Bone marrow suppression (anaemia, neutropenia), hyperlactataemia, lactic acidosis, myopathy
NNRTI	Efavirenz	Skin rash, CNS symptoms such as sleep disturbance, confusion, abnormal thinking and vivid dreams. Hepatitis. Possibly teratogenic.
	Nevirapine	Hepatitis that can be fatal. Skin rash from mild to severe allergic reaction and possibly fatal. Diarrhoea and sedative effects.
PI	Lopinavir/Ritonavir	GIT symptoms like nausea, vomiting, but mostly diarrhoea. Lipid and glucose abnormalities (hypercholesterolaemia and hypertriglyceridaemia)
	Ritonavir	Nausea, vomiting, diarrhoea, hypercholesterolaemia and hypertriglyceridaemia.

(Adapted from Department of Health, 2010b:82-Table 19; Department of Health, 2010c:26-27-Table 16)

2.4.4 Treatment guidelines

For the purpose of this study the focus falls more extensively on the most recent South African Guidelines. The importance of excellent timing when it comes to starting ARV treatment has already been emphasized. Therefore, almost all guidelines begin with eligibility criteria. The South African guidelines for adults and adolescents (2010c:8) stipulate the following as standard criteria:

HIV-positive patients eligible to start HAART:

- All patients with a CD4 count ≤ 200cells/mm^3 irrespective of clinical stage
- All patients co-infected with TB and a CD4 count ≤ 350 cells/mm^3
- All pregnant women with a CD4 count ≤ 350 cells/mm^3
- All patients diagnosed as WHO stage four disease, irrespective of CD count
- Patients infected with MDR/XDR-TB, irrespective of CD count

The standard in South Africa is that all eligible patients should start ARV treatment within two months after the clinical event or reaching the qualifying CD4 count. There are also patients who qualify for what is called fast-tracking, which means that the following patients need to be initiated within two weeks of becoming eligible (Department of Health, 2010c:8):

- Pregnant women eligible for life-long ARV
- Patients with very low CD4 counts (<100 cells/mm^3)
- Patients in clinical stage four and their CD4 counts not yet available
- Patients infected with MDR/XDR-TB

It is a well-known fact that a combination of ARV drugs could prevent or delay drug resistance (Balint, 2001:23). When treating a patient, the combination of three ARV drugs (HAART) is also called a regimen. Once a patient has qualified or become eligible for ARV treatment, the next logical step is to determine the best regimen for that patient. As additional new drugs become available on the market a wider variety of possible combinations of drugs is created, thus forming an increasing number of possible regimens. The following was the most up-to-date available and revised national standard ARV treatment regimens for adult and adolescent patients in SA during the data collection period (Department of Health, 2010c:9):

Table 2-4: 1st Line adult and adolescent ARV treatment

Regimen	Indication and noteworthy remarks included in the guideline
TDF + 3TC/FTC + EFV/NVP	Currently the first choice for all new patients in need of ARV treatment. For patients co-infected with TB the preferred drug would be EFV. For pregnant patients and women of child bearing age, not on a reliable contraceptive, NVP is preferred.
d4T + 3TC + EFV/NVP	For patients currently on a d4T-based regimen with no side-effects. Patients can remain on this regimen but need to switch at the first signs of d4T toxicity. Patients at high risk for toxicity (Older, high BMI, Female and TB treatment) should substitute with TDF.
AZT + 3TC + EFV/NVP	All patients with contra-indications to TDF e.g. renal disease.

(Adapted from Department of Health, 2010c:9-Table 2)

Table 2-5: 2nd Line adult and adolescent ARV treatment

Regimen	Indication and noteworthy remarks from the guideline
TDF + 3TC/FTC + LPV/r	For patients with virological failure on a d4T or AZT-based 1st line regimen. Intensive adherence management is recommended, but if the viral load remains > 1000 copies after 3 months, the patient should be switched.
AZT + 3TC + LPV/r	For patients with virological failure on a TDF-based 1st line regimen. Intensive adherence management is recommended, but if the viral load remains > 1000 copies after 3 months, the patient should be switched.

(Adapted from Department of Health, 2010c:9-Table 2)

HIV-infected children are a particularly vulnerable group of patients and their guidelines are slightly more complicated. As with adults there are clinical criteria and CD4 counts that have to be considered before initiating ART (Department of Health, 2010b:28). The exception in paediatrics is that all children that have been diagnosed as HIV-infected that are younger than one year of age should be started on ARV medication regardless of CD4 count and even if the child is asymptomatic. According to the comprehensive guideline for management of HIV-infected children published by the National Department of Health in South Africa in 2010 (Department of Health, 2010b:10) there is evidence that 40% of HIV-infected children die before reaching age one. Due to a still underdeveloped immune system the disease itself will progress faster in children than in adults and without treatment most children born infected with HIV will develop features of AIDS within six months (Department of Health, 2010b:10). That is the reason why it is

very important to identify children who are infected by HIV as early as possible and to start treatment.

Screening (identifying) and testing children for HIV infection is another challenge with a list of things to keep in mind. Modes of transmission for e.g. are similar to that of adults, but healthcare workers should also be more vigilant in looking out for sexual assault victims and traditional scarification (Department of Health, 2010b:9). Testing is done, like with adult patients, by using rapid tests and laboratory HIV antibody detection tests (ELIZA). But again there are the exceptions in children. HIV antibodies from the mother will be vertically transmitted via the placenta to the baby. The HIV antibodies from the mother can remain in the bloodstream of her infant for up to 18 months after birth. The antibody tests are unable to differentiate between the mother's antibodies and that of the child. The popular term HIV-exposed is then used to describe the child's status when HIV antibodies are detected in any infant younger than 18months, thus meaning that the child was born from an HIV-infected mother (Department of Health, 2010b:14). An HIV viral detection test must be used to confirm infection in all children younger than 18 months of age. The test currently used in South Africa is the HIV DNA PCR (polymerase chain reaction) test. Once the viral load has been established the decision regarding initiating ART can be made, keeping in mind that all the tests can only be considered to be final if the child has not been breastfed within the last six weeks.

As with the adult and adolescent guidelines, paediatric guidelines also have eligibility criteria. However, it is vital to note that with children there are clinical as well as important social criteria to be met. The following is the South African criteria for initiating treatment in children as adapted from the national guidelines in managing HIV infection in children (2010b:30):

Table 2-6: Clinical Criteria for initiating ARV treatment after confirmation of diagnosis of HIV infection

Age of child	Eligibility criteria
Children younger than one year	All children <12months should be initiated on ART
1 to 5 years	Symptomatic (stage III or IV) or CD4 ≤ 25% or absolute CD4 count <750 cells/mm^3
≥ 5 years	Symptomatic (stage III or IV) or CD4 count<350cells/mm^3

The following social criteria are considered extremely important in determining the success of the programme (Department of Health, 2010b:30):

- Most importantly, there should to be an identifiable caregiver who is responsible for the child and who will ensure that medication is administered correctly as prescribed. This is challenging, for e.g. when considering HIV-infected orphans.
- Disclosure to another adult in the same household is strongly encouraged to ensure that there is someone else who can help with caring for the child.

When managing paediatrics, it is furthermore important to know that besides the normal baseline information such as CD4 and viral load that is necessary, it is also essential to have the child's weight, height, age and developmental level when initiating ART. The following is the latest revised treatment guidelines for paediatric patients in South Africa:

Table 2-7: 1st Line regimen for initiation of paediatric patients on ARV's (or ARV naïve patients)

< 3 years or < 10 kg	> 3 years or > 10 kg
Abacavir (ABC) + Lamivudine (3TC) + Lopinavir/Ritonavir (LPV/r)	Abacavir (ABC) + Lamivudine (3TC) + Efavirenz (EFV)

(Adapted from Department of Health, 2010b:30-Table 10)

These are the revised guidelines. In the previous guidelines Stavudine (d4T) was the recommended drug in the place of Abacavir (ABC). The new guidelines do stipulate that all patients currently on Stavudine (d4T) without any side-effects should continue taking it. Only once any lipodystrophy is suspected should the Stavudine be substituted for Abacavir (Department of Health, 2010b:30).

Second line regimens in paediatrics are more restricted with fewer options than adult treatment guidelines. It is preferable to switch the entire 1st regimen for a 2nd regimen to avoid limiting future treatment possibilities. Only when full viral suppression has been achieved may a single drug be switched from a 1st to a 2nd line regimen product if there is intolerance or severe side-effects to a specific drug (Department of Health, 2010b:32).

Table 2-8: 2nd Line ARV regimen for paediatric patients who fail on a 1st line regimen

Drug regimen which has failed:	Possible action to be taken:
For any 1st line regimen containing Lopinavir/Ritonavir (LPV/r) or where the child is < 3 years old	Patient must be referred to next level of care for specialist opinion
Abacavir (ABC) + Lamivudine (3TC) + Efavirenz (EFV)	Change to: Zidovudine (AZT) + Didanosine (ddI) + Lopinavir/Ritonavir (LPV/r)
Zidovudine or Didanosine based regimens (provided that Lopinavir/Ritonavir is not part of the regimen)	Change to: Abacavir (ABC) + Lamivudine (3TC) + Lopinavir/Ritonavir (LPV/r)

(Adapted from Department of Health, 2010b:32-Table 13)

For further specifications on adult or paediatric regimen names or codes as used in the data collection tool for this study, as well as specific dosages of drugs, refer to appendices 3 and 4.

2.4.5 Prevention therapies

2.4.5.1 Prevention of Mother-To-Child Transmission (PMTCT) of HIV

For all HIV-infected children under five years the most common route of transmission is vertical transmission from mother-to-child (Department of Health, 2008a:23). In 2008 the Southern African HIV Clinicians Society published an update on antiretroviral therapy for adults in the summer edition of the Southern African Journal of HIV medicines (SAHIVCS, 2008:1). According to them the leading cause of deaths in pregnant women for the Southern Africa region is AIDS. They continue by describing that AIDS in children born from HIV-positive mothers is a major factor contributing towards the increased morbidity and mortality amongst these children. Even an uninfected child has four times the risk of premature death if his or her mother has died from AIDS (Department of Health, 2010b:10). To assist in combating both the high mortality rate of children as well as the high maternal mortality, a comprehensive PMTCT programme was developed in 2000, piloted at identified sites in 2001 and implemented nationally in 2002 (Department of Health, 2008a:13).

Below are the four main elements of the South African PMTCT programme (Department of Health, 2010d:8):

- The primary prevention of HIV infection, especially in women of child bearing age.
- Preventing unplanned pregnancies in HIV-infected women.
- Vertical Transmission Prevention (VTP) which is the prevention of HIV transmission from an HIV-infected mother to her baby.
- To provide suitable treatment, care and support to women living with HIV, as well as their children and families.

Although the process of PMTCT starts from antenatal care and continues deep into postnatal care (Department of Health, 2010d:10), focus for the purpose of this section of the study only falls on the current treatment options to prevent vertical transmission or Mother-To-Child Transmission (MTCT) of HIV.

Transmission of HIV from mother to baby can occur during pregnancy, childbirth or any time while an HIV-positive mother is still breastfeeding her infant (Department of Health, 2010b:9). According to the South African National Department of Health guidelines for management of HIV in children (2010b:9) approximately 30% of HIV-exposed children will be infected with the virus if no steps are taken to prevent transmission. Intervention strategies to prevent MTCT differ only slightly between the antenatal care period, during labour and delivery and in the postnatal period. However, identifying mothers (antenatal and labour periods) or babies (delivery and postnatal care) to enter into the PMTCT programme is vital throughout the process. The provision of ARV treatment (to the mother) or ARV prophylactic treatment (to the infant) is central to the PMTCT programme (Department of Health, 2010d:10-12). The eligibility criteria for pregnant women are unmistakably aimed at prompt introduction of therapy. The following table shows the South African standardized guidelines, criteria and comments for HIV-infected pregnant women:

Table 2-9: South African treatment guidelines, criteria and comments for HIV-infected pregnant women

ART Regimen	Eligibility criteria and comments
Tenofovir (TDF) + Lamivudine (3TC) / Emtricitabine (FTC) + Nevirapine (NVP)	Pregnant women eligible for lifelong HAART if: CD4 ≤ 350 cells/mm^3 WHO clinical stage 3 or 4 TB/HIV co-infected Lifelong HAART should be initiated within two weeks (Some exceptions do apply, for details see special guidelines on TB/HIV co-infection below)
Zidovudine (AZT) + Lamivudine (3TC) + Nevirapine (NVP)	Standard ART regimen for pregnant patients with contraindications to Tenofovir (TDF). E.g. patients with renal disease.
Continue ARV regimen	Women already on ART and testing pregnant should continue their current regimen. The exception here is women that are on a regimen containing Efavirenz (EFV) and still in the first 12 weeks of pregnancy, then the EFV needs to be substituted for Nevirapine (NVP).
Zidovudine (AZT) from 14 weeks + When in labour: Single dose Nevirapine (sdNVP) + Zidovudine (AZT) 3 hourly until delivery + Immediately after delivery a single dose of: Lamivudine (3TC) and Emtricitabine (FTC)	This is the complete recommended guideline for all HIV-positive expecting mothers who are not yet eligible for lifelong ART e.g.: CD4 > 350 cells/mm^3 And WHO clinical stage 1 or 2
Presenting in labour: Single dose Nevirapine (sdNVP) + Zidovudine (AZT) 3 hourly until delivery + Immediately after delivery a single dose of: Lamivudine (3TC) and Emtricitabine (FTC)	For all HIV-positive women who were not booked and did not attend antenatal care, but presents at a healthcare facility in labour.

(Adapted from Department of Health 2010d: 30-Table 1)

The South African PMTCT guidelines clearly state that all HIV-positive pregnant women should be given lifelong ARV treatment if they have a CD4 count of ≤ 350 cells/mm^3 or are clinically classified as WHO stage 3 or 4, not only for the well-being of the mother, but also to prevent MTCT (Department of Health, 2010d:25). Pulmonary Tuberculosis

(PTB) is a clinical stage 3 disease according to the revised WHO clinical staging system (WHO, 2007:16). All HIV-positive pregnant women co-infected with Tuberculosis then automatically qualify for ARV treatment, regardless of CD4 count. The following table summarises the special guidelines pertaining to the prioritization of TB treatment in TB/HIV co-infected pregnant patients and is supplementary to the above table (Department of Health, 2010d: 26):

Table 2-10: Prioritization of TB treatment in TB/HIV co-infected pregnant patients

Clinical criteria	Recommended action
CD4 count > 250 cells/mm^3	First start with TB treatment and only initiate ART from 12 weeks gestation and after patient has stabilized on TB treatment (2-8 weeks after TB treatment was started).
CD4 count < 250 cells/mm^3	First start with TB treatment and only initiate ART after patient has stabilized on TB treatment (2-8 weeks after TB treatment was started).
Very low CD4 count of < 50 cells/mm^3 or severe morbidity	Start TB treatment and initiate ART 2 weeks after TB treatment was started.
HIV-positive women already on lifelong ART who develops TB	These patients should receive TB treatment as well as continue with their current ART regimen. If a patient is on an LPV/r containing ART regimen, then the LPV/r dosage should be doubled for as long as the patient receives TB treatment.

(Adapted from Department of Health, 2010d:26)

The choice of infant regimen is directly dependent on the maternal regimen and the type of feeding that the infant will receive. The next table explains the recommendations for infant PMTCT regimens:

Table 2-11: Infant PMTCT regimens

Maternal regimen of mother	Regimen and recommendations for infant
Pregnant women already on lifelong ARV treatment (full HAART regimen)	Infant should be given Nevirapine (NVP) at birth and then daily for 6 weeks irrespective of feeding choice.
Pregnant women on PMTCT regimen	Infant should be given Nevirapine (NVP) at birth and then daily for 6 weeks. If the baby is breastfed NVP should be continued and given daily until breastfeeding is stopped. For formula fed babies NVP can be stopped at 6 weeks.
Mother did not receive any ARV treatment during pregnancy or delivery. Assess the mother for eligibility of ART within 2 weeks.	Infant should be given Nevirapine (NVP) as soon as possible and then daily for at least 6 weeks and continue daily NVP until breastfeeding has stopped.

Maternal regimen of mother	Regimen and recommendations for infant
Status of mother is unknown where for e.g. baby is abandoned or orphaned.	Infant should be tested with an HIV rapid test. If the test can be done within 2 hours then wait for result, if not give NVP stat (immediately). For positive result give NVP for 6 weeks, if negative stop giving NVP. Baby should have a 6 week follow-up HIV DNA PCR test.

(Adapted from Department of Health, 2010d:30-Table 2)

Since Nevirapine (NVP) dosing for HIV-exposed infants will not be discussed further in the study or be shown in an appendix, only a short table used as dosing guide follows:

Table 2-12: Infant Nevirapine for PMTCT dosing chart

(The standard commercially available NVP suspension contains 10mg/ml)

Birth weight and age	NVP dose and volumetric quantity
For infant from birth to 6 weeks with birth weight ≤ 2.5kg	10mg daily / 1ml daily
For infant from birth to 6 weeks with birth weight > 2.5kg	15mg daily / 1.5ml daily
From 6 weeks to 6 months for any weight	20mg daily / 2ml daily
From 6 months to 9 months for any weight	30mg daily / 3ml daily
From 9 months till end of breastfeeding	40mg daily / 4ml daily

(Adapted from Department of Health, 2010:31-Table 4)

2.4.5.2 Co-trimoxazole prophylaxis

Co-trimoxazole (Trimethoprim-sulphamethoxazole) has a proven broad spectrum prophylactic action against some general bacterial pathogens (Zachariah *et al*., 2007:686). Common opportunistic infections against which Co-trimoxazole has a prophylactic action and that frequently present in HIV-infected patients in Sub-Saharan Africa includes: toxoplasmosis, bacterial pneumonia, salmonellosis, isosporiasis (Badri *et al*., 2001:1144). Co-trimoxazole has even been proven effective against the well-known protozoa *Plasmodium* (malaria) (Zachariah *et al*., 2007:686). However, besides all these advantages the most important prophylactic use of Co-trimoxazole is against *Pneumocystis* pneumonia, an often life-threatening disease in immune-compromised patients (Ingraham & Ingraham, 2000:591). *Pneumocystis jirovecii* (previously known as *Pneumocystis carinii*) can be found in the lungs of many people, it seems though that the infection is only reactivated once the immune system of the host is extensively

compromised (Ingraham & Ingraham, 2000:591). That is the reason why *Pneumocystis jirovecii* pneumonia (PCP) used to be very rare and seen only in cancer patients, malnourished infants and patients with suppressed immune systems due to immuno-suppressive drugs. Nowadays however, PCP is considered an AIDS defining disease (Badri *et al*., 2001:1143) and it is one of the leading causes of death amongst HIV-infected patients. Co-trimoxazole is a safe, low-cost, easily administered and widely available drug proven to be very effective, both as treatment of and prophylaxis against *Pneumocystisjirovecii* Pneumonia (PCP) in HIV-infected patients (Chintu *et al*., 2004:1865). Routinely administering Co-trimoxazole to infants at risk of HIV can reduce infant mortality in the African setting by a third to half of HIV-related infant deaths (Zachariah *et al*., 2007:686).

The South African guidelines for giving Co-trimoxazole prophylaxis to adult and adolescent HIV-infected patients can effortlessly and shortly be summarized as follows (Department of Health, 2010c:30-31):

- Co-trimoxazole prophylaxis should be given to all patients with a CD4 count < 200 cells/mm^3 or WHO clinical stage 2, 3 or 4 disease.
- Co-trimoxazole prophylaxis can be stopped once a patient has stabilized on ARV treatment and the CD4 count is >200 cells/mm^3.
- Co-trimoxazole prophylaxis can be restarted if a patient develops a new opportunistic infection or the CD4 count again goes down to < 200 cells/mm^3.
- Pregnant women can safely use Co-trimoxazole prophylaxis.
- Patients who experience mild to moderate adverse symptoms to Co-trimoxazole, can use Dapsone.
- Co-trimoxazole should be administered at a dose of 160mg Trimethoprim/800mg Sulphamethoxazole once daily and Dapsone should be given as 100mg daily.

The guidelines for administering Co-trimoxazole prophylaxis to infants and young children are much more complex. Below is an adapted version of the South African national guidelines for giving Co-trimoxazole to paediatric patients (Department of Health, 2010b:20):

Table 2-13: South African national paediatric guidelines on Co-trimoxazole prophylaxis

Indications for Co-trimoxazole	When to start prophylaxis	When to stop prophylaxis
All HIV-exposed newborns	Start Co-trimoxazole from 4-6 weeks after birth	Stop when PCR is negative ≥6 weeks after full cessation of breastfeeding AND infant is clinically HIV negative
All HIV-exposed exclusive formula feeding (EFF) children	Start Co-trimoxazole from 4-6 weeks after birth	Stop when PCR is negative AND infant is clinically HIV negative AND EFF is expected to continue
All HIV-exposed breast-feeding children	Start Co-trimoxazole from 4-6 weeks after birth	Stop when PCR is negative ≥6 weeks after full cessation of breastfeeding AND infant is clinically HIV negative
HIV-infected infants <12 months old	Start Co-trimoxazole from 4-6 weeks after birth or as soon as possible after HIV diagnosis, even if on ART	All infants <12 months should remain on Co-trimoxazole prophylaxis
HIV-infected children 1 to 5 years of age with or without ART	All symptomatic children (WHO clinical stage 2, 3 or 4) or CD4 <15% or CD4 count < 500 cells/mm^3	Stop once ART-associated immune-reconstitution has occurred for ≥ 6months i.e. CD4 ≥ 15% or CD4 count ≥ 500cells/mm^3 on ≥2 occasions, 3-6 months apart.
HIV-infected children ≥ 6years of age with or without ART	Start Co-trimoxazole if CD4 count < 200 cells/mm^3 or <15% or WHO clinical stage 3 or 4 disease	Stop once ART-associated immune-reconstitution has occurred for ≥ 6 months in children more than 1 year of age i.e. CD4 ≥ 15% or CD4 count ≥ 200cells/mm^3 on ≥ 2 occasions, 3-6 months apart.
Any HIV-infected child with a high risk of bacterial infections or at risk of malaria	Start with Co-trimoxazole prophylaxis even with ART immune-reconstitution	Do not stop until risk has been eliminated and all CD4 cell percentage or CD4 cell count criteria listed above have been met.
HIV-infected child with previous PCP infection	Start as soon as first PCP episode has been treated	Stop at 5 years of age

(Adapted from Department of Health, 2010b:20-Table 7)

The following is a table stipulating the recommended daily dosage for Co-trimoxazole (Trimethoprim-sulphamethoxazole) prophylaxis in children:

Table 2-14: Dosing guidelines for Co-trimoxazole (Trimethoprim-sulphamethoxazole) prophylaxis in paediatrics by age or weight

Age or weight of the child	Recommended daily dose
Age < 6 months OR weight < 5kg	100mg Sulphamethoxazole / 20mg Trimethoprim
Age 6 months to 5 years OR weight 5-15kg	200mg Sulphamethoxazole / 40mg Trimethoprim
Age 6 years to 14 years OR weight 15-30kg	400mg Sulphamethoxazole / 80mg Trimethoprim
Age > 14 years OR weight > 30kg	800mg Sulphamethoxazole / 160mg Trimethoprim

(Adapted from Department of Health, 2010b:21-Table 8)

The same as with adults, patients who experiences mild to moderate adverse symptoms to Co-trimoxazole can use Dapsone. Dapsone should be given at a recommended dose of 2mg/kg/day or 4mg/kg/week up to a maximum dose of 100mg per day (Department of Health, 2010b:21).

2.4.5.3 Isoniazid Preventive Therapy (IPT)

According to Grimwade *et al*. (2005:164) two of the leading causes of morbidity and mortality in sub-Saharan Africa are Tuberculosis (TB) and HIV1-infection. In the progress report on the global plan to stop tuberculosis the WHO (2004:16) showed that South Africa has one of the highest HIV and TB co-infection rates in the world. Mortality rates in dual TB-HIV-infected patients are high, especially due to a number of opportunistic infections (Grimwade *et al*., 2005:164). Tuberculosis have even been shown to accelerate HIV disease progression and this dual infection is also the reason why TB is the most common cause of morbidity and mortality in HIV-infected patients (Department of Health, 2010e:2). In 2010 around 350 000 people died worldwide due to HIV-associated Tuberculosis (WHO, 2012c:14). It is consequently clear that preventing TB-infection in HIV-positive individuals will be very beneficial to patients and reduce morbidity and mortality amongst HIV-infected individuals.

First of all, the most important thing to do before implementing a TB preventive therapy is to rule out active tuberculosis (Department of Health, 2010e:3). If there is any doubt whether a patient already has active TB, the patient should not be initiated on a single anti-TB drug (Isoniazid in this case) as this will contribute to the development of drug-

resistant tuberculosis. With HIV-infected patients there is a particularly high risk of developing TB, especially around the time that ART is initiated and during the period shortly thereafter (Department of Health, 2010c:29). Active TB can be missed before ART initiation and that is why it is so important to do systematic TB screening before initiating ART and during the first 6 months of ART, particularly in the presence of Immune Reconstitution Inflammatory Syndrome (IRIS) (Department of Health, 2010e:4). According to the guidelines for tuberculosis preventive therapy among HIV-infected individuals in South Africa (2010e:3), TB preventive therapy can be given to all HIV-infected patients without any signs and symptoms of active TB. As with HIV there are groups of people at higher risk for developing TB, these include children, health care workers, miners, prisoners and others with close TB contacts. The following table summarises the South African 2010 Isoniazid Preventive Therapy (IPT) guidelines (Department of Health, 2010e:4-5):

Table 2-15: Summarised South African 2010 IPT guidelines

IPT Criteria	Guideline recommendation
Isoniazid Preventive Therapy (IPT) and pregnancy	The benefit of using IPT in HIV-infected pregnant women outweighs the risks and it is therefore recommended that IPT should be offered to all these women. Treatment should also be continued and completed even if a woman falls pregnant while on IPT.
Concomitant use of IPT and ART	A patient already on IPT that becomes eligible for ART should continue IPT and also be initiated on ART. Patients already on ART can also be given IPT as long as active TB has been excluded. Patients on IPT and ART should be closely monitored for peripheral neuropathy in patients who use d4T and INH and for hepatotoxicity in patients who use NVP and INH simultaneously.
The use of IPT in patients that have previously been treated for TB	IPT does offer advantages to patients that have previously been treated for TB. IPT can be initiated at any stage after the previous TB event has subsided, again only as long as active TB has been ruled out.
Patients not eligible for IPT	Any patient with signs or symptoms of active TB disease is not eligible for IPT. Due to the risk of hepatotoxicity patients who abuse alcohol and patients with active liver disease should not be given IPT.
Dosing regimens for IPT	For Adults: 5mg/kg/day of Isoniazid (INH) For Children: 10mg/kg/day of Isoniazid (INH) The maximum dose for both adults and children is 300mg of INH per day. The normal recommended duration of IPT is 6 months, although the course can be finished over a period of 9 months.

(Adapted from Department of Health, 2010e:4-5)

The frequent appearance of symptoms of peripheral neuropathy due to the usage of Isoniazid (INH) underlies the recommendation to also provide patients with Pyridoxine (vitamin B6) 25mg daily to prevent such symptoms. If mild peripheral neuropathy is experienced the dose of Pyridoxine can be increased up to 100mg per day. If severe peripheral neuropathy or signs of hepatitis (due to hepatotoxicity) develops IPT must be stopped at once and the patient referred to a medical officer (Department of Health, 2010e:7).

2.5 Global Impact of HIV/AIDS

When global leaders came together at the United Nations Millennium Summit in 2000 they developed a series of Millennium Development Goals with the aim of making the world safer, healthier and more equitable. In September 2000 the commitment was made official when 189 countries signed the Millennium Declaration. The following are the eight goals in the order that they were set (Statistics South Africa, 2010:13):

- To eradicate extreme poverty and hunger
- To achieve universal primary education
- To promote gender equality and empower women
- To reduce child mortality
- To improve maternal health
- To combat HIV/AIDS, malaria and other diseases
- To ensure environmental sustainability
- To develop a global partnership for development

Millennium Development Goal (MDG) number 6 specifically addresses the HIV/AIDS epidemic (WHO, 2008:14). According to the WHO progress report (2008:15), this goal states that “a strong HIV response yields health benefits that extend well beyond HIV itself. For example, HIV is an important contributing factor in the continued spread of tuberculosis. The push to expand access to HIV/AIDS treatment in resource-limited settings is helping to strengthen fragile health infrastructures and is driving improvements in human capacity in low- and middle-income countries”. Target 6A of MDG 6 further states that the world should have halted the progress of HIV/AIDS by 2015 and even have started to reverse the epidemic; while target 6B aims for universal

access to treatment by 2010 for all patients in need of it (WHO, 2012d). Universal access is probably one of the biggest challenges of our time. This does not only concern HIV/AIDS, but is a concern across the health sector. In fact, the entire 2010 World Health Organisation report (WHO, 2010:1) was dedicated to finding paths to financing and ensuring universal health coverage. According to the WHO many countries need financing systems that will enable patients to access any type of health service, whether for prevention, treatment, promotion of health or rehabilitation without the patient or relatives declining into severe financial hardship or poverty as a result (WHO, 2010:2). Some universal reasons for financial shortages in many countries seem to be attributable to ageing populations and shrinking workforces.

Although universal access to treatment for HIV/AIDS patients has not yet been achieved, there has been significant global progress in increasing the number of patients who receive ARV treatment. An estimated 34 million people were living with HIV by the end of 2010 (WHO, 2012c:15) and 16 times more patients infected with HIV were receiving treatment in 2010 than in 2003. Just fewer than 6 million patients worldwide were receiving ART by December 2009. This unfortunately still constitutes only about 36% global coverage for ART and there are major variations in treatment coverage between different regions (WHO, 2011:17).

Table 2-16: ART coverage for low-and middle-income countries by WHO region in 2009

WHO Region	Number of HIV-infected people receiving ART	Percentage of ART coverage amongst patients with advanced HIV infection
African Region	3 912 000	37%
Region of the Americas	478 000	50%
South-East Asia Region	577 000	32%
European Region	115 000	19%
Eastern Mediterranean Region	13 000	7%
Western Pacific Region	160 000	33%
Global Totals	5 254 000	36%

(Adapted from WHO 2011:18-Table 3)

Besides the numbers in the above table, an additional 700 000 patients were receiving treatment in high-income countries (WHO, 2011:17). Access to ART keeps improving

and the last available WHO report indicates that the global percentage of patients with advanced HIV infection receiving ART is as high as 47% (WHO, 2012c:107). Ageing populations are not only apparent in the general global population, but also very visible amongst patients living with HIV/AIDS where the life-prolonging effects of ARV drugs are becoming more and more observable. Statistics show that around 2.6 million people were newly infected with HIV in 2009 and 1.8 million HIV/AIDS related deaths occurred during the same year (WHO, 2011:17). This means that there are more people who are newly infected with HIV each year than people who are dying from it, which also causes a continuously growing HIV population.

Child mortality is usually a good indicator to understand public health in a country. Fortunately, child mortality is on a global decline. Although still high, the under-five mortality did drop considerably from 12.4 million children under five years in 1990 to 8.1 million deaths in children under five in 2009. The number of deaths during the neonatal period (28 days after birth) remains alarmingly high, with 40% of children who die before reaching five years of age die during the neonatal period (WHO, 2011:13). It must be said that even though these percentages are high, the neonatal mortality rate (per 1000 live births) did go down from 32 (deaths per 1000 live births) in 1990 to 23 (deaths per 1000 live births) in 2010 (WHO, 2012c:61).

In 2009 the UNAIDS recognised that, although there has been significant reaction and results in the fight against HIV/AIDS over the past 25 years, there is a crossroad ahead. It is equally important to keep the momentum and to plan ahead and come up with strategies that will ensure that the response to HIV/AIDS keeps moving forward (UNAIDS, 2009c:3-4). The organisation developed ten priorities in consultation with stakeholders and decided to focus their efforts on the realisation of these priorities. The following were the ten priorities and cross-cutting strategies developed by the UNAIDS as part of their outcome framework for 2009-2011 (UNAIDS, 2009c:6-8):

- Reduce sexual transmission of HIV
- Prevent mothers from dying and babies from becoming infected with HIV
- Ensure that people living with HIV receives treatment
- Prevent people living with HIV from dying of TB
- Protect drug users from becoming infected with HIV

- Empower men who have sex with men, sex workers and transgender people to protect themselves from HIV infection and to fully access antiretroviral therapy
- Remove punitive laws, policies, practices, stigma and discrimination that block effective responses to AIDS
- Meet the HIV needs of women and girls and stop sexual and gender-based violence
- Empower young people to protect themselves from HIV
- Enhance social protection for people affected by HIV

These priorities are very much in line with the Millennium Development Goals, but specifically address HIV/AIDS in MDG 6. The renewed commitment was evidently aimed at preventing new HIV infections and HIV-related deaths, while also improving the quality of life for people living with HIV in the future.

2.6 History and burden of HIV/AIDS in South Africa

In South Africa the first coordinated public policy response to HIV and AIDS was in 1992 when theNational AIDS Coordinating Committee of South Africa (NACOSA) was formed. In 1997 the South African National STI, HIV and AIDS review assessed the progress in implementing the NACOSA plan (Department of Health, 2003:1). To meet objectives and targets set, South Africa decided in 2000 to develop a guide according to which the country acts in response to HIV, Sexually Transmitted Infections (STI) and Tuberculosis (TB) (Department of Health, 2004:1). This guide was called the National Strategic Plan (NSP) on HIV, STI's and TB and is revised every five years, not only to review its relevance and effectiveness, but also to ensure that it addresses the latest issues, especially concerning HIV and TB. The NSP is aligned with international and regional commitments, targets and obligations and aims to communicate the implementation plans on HIV, STIs and TB to community-level stakeholders (NSP, 2011:12).

In 2001, during the United Nations General Assembly Special Session, South Africa was one of the member countries that signed the Declaration of Commitment on HIV/AIDS (Department of Health, 2010a:2). Cabinet reviewed its commitment and approach to HIV and AIDS in April 2002 and by July 2002 the government had put together a combined health and treasury task team to focus on treatment, care and support for those infected by HIV or affected by AIDS (Department of Health, 2003:2).

During their Cabinet meeting on 08 August 2003, the Cabinet received the report back from the task team and then assigned the Department of Health to create an operational plan for implementation of an antiretroviral treatment programme. The operational plan was created by the National task team and adopted in November 2003 (Department of Health, 2004:2). The Department of Health created the operational plan with two main, unified goals. The first was to provide comprehensive care and treatment to patients living with HIV/AIDS and the second was to facilitate the strengthening of the overall national health system in South Africa. The plan for roll-out of ARV treatment was broad and all-inclusive; the following simply summarizes the main elements and chapters of the plan (Department of Health, 2003:19):

- Prevention, care and treatment
- Nutrition related interventions
- Traditional medicines
- Accreditation of service points
- Human resources
- Provincial site assessments
- Drug procurement
- Drug distribution
- Laboratory services
- Social mobilization and communication
- Patient information systems
- Monitoring an evaluation
- Pharmacovigilance
- Research priorities
- Programme management
- Budget

The South African antiretroviral therapy programme was called the Comprehensive Care Management, Treatment and Support programme (CCMTS) (Department of

Health, 2010b:7). The roll-out of ARV treatment in 2003 brought significant changes in the overall impact of HIV/AIDS in South Africa. By 2004 it was already clear that there is much uncertainty regarding exactly what the coverage of ART and its effect will be (Dorrington *et al*., 2004:1). By October 2004 around 19 500 patients were receiving ART in South Africa and already the projected life expectancy for 2010 has been modified from the initial estimate of 43 years to just below 50 years. It consequently became necessary to adjust projection models as newer epidemiological data became available. According to the indicator report published by theCentre for Actuarial Research and South African Medical Research Council (Dorrington *et al.*, 2004:2) the uncertainty that changes in data causes does not mean that all future estimates are not important. In fact, with an epidemic of this magnitude future estimates remain essential for planning the impact that HIV/AIDS will have on all sectors.

Now, to shine a little light on some of the issues and indicators it is important to also look at and compare statistics over the last decade or so. In 2004 just over 5 million people were infected with HIV in South Africa, which at that stage amounted to around 11% of the total population. In 2006 there were approximately 5.4 million people living with HIV/AIDS, which was also more or less 11% of the total population (Dorrington *et al.*, 2006:ii). This already indicated that the prevalence of HIV/AIDS in South Africa was stabilizing. According to the mid-year 2011 estimates from Statistics South Africa (Statistics South Africa, 2011:5) there has been an increase from an estimated 4.21 million HIV-infected people in 2001 to 5.38 million people living with HIV (PLHIV) in South Africa in 2011. The prevalence for 2011 indicates that approximately 10.6% of the total South African population is infected with HIV (Statistics South Africa, 2011:2). This prevalence is actually slightly lower than three or four years before. Noteworthy however, is that the prevalence for all adults age 15-49 years in 2011 was 17.3% (Department of Health, 2012a:56-Table 25).

The fact that South Africa has the largest antiretroviral treatment programme in the world could very well be the main reason for the stabilization in prevalence (Statistics South Africa, 2010:76). By mid-year 2006 some 225 000 patients were already receiving ART (Dorrington *et al.*, 2006:i) and the proportion of the population with advanced HIV infection accessing HAART was rapidly increasing. While only 13.9% of people in need of treatment accessed ART in 2005, around 41.6% of patients with advanced HIV infection were receiving treatment by 2009 (Statistics South Africa,

2010:80). In 2011 alone approximately 650 000 people were newly initiated on ART in South Africa, bringing the total number of PLHIV that received ART by the end of 2011 to 1.6 million patients (Department of Health, 2012b:15). This is in part due to the elevated threshold in eligibility criteria announced in 2009 that saw more PLHIV put onto treatment. These new initiations also increased the percentage of adults and children who are eligible for HAART and who receive treatment to 75.2% (Department of Health, 2012b:64).

Another reason why prevalence is stabilizing is because of the introduction of dual therapy for the Prevention of Mother-To-Child Transmission (PMTCT) in 2008 and the accomplishment that this PMTCT service is provided at more than 95% of public health facilities (Department of Health, 2010a:15). Due to the PMTCT programme the proportion of HIV-positive babies declined from an estimated 15.2% in 2008-2009 to 9.4% in 2009-2010 (Statistics South Africa, 2010:77). Also due to the scale-up of PMTCT the percentage of HIV-positive pregnant women that received ART to stop Mother-to-Child Transmission (MTCT) increased to 87.1% in 2011 (Department of Health, 2012b:60).

Public knowledge of HIV/AIDS and its treatment have also shown to be an important issue and formed a large part of the South African strategy to combat the disease. According to the 2009 National Communication Survey 87% of people who knew about HIV treatment were able to identify antiretroviral therapy (ART) as the treatment for HIV, compared to only 42% identifying ART as treatment in 2006 (Statistics South Africa, 2010:78). The survey also indicated that 73% of the 2009 group knew that ART should be taken for life whereas only 40% knew that ART was lifelong treatment in 2006 (Statistics South Africa, 2010:78). Another aim of spreading knowledge to combat HIV was to change or reduce behavioral risks. A critical indicator used in understanding risky sexual behavior in South Africa is condom usage at the last high-risk sex. Through increased awareness the percentage of adults 15 years and older who used a condom at last sex increased from 27.3% in 2002 to 62.4% in 2008 (Statistics South Africa, 2010:78). One more important thing connecting public knowledge and risk behavior, is the fact that PLHIV that are unaware of their HIV status are significantly less likely to use a condom than PLHIV that know their HIV status (Department of Health, 2012b:48).

Infant Mortality Rate (IMR) is defined as the probability that an infant dies before reaching age 1 (WHO, 2012c:51), and is usually expressed as a number of patients dying out of 1000 newborns. As the table below indicates, it is evident that the IMR in South Africa has steadily declined during the past decade or so, from 53 deaths per 1000 newborns in 2001 to 38 deaths per 1000 newborns in 2011 (Statistics South Africa, 2011:5). Although 38 is still high, it is an enormous improvement.

Table 2-17: Infant Mortality Rate in South Africa 2001-2011

Year	Infant Mortality Rate (IMR)
2001	53.3
2002	53.0
2003	52.4
2004	51.4
2005	50.0
2006	46.8
2007	45.1
2008	42.1
2009	40.6
2010	39.1
2011	37.9

(Adapted from Statistics South Africa 2011:6-Table 5)

The IMR is not the only positive figure that South Africans have seen over the past few years. Life expectancy has also improved with an average of two years from an estimated average of 55.1 years in 2001 to 57.1 years in 2011 (Statistics South Africa, 2011:5).

The following table was adapted from the UN East Asia model life table used by Statistics South Africa to make assumptions on life expectancy at birth:

Table 2-18: Life-expectancy for South Africans 2001-2011

	Life Expectancy at Birth		
Year	Male	Female	Total
2001	52.1	57.8	55.1
2002	51.1	56.4	53.9
2003	50.3	55.2	52.9
2004	49.8	54.4	52.2
2005	49.6	53.8	51.8
2006	50.1	54.2	52.3
2007	50.9	54.9	53.0
2008	52.1	56.1	54.1
2009	53.3	57.5	55.5
2010	54.3	58.5	56.5
2011	54.9	59.1	57.1

(Adapted from Statistics South Africa 2011:6-Table 5)

From the above table it can be seen that although life expectancy was still declining for the first part of the decade, it started improving soon after the roll-out of ARV treatment and in 2011 the life expectancy for males were already estimated at 54.9 years and 59.1 years for females (Statistics South Africa, 2011:6) . Interestingly, the life expectancy at birth varied notably between provinces within South Africa. The Western Cape had the highest life expectancy between 2006 and 2011 with an estimated average of 59.9 years for males and 65.8 years for females (Statistics South Africa, 2011:11-Figure 2&3), while the Free State had the lowest with an average life expectancy of only 44.6 years for men and 47.9 for women during the same period.

The 2010 National Antenatal Sentinel HIV and Syphilis Survey (Department of Health, 2011:29) indicated that age is an important risk factor. The prevalence of HIV in the 15-24 years age group is a good indicator of new HIV infections for the total population (keeping in mind that sexual transmission is still the main driver of the disease in countries like South Africa). The prevalence in this group is also central in reporting on MDG 6, Target 7, indicator 18 (Department of Health, 2011:29). Good news is that the prevalence in this group seems to have been on the decline ever since 2005 when 10.3% of the total population aged between 15-24 years were HIV-positive. By 2008 HIV prevalence had declined to 8.7% (Shisana *et al*., 2008:31). Concerning though, is that there are still significant prevalence differences between genders in this group. The

adult HIV-infection prevalence for males 15-24 years was 5.3%, while the prevalence for the same age group in females were 11.9% in 2011 (Department of Health, 2012a:56-Table 25). In the antenatal survey the prevalence among pregnant women 15-24 years had also declined from 2005, but seems to have reached a plateau during 2008-2010. The HIV prevalence in this age group of pregnant women did, however, again decline by 1.3% from 21.8% in 2010 to 20.5% in 2011 (Department of Health, 2012a:18).

On the other hand, even though most of the figures presented give a positive outlook, the devastation that this disease has caused continues to show. Although South Africa has the largest and best developed economy in Sub-Saharan Africa, the country is not excluded from being hard hit. Like most countries with a high prevalence of HIV/AIDS, the country's economic and social development is negatively affected by the burden of the disease. Despite the increase in life expectancy over the past decade, South Africa is still renowned for large numbers of young adult deaths, AIDS orphans and socially and economically vulnerable children (Statistics South Africa, 2010:74). By 2011 HIV/AIDS had orphaned an estimated 2.01 million children in South Africa alone. Furthermore, during 2011 an estimated 316 900 adults (15 years and older) were newly infected and approximately 63 600 children (14 years and younger) were also infected with HIV (Statistics South Africa, 2011:8). Although the overall prevalence seems to have stabilized, it does not change the fact that an estimated 17.3% of the adult population between 15 and 49 years in South Africa is infected with HIV/AIDS (Department of Health, 2012a:56-Table25). These are still shockingly high statistics when compared to global figures. For e.g. South Africa's total HIV prevalence is 10.6%, whereas the total global prevalence is only 0.8% (Statistics South Africa, 2010:74).

The most recent antenatal survey showed that 29.5% of all pregnant women attending antenatal care for the first time in public health clinics in 2011 were HIV positive (Department of Health, 2012a:12). Even though this is slightly lower than the 2010 prevalence of 30.2%, there is no statistically significant difference in the HIV prevalence amongst pregnant women for the last five years and prevalence has been stable around 29%. As with the life expectancy, the prevalence among pregnant women attending antenatal clinics also varies considerably between provinces. Four provinces had an HIV prevalence of more than 30% in 2011. Between these four provinces KwaZulu-Natal had the highest prevalence with 37.4% of the province's women attending

antenatal care being HIV-infected (Department of Health, 2012a:14). KwaZulu-Natal also had the highest prevalence in South Africa for the past twenty years (Department of Health, 2012b:34). The prevalence in this province did show a remarkable drop from 39.5% in 2010 to the 37.4% in 2011. The only two provinces with a HIV prevalence of less than 20% were the Western Cape with 18.2% and the Northern Cape with 17% of pregnant women who are HIV-infected (Department of Health, 2012a:15).

The NSP has adopted a long-term plan for the next 20 years in the fight against HIV and AIDS (NSP, 2011:12). They compiled the following goals as part of the vision:

- Zero new HIV and TB infections
- Zero new infections due to vertical transmission (Mother-to-child)
- Zero preventable deaths associated with HIV and TB
- Zero discrimination associated with HIV and TB

In the five year NSP for 2012 to 2016 government has aligned these broad goals with the following 20 year long-term plan agenda (NSP, 2011:12):

- To reduce new HIV infections by at least 50%, using combination prevention approaches
- Initiating at least 80% of patients eligible for treatment on antiretroviral treatment (ART), with 70% of these patients alive and on treatment five years after initiation
- To reduce the number of new TB infections and deaths due to TB by 50%
- To ensure an accessible legal framework that protects and promotes human rights in order to support implementation of the NSP
- Reduce self-reported stigma related to HIV and TB by at least 50%.

Strategic objective have been set in order to target specific populations with different, yet particular interventions to achieve these goals. The four strategic objectives for the 2012-2016 NSP are:

- Strategic Objective 1
- Addressing social and structural drivers of HIV, STI and TB prevention, care and impact

- Strategic Objective 2
- Preventing new HIV, STI and TB infections
- Strategic Objective 3
- Sustaining health and wellness
- Strategic Objective 4
- Ensuring protection of human rights and improving access to justice

The public health sector in South Africa is insufficiently funded, but there is confidence that government is steadily increasing public health funding (NSP, 2011:81). Although donor funding and external grants will continue to be a vital funding source for implementing the NSP, sufficient domestic funding is necessary to ensure the long-term sustainability of interventions (NSP, 2011:81). Costing all the known key drivers of the NSP is a huge task and only estimated figures can be provided. The estimated cost for all four objectives of the NSP for 2012-2016 is summarized in the following table (NSP, 2011:78):

Table 2-19: Estimated cost for all four the main objectives of the NSP for 2012-2016

Period	2012/13	2013/14	2014/15	2015/16	2016/17
Total annual costs to achieve the objectives (in ZAR million)	18 728	23 432	26 628	29 675	32 248

(Adapted from NSP, 2011:78-Figure 4)

Although the NSP is not a strategic plan of the Department of Health, it is true that the health department will utilize the majority of the allocated funds. The component that will consume by far the largest portion of funds within the health department will specifically be the pharmaceutical resources required to implement proposed interventions (NSP, 2011:77).

The following costs have been estimated for the supply of ARV drugs:

Table 2-20: Estimated cost of ARV drugs in SA for 2012-2016

Period	2012/13	2013/14	2014/15	2015/16	2016/17
Estimated Costs of ARV drugs (in ZAR million)	11 681	14 783	16 827	18 352	19 737

(Adapted from NSP, 2011:79-Table 6)

2.7 Demographics and social economic conditions of the research population

The study was conducted at Thusong Hospital Pharmacy in the Ditsobotla Sub-district of the Ngaka Modiri Molema district in the North West province. The Ditsobotla municipality comprises of Biesiesvlei, Coligny, Itsoseng and Lichtenburg (SAdoctors, 2013).Although Thusong Hospital is situated about 23km outside of Lichtenburg next to the R503 national highway on route to Mafikeng, it forms a complex with the General De La Rey Hospital in Lichtenburg and together this complex serves an estimated population of 149 737 people. Thusong is a 300-bed hospital with 120 active beds and General De La Rey hospital is a 61-bed hospital with 45 active beds, of which 4 beds are for private patients (NWDoH, 2012).

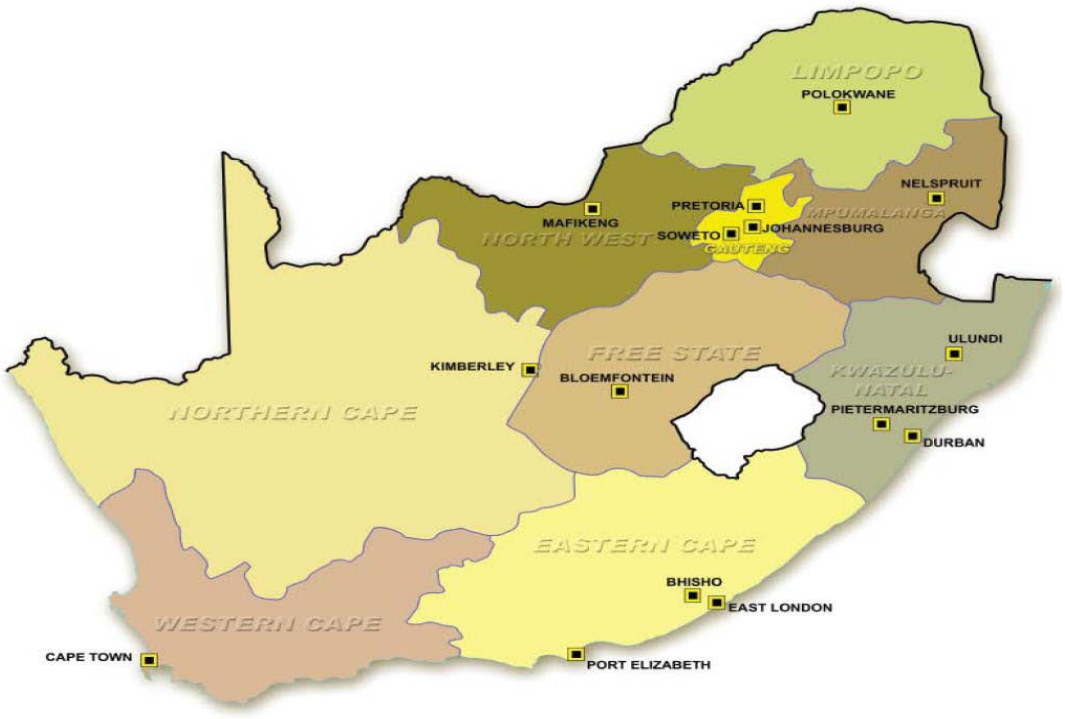

Figure 2-3: Demographic location of the North West province

(Adopted from Statistics South Africa, 2010:6)

2.7.1 Demographics of the North West province and profile of the population

South Africa is divided into nine provinces. Due to movement of municipal boundaries between 2001 and 2011 the North West province lost around 11 348.9 square kilometers of land size, mostly to the Northern Cape province (Statistics South Africa, 2012:9-10). The North West province is the sixth largest province in South Africa, covering a land area of 104 882 square kilometers and amounting to 8.7% of the total land area of South Africa in 2011 (Statistics South Africa, 2012:13-Figure 2.1). The North West province is the seventh most populated province in South Africa with an estimated total population of just over 3.25 million people in 2011 (Statistics South Africa, 2011:15-Table 15). This amounts to roughly 6.43% of the total population (Statistics South Africa, 2011:12).

The population groups as a percentage of the of the North West province's population comprises of 89.8% Black African, 2.0% Coloured, 0.6% Asian, 7.3% White and 0.3% classified as other race groups (Statistics South Africa, 2012:16-Table 3.2). The median age of a population is used to describe whether a population is young (<20 years), intermediate (between 20 and 29 years) or old (≥30 years). The median age for the North West province was 25 years in 2011, which is up from a median age of 22 years in 1996 (Statistics South Africa, 2012:20-Figure 3.8). Could this indicate an aging population (perhaps due to ART)? Or is it an indication of a high mortality rate in young children? Age-sex distribution for the entire country could argue the latter by showing a considerable decline in both males and females between the ages of 5-14 years (Statistics South Africa, 2012:22). However, life expectancy at birth did increase slightly in the province. Between 2006 to 2011 life expectancy for males in the North West province increased to 50.4 years from 49.0 years in the 2001-2006 period. Life expectancy for females decreased insignificantly to 53.2 years in the 2006-2011 period from 53.3 years in the 2001-2006 period (Statistics South Africa, 2011:11-Figure 2&3).

2.7.2 Education in the North West province

Millennium Development Goal number 2 (MDG2) aims to achieve universal primary education by 2015 (Statistics South Africa, 2010:41). Although universal access to a primary education has effectively already been achieved in South Africa with an enrollment ratio of above 98% since around 2007, there are still some challenges that require ongoing monitoring. Early marriages is one of these challenges, since it reduces

the chance that the mother will complete her schooling while also reducing the probability that she will be able to ensure an education for her child (Statistics South Africa, 2010:41&49). As indicated in the 98%, there has been significant improvement in the enrollment of learners into primary schools across the country. This would explain the momentous decrease in the percentage of people 20 years and older with no education, dropping from 19.1% in 1996 to only 8.6% of this group by 2011 (Statistics South Africa, 2012:34). Functional illiteracy (people with no education or education less than grade 7) have gone down nationally and the percentage of people that are functionally illiterate in the North-West province dropped considerably from 41.2% in 1996 to 26.4% in 2011 (Statistics South Africa, 2012:34). However, the North West still falls in the bottom three provinces with regard to high functional illiteracy.

2.7.3 Employment in the North West province

One of South Africa's leading development challenges is poverty. According to the South African 2010 progress report on the MDGs (Statistics South Africa, 2010:30), poverty and employment are inter-linked within RSA. The national employment-to-population ratio average is low and hovers around 43% (Statistics South Africa, 2010:30). The national unemployment rate according to the official definition was 29.8% during the 2011 Census. For reference, RSA has an official and expanded definition for unemployed people used during a census. The official definition is defined as "Persons who did not work, but who looked for work and were available to work in the reference period" while the expanded definition is defined as "Persons who did not work, but were available to work in the reference period" (Statistics South Africa, 2012:41). The unemployment rate for the North West province by official definition was 31.5% in 2011, which made it the province with the sixth highest unemployment rate in the country (Statistics South Africa, 2012:43). The study population is mainly a rural community and the second most employment opportunities or economic activities are agriculture and the production of cement. However, the government sector remains the main source of employment (SAdoctors, 2013).During the 2011 census the North West province had a labour force participation rate of 55.3%. The labour force participation rate is the labour force (employed or unemployed persons) calculated as a percentage of the working age population, whereas the working age population is persons aged 15-64 years (Statistics South Africa, 2012:41). The employment status of parents should be taken very seriously because unemployment and/or poverty can often be held responsible for

many other health and social problems e.g. under-nutrition or malnutrition in children. The North West province had on average a 9.4% prevalence in malnutrition for children under five years during the period from 2001 to 2010 (Statistics South Africa, 2010:32). The average annual household income for the North West province in 2011 was R69 955.00, which is an increase of 131.7% in the average income from 2001 (Statistics South Africa, 2012:37).

2.7.4 Health profile and burden of HIV/AIDS in the study population

To improve the overall health profile of South Africans many endeavours had to be undertaken over and above the obvious health care improvements. For example, access to basic services such as piped water, electricity and proper sanitation had to be improved. The 2011 census information shows that the North West province managed to do so and amongst other things the province reported the following (Statistics South Africa, 2012:52-55):

- 69.3% of households in the North West (NW) province had access to piped water inside the yard or dwelling,
- 22.3% of households in the North West (NW) province had access to piped water outside the yard (leaving only 8.4% with no access to piped water),
- 84% of households in the North West (NW) province use electricity for lighting
- 75.3% of households in the North-West (NW) province use electricity for cooking, and
- 57% of all South African households have flush toilets connected to the sewage system.

The aim of all these interventions would be to improve morbidity and mortality.

As mentioned in the preceding employment section, the impact that the health of a parent or parents has on the health outcomes of the child is very significant and can be seen or monitored through various indicators. One such indicator is the estimated number of children who lost one or both parents. Parental orphanhood is steadily increasing in South Africa and in 2011 the North West province had the sixth lowest percentage of orphans between the nine provinces, with 7.5% of children having lost one or both parents (Statistics South Africa, 2012:68-Figure 3.63).

HIV/AIDS probably plays one of the biggest roles in negatively affecting statistics like adult and child mortality, life expectancy and orphanhood. The roll-out of ARV treatment in the North West province was initiated in 2004, but it started off slowly and there were only about 130 patients on ARV treatment in the province by the end of 2004 (JCSMF, 2006:1). By March 2006, however, statistics went up and the HIV programme of the North West provincial department of health proudly announced, during the Joint Civil Society Monitoring Forum (JCSMF) meeting held on 03 March 2006 in Orkney, that the province has exceeded its original target for 2006. There were 12 500 patients put on ART while the initial target for 2006 was set at 10 000 for the North West province (JCSMF, 2006:1). Nationally in 2006 there were roughly 110 000 patients on ARV treatment in the public health sector and 90 000 patients on treatment in the non-state sector through medical schemes, workplace treatment programmes, donor sponsored not-for-profit programmes and the unfunded private sector. Most of the patients at this stage were hospital based and women; very few children were on treatment mainly due to late diagnoses. Noteworthy in the "old" reports is the early comments, challenges and breakthroughs that have been identified. The following is some of the common remarks made by several of the county's largest Disease Management Programmes (DMP) (JCSMF, 2006:2):

- They identified that the overwhelming majority of employees that have been started on ART recovered wellness and returned to work. Data shows a drop in absenteeism
- The two main causes for non-adherence or drop-out of treatment programmes were death (due to late enrollment) and leaving employment
- The number of serious adverse events reported due to ARVs were very few
- There was consensus among HIV clinicians in the private sector that d4T (Stavudine) should be removed from the first line treatment and be replaced with Tenofovir (TDF), which has fewer side-effects. The problem was that Tenofovir at that stage was not yet registered by the Medicines Control Council (MCC).

Interestingly, it was already evident in 2006 that slow decision making and the delay in registration of Tenofovir was obstructing decisions around optimal treatment options in the private sector, something that would in the near future also significantly alter guidelines in the public sector.

To encourage testing for both HIV and TB, South Africa launched a national HCT (HIV Counseling and Testing) campaign from April 2010 onwards. By the end of June 2011 just over 13.3 million people have been tested in South Africa with this campaign. North West managed to test 1 066 832 people for HIV during this time, exceeding their original target by 7% and obtaining a positivity result of 16% (Department of Health, 2012b:49-Table 2). The prevalence of HIV/AIDS pregnant women attending antenatal care in the North West province was 30.2% in 2011 and seems to have stabilised between 29-32% over the past seven years (Department of Health, 2012a:44-Figure 39). The North West province is divided into four districts, namely Bojanala, Dr. Ruth Sekgomotsi Mompati, Ngaka Modiri Molema and Dr. Kenneth Kaunda districts. This study was conducted in the Ngaka Modiri Molema district of the province and the prevalence among antenatal women in this district declined from 25.9% in 2010 to 24.9% in 2011 (Department of Health, 2012a:45-Table 19). This is actually an admirable result considering that the prevalence for North West, as discussed, was 30.2% and the National HIV prevalence for these women were 29.5%.

2.8 Chapter summary

Chapter 2 started off by discussing all the clinically important aspects of HIV/AIDS. After the clinical discussion of the virus and disease, it provided a thorough description of the possible treatment options. The discussion offered a depiction of the burden and prevalence of HIV/AIDS in the world and then the focus moved to a closer and a more meticulous look at the South African burden of disease. The chapter concluded with a description of the demographics of the specific research population, including education, employment and health status. Chapter 3 will provide the reader with a comprehensive explanation of the empirical investigations that were conducted to achieve the specific objectives of this study.

Chapter 3: Empirical Investigation

3.1 Introduction

The empirical investigation forms the second phase of the research process. This chapter discusses the general objectives of the study, as well as the specific objectives of the empirical investigation. The research methodology will be explained with reference to topics such as the selection of the research design, study population and data collection process. This chapter also aims to provide suitable insight into the implementation of the data collection process and analysis of the acquired data. Finally, the chapter provides concluding details on all ethical considerations.

3.2 Objectives of the empirical study

The research objectives of the study were divided into a broad general objective and specific research objectives for both the literature review and the empirical investigation. The focus of this chapter is on the specific objectives of the empirical study. The specific research objectives of the literature study were discussed in chapter 1 and achieved in chapter 2.

3.2.1 General research objective

The general research objective of this study is to investigate the medicine treatment patternsof HIV/AIDS patients at a rural district hospital in the North West Province.

3.2.2 Specific research objectives

The specific research objectives for the empirical investigation include the following:

- To analyse the prevalence of HIV/AIDS patients receiving HAART according to gender, age and other demographic factors.
- To determine the number of both adult and paediatric patients that have defaulted ARV treatment during the data period, as well as to provide a glance at the periods of defaulting.
- To investigate the medicine treatment patterns of HAART at a district hospital.
- To examine the vigilance with prescribing prophylactic treatment such as Co-trimoxazole and Isoniazid.

- To compare body weight, CD4 T-cell counts and viral loads between genders.
- To briefly assess the influence of HAART on patients' body weights, CD4 T-cell counts and viral loads.

3.3 Research methodology

3.3.1 Research design

A non-experimental, retrospective, cross-sectional drug utilisation review method was used to obtain the data and achieve the specific objectives of this research project.

The following provides a better understanding of the terms used to describe the research design:

Non-experimental research design means that the study was conducted through observations only and no interventions were made (Waning & Montagne, 2001:43). Retrospective merely means that the study evaluated therapy after the therapy was initiated and not before it was dispensed. Cross-sectional study is a prevalence study of a total population or population group designed to assess the occurrence of a condition or disease at one point in time (Waning & Montagne, 2001:46, 51, 59). Hartzema *et al.* (2008:160) state that the WHO defines drug utilisation research as the "marketing, distribution, prescription and the use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences."

3.3.2 Selection of the study site and population

The researcher is an employee of the North West provincial government and has been stationed at the selected hospital for a number of years. The study site and population were therefore selected based on convenience.

3.3.2.1 Study site

The study site selected for this study is the pharmacy at Thusong Hospital. This institution is a rural district hospital in the Ditsobotla sub-district in the North West Province of South Africa.

3.3.2.2 Study population

The target population for this study included patients of all ages who visited the pharmacyat Thusong Hospital during the defined data collection period, which commenced on 01 February 2012 and ended on 31 March 2012. From this population, data were collected retrospectively for one year for all patients that received ARV treatment every month at Thusong Pharmacy.

Inclusion criteria:

- Patients of all ages on HAART receiving treatment at the hospital during the defined period from 01 February 2012 to 31 March 2012.
- From the retrospective data only patients who received monthly treatment at Thusong Pharmacy were included.

Exclusion criteria:

- Patients on HAART who receive treatment at a PHC (Primary Health Care) institution and who had only returned to hospital during the collection period for a six monthly review of their CD4 T-cell count, viral load or prescription.
- Patients who defaulted for more than one year before or passed away before 01 February 2012.
- Patients who received more than two months' treatment prior to 01 February 2012.
- All patients transferred to other facilities of care before 01 February 2012.

3.3.3 Data collection method

This section describes the data sources and survey instruments that were used in the study and also offers a discussion on how these were put to use in collecting the data.

3.3.3.1 Data sources

Patient hospital records/files

The hospital records/files for each patient who had been selected according to the inclusion criteria was used as the only data source.

3.3.3.2 Survey instruments

3.3.3.2.1 Data collection tools (Refer to appendices 1 & 2)

Two separate survey forms were created by the researcher, one for adults and one for paediatric patients. These survey forms are Excel® spread sheets used to capture all the details directly from the patient file. The data collected included the following:

- Employment status
- Geographical area
- Age
- Gender
- Marital status
- Weight
- Dates of visits to hospital
- Whether the patient is an initiation, down-referral or repeat hospital patient
- CD_4 T-cell count and viral load
- HAART regimen and exact dosages
- Other related acute medication, including prophylaxis
- Only certain side-effects relating to this chronic condition or the treatment

3.3.3.2.2 De-coding lists for data collection tool (Refer to appendices 3 & 4)

The other instruments used in the survey were two de-coding lists for the two data collection tools explaining the short codes and abbreviations used in these survey forms.

3.3.3.3 Implementation of the action plan

The researcher decided that to ensure that no patient was overlooked and to guarantee accurate data, data would be collected at the institution during the defined data collection period. This meant that after a patient collected medication from the pharmacy on a specific day during the defined data collection period, his/her file was retained and the data were captured on site by the researcher. Each patient's file was

thoroughly scrutinized for information and to ensure truthful data the unrefined information from laboratory results, history sheets, prescriptions, etc. were used. Patients' initiation (starting) dates on treatment during the defined year have been identified and where patients have been on treatment for more than one year before the data collection period, their initiation (starting) dates were established by going through the history in their files and retrieving these dates. The data obtained from the patient files were captured electronically onto the data collection tools. The de-coding lists were updated throughout the data collection process to ensure that all new patient and/or treatment information was thoroughly explained.

3.3.3.4 Study variables

- Employment status, Geographical area (residential area), Age groups, Gender and Marital status

As discussed in chapter two, there are numerous risk factors that influence the spread of HIV/AIDS. The above variables were chosen specifically to identify populations (groups) at higher risk by comparing the prevalence of HIV/AIDS among these different groups.

- Age (Date of birth)

Age was, apart from being used to develop age groups, also used to divide the study population between adult and paediatric patients on treatment. Patients had to be separated at around 18 years of age due to the different challenges that adults and children face with regard to collection of and adherence to HAART. All data analysis needed to be done separately on adults and paediatrics to provide practically comparable results.

- Weight, CD_4 T-cell count and viral load

Refer to chapter two for the clinical importance of these variables in the prognosis of an HIV/AIDS patient. Based on the information from the literature study, the weight, CD_4 T-cell count and viral loadof patients were identified by the researcher as important variables to collect for clinical comparative analysis.

- Dates of visits to hospital and the identification of whether the patient was an initiation, down-referral or repeat-at-hospital patient

These variables were selected to determine the period for which patients had been receiving HAART. Patients were also classified and scrutinised for inclusion criteria according to the period on HAART and whether they had collected treatment every month at the study facility.

- HAART regimen and exact dosages

Most importantly, the HAART regimens for both adult and paediatric patients had to be collected. This study variable is central to providing the answer to the general objective of the study by indicating the medicine treatment patterns of HIV/AIDS patients in the rural district hospital.

3.3.4 Data analysis

Data analysis was done by using the Statistical Analysis System®, SAS 9.3® (SAS Institute Inc., 2006-2007). This program was used to extract and analyze data from the Excel® spread sheets (data collection tools).

3.3.5 Statistical analysis

This section describes the different calculations that were involved in using descriptive and inferential statistics to analyse the data.

3.3.5.1 Descriptive statistics

Descriptive statistics was applied in order to sort the collected data so that the results demonstrate the preferred tendency and properties of the study. Descriptive statistics involves describing the collected data through tabulation of frequencies and other descriptive measures (Fink, 1995:17).

3.3.5.1.1 Frequency (*n*)

The number of times that a specific value or category appears in a set of data is known as the frequency (Martin & Pierce, 1994:13).

3.3.5.1.2 Percentage (%)

Percentage is described as a proportion. This implies that if the number of observations or obtained replies with certain characteristics is divided by the total number of observations and then multiplied by 100, a percentage is achieved (Fink, 1995:17).

3.3.5.1.3 Mean (μ)

The mean is also commonly known as the average and noted by the Greek letter μ (Waning & Montagne, 2001:83). The mean is obtained by summation (adding) of all the values of the observations and then the sum is divided by the total number of observations (Rossman, 1996:41).

3.3.5.1.4 Standard deviation (SD)

The standard deviation, according to Fink (1995:22), is a measure of the variation from the mean of the observed data. It can also be described as measuring how far the spread of the observations are from the mean and is calculated as the square root of the variance (Waning & Montagne, 2001:85).

3.3.5.1.5 Confidence intervals (CI)

The mean that is achieved in any study should be considered an estimate and not necessarily the true mean. As a result more information is needed about the reliability of the estimate. Confidence intervals can be used to articulate the confidence that researchers have in the estimated mean. These intervals can be calculated at various degrees of assurance (Waning & Montagne, 2001:87-88). A 95% confidence interval was chosen for this study, meaning that the investigator is 95% confident that the true mean falls between the minimum and maximum interval or that the same mean will be achieved 95 times out of a 100 if the investigation was to be repeated 100 times.

3.3.5.2 Inferential statistics

Inferential methods were used in this study to test whether the descriptive results were due to random factors or due to actual association.

3.3.5.2.1 Chi-square test (χ^2)

According to Waning and Montagne (2001:98) the Chi-square test is commonly used to analyse discrete data, especially in larger samples. The Chi-square test (χ^2) is a non-parametric statistical method used to determine if the proportions of a characteristic or event in two groups are equal.

3.3.5.2.2 Student's *t*-test (*t*)

The student's *t*-test (*t*) is one of the most common statistical tests that use the t-distribution. The student's *t*-test (*t*) is used to compare the means of two samples or groups when there is one nominal variable and one measurement variable (Mcdonald, 2009). This test allows the investigator to compare the mean values of the measurement variable.

3.3.5.2.3 Analysis of variance (ANOVA)

The one-way ANOVA, or analysis of variance, is able to compare the means of more than two groups. To test if all the groups have the same mean, ANOVA uses the F statistic, whereas the t-tests report the t statistic. The t-test can be considered a special case of the one-way ANOVA (Park, 2009:34). In SAS®, the one-way analysis of variance procedure only performed ANOVA on the balanced data.

3.3.6 Statistical and practical significance

In this study it was important to determine both the statistical significance as well as the practical significance of results because some statistically significant results may not be practically relevant in this field. Statistically significant meant that the results were not likely due to chance. The alpha (α)-level is used to describe the likelihood of a type 1 error (the difference observed between groups is not a real difference but instead due to chance) (Waning & Montagne, 2001:71). The α-level for the test is also called the reference probability. Significance is formulated on the *p*-values and the *p*-value is also known as the attained probability. The level of significance for this study was predetermined at the 0.05 α-level, which means that the researcher was willing to accept a 5% risk of committing a type 1 error. A *p*-value of 0.05 inevitably indicates a 5% probability that the difference observed between two groups was in fact due to chance. Thus, if the statistical test is performed and the *p*-value is less than the 0.05 α-level, the result was statistically significant. To establish practical significance the following equation had to be used to calculate and evaluate the effect sizes:

- Difference between two group means (Cohen's *d*) (Cohen, 1992:156-158):

The effect size is computed by subtracting one group mean from the other and dividing the answer by the maximum standard deviation of the two groups.

To determine the extent of the effect size the following guidelines are used:

d = 0.2 : Considered a small effect or non-significant

d = 0.5 : Considered a medium effect and effect is observable and can be a sign of

significant differences

d = 0.8 : Considered a large effect and effects are considered as practically significant

- Effect size for the relationship between two nominal variables

Cramer's *V*, sometimes also called Cramer's ϕ, is the measure of effect size for any Chi-square analysis (χ^2) (Roberts, 2013:4; Ferguson, 2009:534). Regardless of the sample or table size, Cramer's *V* measures the effect size from 0 to 1. A smaller Cramer's *V* value (closer to zero) indicates a weaker relationship between the variables and a larger value for Cramer's *V* (closer to one) indicates a stronger relationship between the variables (Anderson *et al*., 2009:782).

3.4 Reliability and validity of the research instruments

All the data captured on the data collection tools were obtained directly from the patients' hospital records and no data collected was altered or manipulated by the researcher. The researcher has extensive experience in managing these hospital records and has, together with his research supervisor, assessed the face and content validity of the data collection tools and amended any inadequacies to obtain a representatively valid final data collection tool. The hospital file number was used to ensure that all prescriptions and other data from these records correlate and indeed apply to the specific patient researched. However, the patient was not identified during the data analysis. The data captured directly from the patient file can thus be assumed to be correct and accurate.

3.5 Ethical considerations

Permission to conduct the study was granted by the North-West University's Research and Ethical committee under approval number: NWU-000049-11-S5 (see appendix 5). Permission to access patient records for the data collection and approval to conduct the study at the specific hospital was obtained from the hospital management (see

appendix 6) and the North West Provincial Policy, Planning and Research Department (see appendix 7).

No interviews were conducted with patients. The data collected from the patient records were treated with strict confidentiality and anonymity was respected and maintained by the researcher throughout the study. To ensure that patient names were not used at all, only the hospital file number appeared on the survey forms and all data collected was stored electronically and only accessible to the researcher and his supervisor. The analysis of data from the research instruments did not reveal any patient-specific information that can compromise the anonymity of any patient.

3.6 Chapter summary

The third chapter introduced the reader to the empirical investigation. For clarity the general objective of the study was revisited. The specific objectives of the empirical investigation were thoroughly explained, after which the methodology of the study was elucidated. The identified study site as well as study population were shown and the survey instruments were explained. The process that the researcher underwent for data collection was provided and to bring the methodology design to a close a description was given on how the data was analysed. Chapter 3 concluded by explicating the reliability of the data and offering a transparent look into the related ethical considerations of the study.

Chapter 4: Results and Discussion

4.1 Introduction

This chapter reports on the results from the empirical investigation and discusses these findings. Since the general research objective of this study is to investigate the medicine treatment patternsof specifically HIV/AIDS patients, the chapter will firstly report on the overall prevalence of HIV/AIDS patients at the hospital. The prevalence is presented in numerous groupings, starting with the basic demographical information such as the number of patients from different genders, age groups, residential areas and marital- and employment status groups. The results from the study are divided between adult and paediatric patients throughout the chapter.

Perhaps the most central section then follows where the medicine treatment patterns for this hospital are indicated and exemplified by the different regimens that these patients received as treatment. Also included in the treatment segment are the results of an investigation into the prescription of prophylactic medication and the inclusion of vitamin supplements for HIV/AIDS patients. The subsequent section aims to achieve the more clinical objectives of the empirical study by showing the influence that HAART had on patients' weight, CD4 T-cell counts and viral loads. A list providing the most commonly prescribed medication other than HAART that patients received, as well as a list of the most commonly reported complaints from HIV/AIDS patients are provided in the appendices.

4.2 Prevalence results

4.2.1 Prevalence of HIV/AIDS patients according to gender

The total number of adult HIV/AIDS patients seen during the data collection period was 399 (N=399) and all patients included in the adult data were 18 years or older at the time of data collection. Table 4.1 below reveals that more than two thirds (69.17%, n=276) of adult patients were female. Only 30.83% (n=123) of all adult patients who consulted at the facility during the data collection period were male patients. As discussed in chapter 1 (Department of Health, 2010a:11), this confirms the disproportionate burden of HIV/AIDS on female patients in South Africa. Important, however, is to note that this study and the table below indicate the number of adult patients who receive HAART at the hospital. What makes this so noteworthy is the fact

that this does not necessarily represent the same percentage of infected male or female patients in this population. There could be numerous reasons why more adult female patients are diagnosed with HIV/AIDS than adult males. One of these reasons could be that women attend antenatal clinics where they are tested and diagnosed with HIV/AIDS, whereas males perhaps only seek hospital or healthcare treatment once they feel ill. Table 4-1 below shows the number and percentage of adult patients, according to gender, who received ARV treatment at the study site during the data collection period.

Table 4-1: Number and percentage of adult patients on HAART according to gender at last treatment date

Gender	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Female	276	69.17	276	69.17
Male	123	30.83	399	100.00

The total number of paediatric patients seen during the data collection period was 161 (N=161) and all patients included in the paediatric data were 18 years or younger (still at school) at the time of data collection. The following table indicates the number and percentage of paediatric patients, according to gender, who received ARV treatment at the study site during the data collection period.

Table 4-2: Number and percentage of paediatric patients on HAART according to gender at last treatment date

Gender	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Female	64	39.75	64	39.75
Male	97	60.25	161	100.00

The data in Table 4-2 above came as an unexpected revelation. So much is made of the burden of HIV/AIDS on female patients that these results are completely unexpected. Almost the exact opposite from the adult data is true with the paediatric patients, the male paediatric patients account for just over 60% (60.25%, n=97) of all paediatric patients receiving HAART at the study facility, whereas the paediatric female patients make up less than 40% (39.75%, n=64) of the total. This does tie in with what was said about there being numerous reasons for more adult female patients seeking medical attention (for e.g. due to pregnancy). It does create the question of whether this

is a trivial phenomenon at this study facility, or whether it is also true for other healthcare facilities within the province or country?

4.2.2 Prevalence of HIV/AIDS patients according to age and age groups

According to the South African National Prevalence, Incidence, Behaviour and Communication survey (Department of Health, 2008b:31-Figure 3.1), there are significant differences in prevalence of HIV/AIDS between different age groups. The 2010 Antenatal Sentinel HIV and Syphilis Prevalence Survey Report clearly states that age is a major risk factor in the transmission of HIV and vital in monitoring the spread of the disease amongst the sexually active age groups (Department of Health, 2011:29). The results in table 4.3 below thus came as no surprise. However, it does seem as if these results do indicate a somewhat older population of patients. Most of the well-known prevalence reports in South Africa indicate the highest prevalence rates among the 25-29 year or 30-34 year age groups (Department of Health, 2008b:31; Department of Health, 2011:47). This study though, found that the highest prevalence of patients receiving HAART is among the 36 to 45 year age group (39.45%, n=157) and only second highest is the 25 to 35 year group (27.64%, n=110). Eligibility criteria could play a significant role in this, since HIV/AIDS patients only become eligible for treatment at a later stage after infection. Again the older population is evident with the third most people receiving treatment falling into the older than 45 year and younger or equal to 55 years age group (19.85%, n=79). With only 4.77% (n=19) of patients on treatment in the 18 to 25 years category, these results almost beg to be investigated. Why is the younger adult generation not coming forward to test for HIV, or why are they not collecting treatment?

Table 4-3: Number and percentage of adult patients on HAART according to age group at last treatment date

Age group in years	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
≤ 18 and ≤ 25	19	4.77	19	4.77
< 25 and ≤ 35	110	27.64	129	32.41
< 35 and ≤ 45	157	39.45	286	71.86
< 45 and ≤ 55	79	19.85	365	91.71
> 55	33	8.29	398	100.00

Table 4-3 above shows that the cumulative total number of adult patients was 398, meaning that for one patient the age category could not be determined. The following

two tables (4-4 and 4-5) indicate that the adult male patients receiving treatment were on average just over three years (3.2 years) older than the average adult female patient at the last date of receiving treatment.

Table 4-4: Average age of adult patients on HAART according to gender at last treatment date

Gender	Number of patients (n)	Mean age (years)	Minimum age (years)	Maximum age (years)
Female	276	39.3225	18.8008	74.7351
Male	122	42.5258	19.8193	71.6359
Difference (male-female)		3.2033		

The average age of adult male patients receiving treatment were calculated at 42.5 ± 10.54 years (n=122) and the average age of adult female patients receiving treatment were 39.3 ± 10.01 years (n=276). Once more the results show that the majority of adult patients receiving treatment at this study site are a slightly older group of patients than would have been expected. The maximum age or adult patient with the highest age for both male and female patients was a person in the early to mid 70's. The minimum age confirms that only patients that were 18 years of age or older at the time of data collection were included as adult patients.

Table 4-5: Average age of adult patients on HAART according to gender at last treatment date, including the 95% Confidence Intervals (CI) and the Standard Deviation (SD)

Gender	Mean age (years)	95% CI Mean age (years)		Standard Deviation	95% CI Standard Deviation	
Female	39.3225	38.1366	40.5084	10.0078	9.2367	10.9204
Male	42.5258	40.6360	44.4156	10.5435	9.3660	12.0624

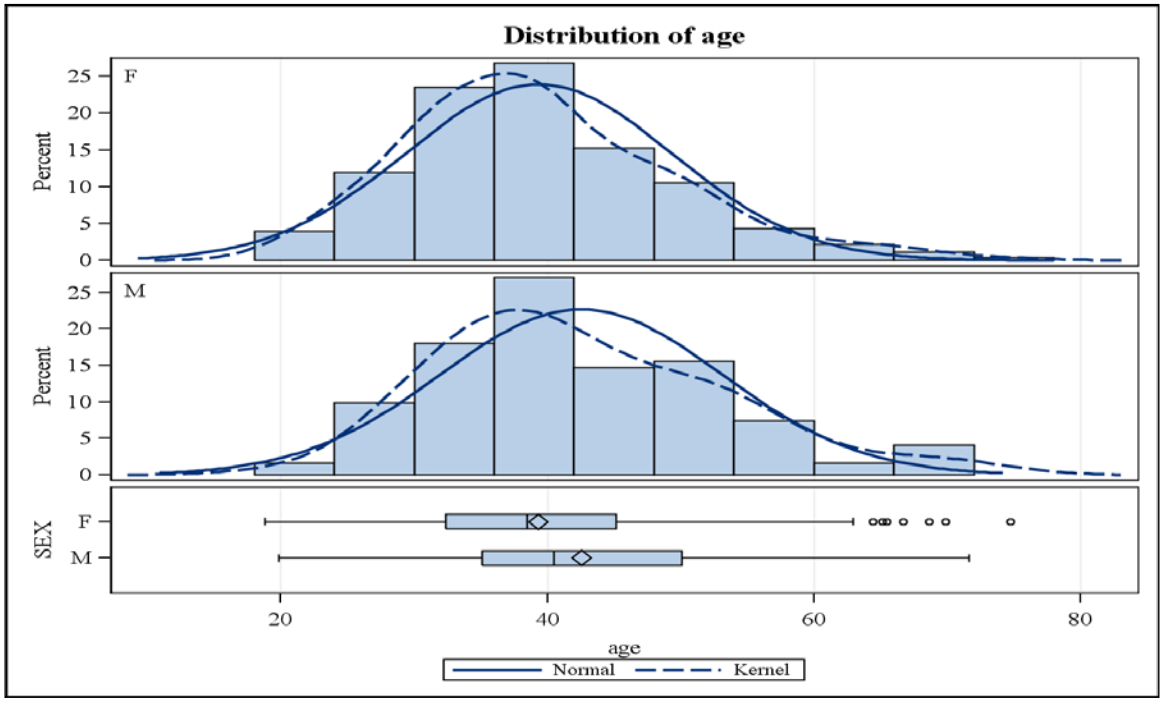

Figure 4-1: Average age of adult patients on HAART according to gender at the last treatment date

The reason why the adult male minimum age (or youngest) is indicated as 14 years old in Table 4-6 below, is that this table shows the ages of patients on initiation of treatment and this patient was initiated on treatment at 14 years old, but was over 18 years of age at the time of data collection. One of the reasons why it is so important to see at what age patients are initiated on HAART is to monitor or follow-up on how many patients are in reality still receiving treatment as adults, although they were initiated before turning 18 years or while still of normal school going age. Astonishingly, only one patient that was initiated as a paediatric was still receiving treatment as an adult at this study facility. The following table shows the average as well as minimum and maximum ages at which adult patients were initiated on HAART according to gender.

Table 4-6: Average age of adult patients according to gender on initiation of HAART

Gender	Number of patients (n)	Mean age (years)	Minimum age (years)	Maximum age (years)
Female	234	37.3483	18.5572	73.7303
Male	106	40.8765	14.2259	71.4031
Difference (male-female)		3.5282		

The results of the age differences between different genders on initiation of treatment once more indicates that the average male patient is more or less three and a half years (3.5282 years) older than the average female patient. Table 4-7 below also indicates the average age of patients according to gender on initiation of HAART, but it also shows the 95% confidence intervals (CI) and Standard Deviation (SD). According to Olejnik and Algina (2000:242) there are some researchers and methodologists who will disagree on the importance of the tests for determining statistical significance and who have stated that these test are in fact generally not useful. They would rather argue that confidence intervals and measures of effect size should be used to describe research findings. For that reason the researcher decided to include the standard deviations and 95% confidence intervals for all comparative results in this chapter.

Table 4-7: Average age of adult patients according to gender on initiation of HAART, including the 95% Confidence Intervals (CI) and the Standard Deviation (SD)

Gender	Mean age (years)	95% CI Mean age (years)		Standard Deviation	95% CI Standard Deviation	
Female	37.3483	36.0908	38.6059	9.7641	8.9524	10.7391
Male	40.8765	38.7747	42.9783	10.9134	9.6159	12.6188

The above Table 4-7 and Figure 4-2 below illustrates that the majority of adult female patients fall in the mid to late 30's category on initiation of treatment, whereas the most male patients were slightly older.

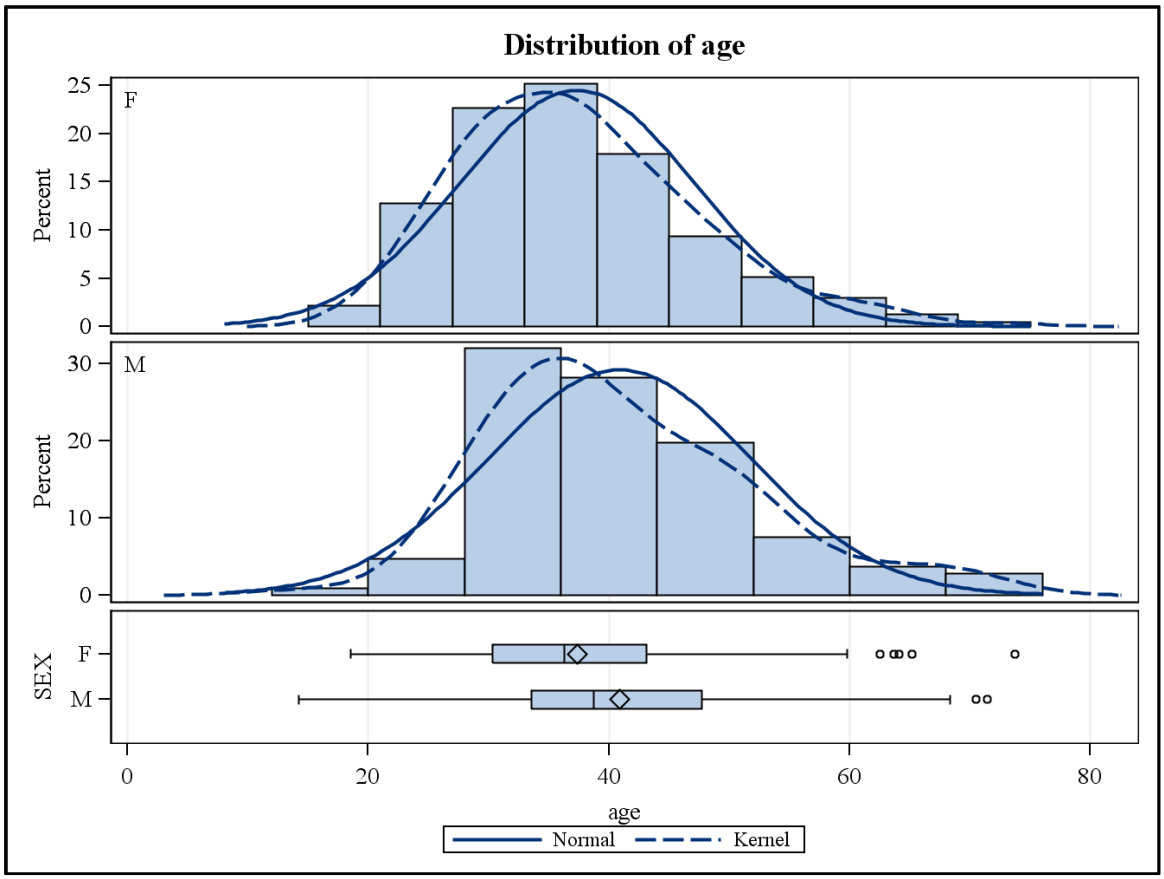

Figure 4-2: Average age of adult patients according to gender on initiation of HAART

Although a calculated *p*-value of *p*=0.0032 shows that the results for the difference between the age of adult male and female patients on initiation of HAART was statistically significant, it only means a small effect and is of relatively insignificant practical importance (*d*=0.323).

Figure 4-2 and Table 4-7 above also indicate that the average adult female patient were initiated on HAART at 37 years (37.3483 ± 9.76 years), while the average male patient was initiated in their early 40's (40.8765 ± 10.91 years). These ages are however higher than would have been expected when looking at the literature research. According to the SA National Prevalence, Incidence, Behaviour and Communication survey of 2008, first sexual intercourse in Sub-Saharan Africa is predicted to occur somewhere between 15 and 20 years of age (depending on gender) and 45% of new infections occur when subjects are between 15-24 years old (Department of Health, 2008b:1). As discussed earlier in this chapter, the highest prevalence in SA is also in the 20-29 year age groups and not around 40 years old, as was discovered in this study facility.

The significance of the paediatric data is somewhat different. The most common route of transmission for all HIV infected children younger than five years is vertical transmission from mother-to-child (Department of Health, 2008a:23). The objectives of the whole ARV programme hopes to see fewer patients in the lower age categories, implying that the implementation of the PMTCT programme should be delivering the desired results. This would mean that there would probably be more patients on treatment in the teenage or adolescent age groups. Table 4-8 below shows the results of analysing and grouping the latest available age data for paediatric patients receiving treatment at the study facility.

Table 4-8: Number and percentage of paediatric patients on HAART according to age group at last treatment date

Age group in years	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
≤ 5	40	24.84	40	24.84
> 5 and ≤ 9	56	34.78	96	59.63
> 9 and ≤ 14	50	31.06	146	90.68
> 14	15	9.32	161	100.00

According to the table above, the largest number of paediatric patients on HAART at the last date of receiving treatment was in the older than 5 years and younger or equal to 9 years age group. Fifty six (n=56, 34.78%) paediatric patients in this group were receiving HAART. The second largest number of paediatric patients (n=50, 31.06%) were in the older than 9 years and younger or equal to 14 years age group. Under five mortality is an important indicator in monitoring the spread of HIV/AIDS (refer to chapter two) and approximately a quarter (n=40, 24.84%) of all paediatric patients on treatment at the study facility were under five years of age. Unfortunately the results show that less than 10% (n=15, 9.32%) of paediatric patients on ARV treatment were in the more sexually active age group of teenagers older than 14 years and up to 18 years old. The reason why patients have been divided between adults and paediatric patients around the age of 18 years is because there are different challenges surrounding for example the collection of treatment for adults and for children who are still in school. The 18 year old female patient in the maximum age column inTable 4-9 below is a child who is still at school and is therefore included in the paediatric data.

Table 4-9: Average age of paediatric patients on HAART according to gender at last treatment date

Gender	Number of patients (n)	Mean age (years)	Minimum age (years)	Maximum age (years)
Female	64	5.9244	0.1752	18.0205
Male	97	5.4795	0.5120	16.2574
Difference (female-male)		0.4449		

Although the average age of paediatric patients does not tell a complete story on its own, it does indicate that both the male (n=97, 5.4795 years) and female (n=64, 5.9244 years) paediatric patients at the last date of receiving treatment had an average age of between 5 and 6 years old. The youngest paediatric patient who received treatment was a female baby of barely 2 months (0.1752 years) old and the youngest male patient was a 6–month-old (0.5120 years) boy. What does however show the full story is Figure 4-3 below, which illustrates the age distribution of paediatric patients.

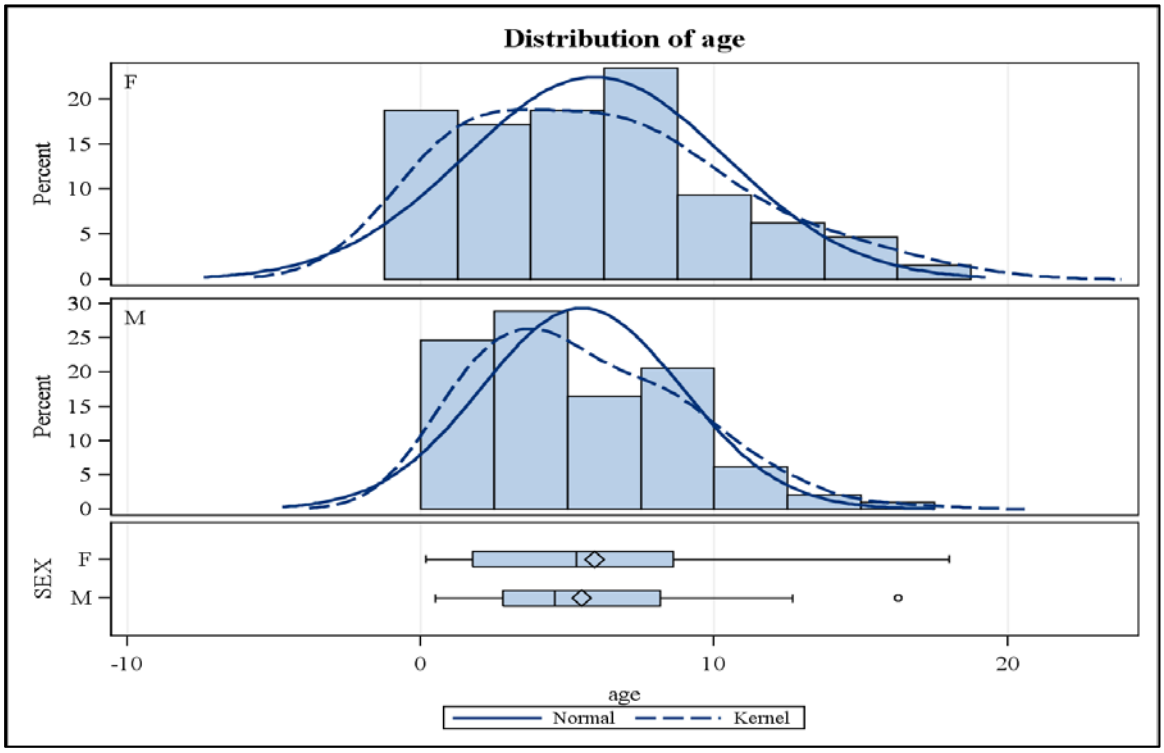

Figure 4-3: Average age of paediatric patients on HAART according to gender at last treatment date

The graphs in Figure 4-3 provide a better understanding of the age of the majority of paediatric patients who receive treatment. From these graphical representations it is obvious that the majority by far of both male and female children were younger than ten

years old. These graphs also provide a better visual indication of the minute proportion of teenagers who received treatment at the facility. This statement is also supported by the adult age group data that show that less than 5% (4.77%) of adult patients on treatment were between 18 and 25 years of age.

It was already mentioned that paediatric patients do have to comply with slightly different criteria than adults. Similarly, however, there are clinical criteria and CD4 counts that need to be considered before initiating ART (Department of Health, 2010b:28). This criterion does differ from the adult eligibility criteria in that all children that have been diagnosed with HIV infection who are younger than one year of age should be started on ARV treatment regardless of CD4 count, even if the child is asymptomatic. According to the comprehensive guideline for management of HIV infected children in South Africa (Department of Health, 2010b:10) there is evidence that indicates that 40% of HIV-infected children die before reaching age one. Due to a still underdeveloped immune system the disease itself progresses faster in children than in adults and without treatment most children born infected with HIV will develop features of AIDS within six months (Department of Health, 2010b:10). This is the reason why it is very important to identify children who are infected by HIV and to start treatment as early as possible. Table 4-10 below was developed to indicate the average age at which paediatric patients are initiated on treatment.

Table 4-10: Average age of paediatric patients according to gender on initiation of HAART

Gender	Number of patients (n)	Mean age (years)	Minimum age (years)	Maximum age (years)
Female	56	5.4407	0.1752	18.0205
Male	90	5.2729	0.5120	12.6653
Difference (female-male)		0.1678		

Although not that much different from Table 4-9, there is a vaguely lower average initiation age for both male and female paediatric patients than what was seen at the last treatment date. Again the initiation ages for both sexes are very similar, with barely a two months difference (0.1678 years). The average male child is initiated at roughly five years and four months (5.2729 years) and the average female child is initiated at lmost five years and six months (5.4407 years).

The *p*-value for the difference between the initiation age of paediatric male and female patients was calculated as *p*=0.793, indicating that there was no statistically significant difference. It was also calculated that there were no practical significance in the difference between the initiation age of paediatric male and female patients (*d*=0.038).

Attention should once more be given to the graphical presentation of the paediatric age results. Figure 4-4 below shows the age distribution of paediatric patients on initiation of HAART.

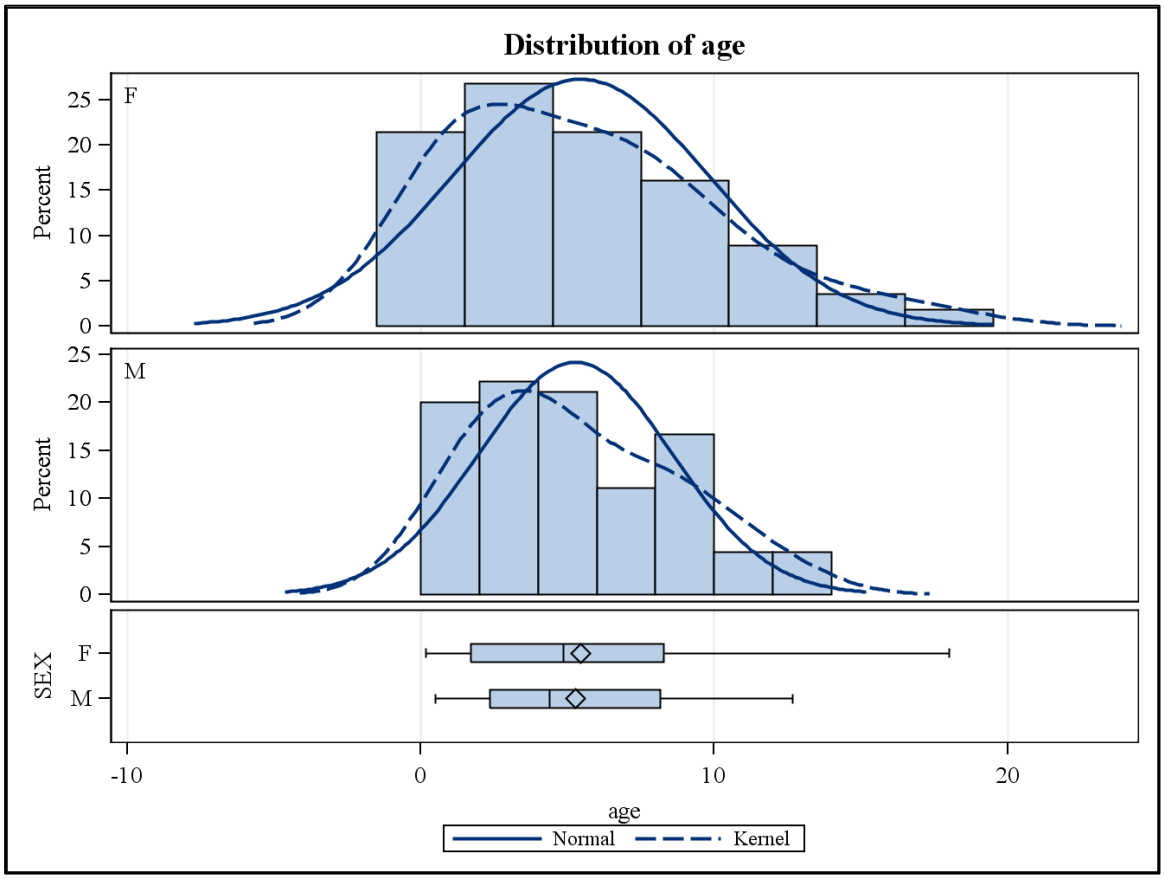

Figure 4-4: Average age of paediatric patients according to gender on initiation of HAART

During the South African Census 2011 (Statistics South Africa, 2012:21) survey there was a marked decrease in the population size for both males and females aged 5-9 and 10-14 years. According to the survey results there could be a number of reasons for this occurrence and further investigations must still be done to determine what drives this phenomenon. Could this marked decline in the population size for these age groups have the same cause as the evident decline in the number of patients older than 5 years receiving treatment in Figure 4-3 and Figure 4-4 above?

4.2.3 Prevalence of adult HIV/AIDS patients according to marital status

Objective number two of the National Strategic Plan (NSP, 2011:39) states that much attention will be given to prevention efforts in areas of high-transmission and to key populations in order to have the greatest impact on preventing new infections. The following three factors namely marital status, residential area and employment status indicate exactly some of these key groups of people that will benefit from such prevention efforts. Although sexual transmission of HIV is a relatively inefficient way to infect a person and usually requires repeated unprotected exposure, it is still the main driver in the spread of the South African and global HIV/AIDS epidemic (WHO, 2000a; Department of Health 2008b:1). For this reason it is important to look at marital status due to the diverse risk behaviours that for example married and single (unmarried) people are involved in. Table 4-11 indicates the number of patients and the percentage of the study population according to their different marital statuses.

Table 4-11: Number and percentage of adult patients on HAART according to marital status

Marital status	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Divorced	5	1.25	5	1.25
Married	50	12.53	55	13.78
Not Known	4	1.00	59	14.79
Single (unmarried)	323	80.95	382	95.74
Widowed	17	4.26	399	100.00

Astonishingly true is the fact that 80.95% of adult patients who receive treatment at the study site were unmarried. This unmarried or so called “single” group of people is more likely to be involved in risky behaviour such as having more than one sexual partner or drug and alcohol abuse (Department of Health, 2008b:4). Also of note is that it is recorded in almost 5% of patients’ records that their spouse has already passed away. Table 4-12 below also shows that the mean age for these widowed patients is a mere 51 years (51.50 ± 12.28 years). This is below the SA average life expectancy in 2011, which was estimated at 57.1 years (Statistics South Africa, 2011:6).

Table 4-12: Comparison of the mean (average) age between the different marital statuses

Marital Status	Number of patients (n)	Mean age (years)	Standard Deviation	Minimum age (years)	Maximum age (years)
Divorced (D)	5	48.8596851	6.7593225	41.0978782	58.1355236
Married (M)	50	46.0997125	10.6591748	28.5530459	71.4031485
Not Known (N/K)	4	46.0629706	14.9160232	36.7008898	68.3312799
Single (S) (unmarried)	322	36.3779424	8.9775185	14.2258727	66.6913073
Widowed (W)	17	51.4947860	12.2763885	33.8617385	73.7303217

The data contained in Table 4-11 as well as Figure 4-5 below is of significant importance. Since it has already been clarified that age is a major risk factor in the spread of HIV/AIDS and that an unmarried status increases a person's chances of being involved in higher risk behaviour, one can assume that being young and unmarried would increase the risk significantly. The results in Table 4-12 above indicate an average age for unmarried patients of around 36 years (36.38 ± 8.98 years) and Figure 4-5 below shows that the majority of unmarried patients are younger than 40 years old. This places almost all of the unmarried patients in the highest adult HIV/AIDS prevalence age range.

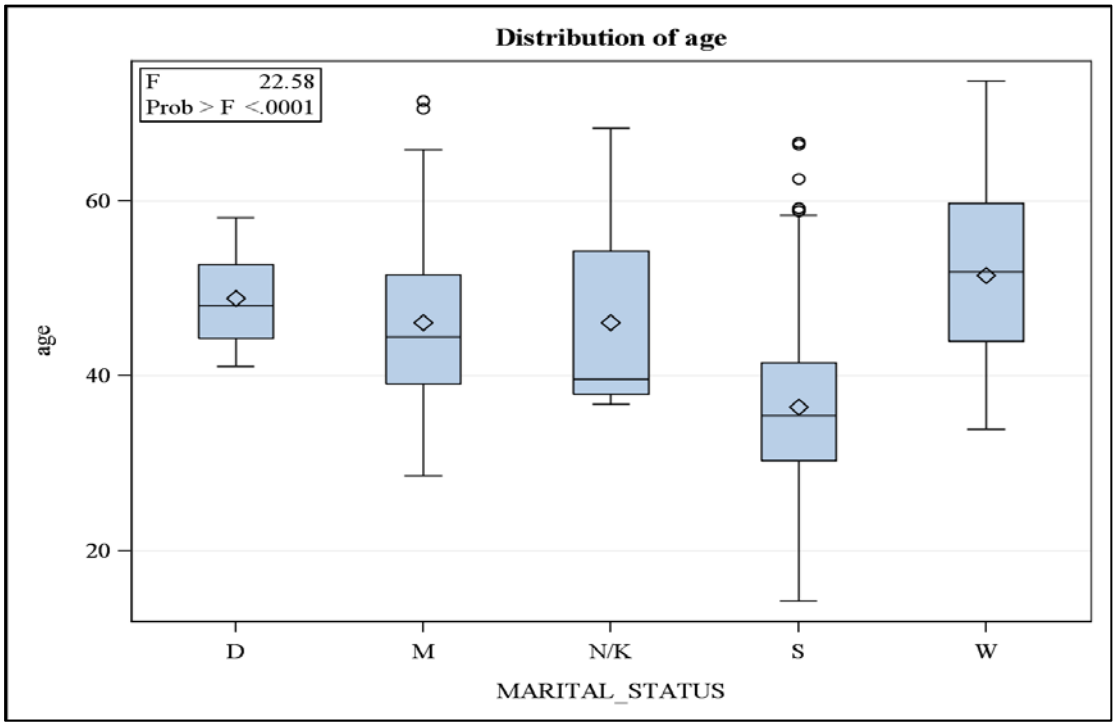

Figure 4-5: Comparison of the age distributions between the different marital statuses

The difference in the age means (averages) between different marital statuses is of particular significance when considering unmarried (single) patients and married patients. Table 4-13 below indicates that married patients were on average almost 10 years (9.72 years) older than unmarried patients on treatment, which indicates that the married group of patients have an average age of just over 46 years (46.06 ± 14.92 years), placing the majority of them only in the third highest adult prevalence range according to this study.

Table 4-13: Comparison of the mean age difference between different marital statuses

Marital status comparison	Difference between age means (years)	Simultaneous 95% Confidence Intervals (CI)		Significant at the 0.05 level
W - D	2.6351	-10.4657	15.7359	
W - M	5.3951	-1.8347	12.6248	
W - N/K	5.4318	-8.8786	19.7422	
W - S	15.1168	8.7085	21.5252	***
D - M	2.7600	-9.3184	14.8383	
D - N/K	2.7967	-14.4777	20.0711	
D - S	12.4817	0.8764	24.0871	***
M - N/K	0.0367	-13.3440	13.4174	
M - S	9.7218	5.8075	13.6361	***
N/K - S	9.6850	-3.2703	22.6403	

Comparisons significant at the 0.05 level are indicated by ***

See also Table 4-12 for an explanation of the abbreviations used in Table 4-13.

The data in Table 4-13 shows that there were significant age differences between all the known marital statuses when compared to the unmarried (single) group. Specific populations (groups of people) that have a higher prevalence of HIV/AIDS than the general population are called Most-At-Risk-Populations (MARPs) (Department of Health, 2008b:3). The conclusion can be drawn that whether due to the younger age or due to being single, this group can definitely be considered as a key population at the highest risk of HIV transmission.

4.2.4 Prevalence of HIV/AIDS patients according to residential area

The following two tables, Table 4-14 and Table 4-15, summarise the residential areas where the study population receiving treatment at the study facility currently resides.

Table 4-14: Number and percentage of adult patients on HAART according to residential area

Residential area	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Itsoseng Zone I	57	14.29	57	14.29
Verdwaal I	22	5.51	79	19.80
Verdwaal II	21	5.26	100	25.06
Boikhutso	11	2.76	111	27.82
Bakerville	4	1.00	115	28.82
Coligny	4	1.00	119	29.82
Schoongezicht	3	0.75	122	30.58
Rooigrond	16	4.01	138	34.59
Mafikeng	11	2.76	149	37.34
Shukran	1	0.25	150	37.59
Blaauwbank	3	0.75	153	38.35
Itsoseng Zone II	17	4.26	170	42.61
Itekeng	2	0.50	172	43.11
Blydeville	2	0.50	174	43.61
Lichtenburg	1	0.25	175	43.86
Klerksdorp	1	0.25	176	44.11
Itsoseng Zone II Ext	13	3.26	189	47.37
Itsoseng Zone III	67	16.79	256	64.16
Bodibe Village	75	18.80	331	82.96
Springbokpan	10	2.51	341	85.46
Meetmekaar	13	3.26	354	88.72
Matile	8	2.01	362	90.73
Shiela Village	37	9.27	399	100.00

The majority of adult patients receiving treatment at the study facility live in Bodibe Village, Itsoseng Zone III and Itsoseng Zone I areas. Together these three areas account for half (49.88%, n=199) of all adult patients receiving treatment at the study facility.

Table 4-15: Number and percentage of paediatric patients on HAART according to residential area

Residential area	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Itsoseng Zone I	13	8.07	13	8.07
Verdwaal I	9	5.59	22	13.66
Verdwaal II	3	1.86	25	15.53
Boikhutso	2	1.24	27	16.77
Coligny	2	1.24	29	18.01
Mafikeng	2	1.24	31	19.25
Rooigrond	5	3.11	36	22.36
Schoongezicht	2	1.24	38	23.60
Itsoseng Zone II	8	4.97	46	28.57
Itsoseng Zone II Extension	3	1.86	49	30.43
Itsoseng Zone III	26	16.15	75	46.58
Bodibe Village	70	43.48	145	90.06
Springbokpan	3	1.86	148	91.93
Meetmekaar	1	0.62	149	92.55
Matile	4	2.48	153	95.03
Shiela Village	8	4.97	161	100.00

Again the Bodibe Village, Itsoseng Zone III and Itsoseng Zone I areas indicated where most paediatric patients receiving treatment live. In fact, more than two thirds (67.7%, n=109) of all paediatric patients receiving HAART at the facility reside in one of these three areas. When compared to the actual population sizes of each area, both the data for adult as well as paediatric patients can help indicate high risk areas or areas of high HIV-transmission.

4.2.5 Prevalence of adult HIV/AIDS patients according to employment status

There are more and more girls that have sexual relations with older men, mostly for material gain or financial exchange, especially younger girls (Department of Health, 2008b:65). According to the above-mentioned behaviour survey, poverty is a motivator for people and more specifically young girls to be involved in sexual relationships, or even multiple sexual relationships. It can therefore be said that financial or employment status does also play a vital role in the spread of HIV/AIDS. The table below shows that roughly 86% (n=343) of the patients receiving treatment have declared in their records that they are unemployed. Again this does not mean that unemployment is the only or most important risk factor in the spread of the HIV/AIDS epidemic. Also note that these

results are probably biased towards unemployed people due the fact that the study was conducted in a government healthcare facility where services are provided at minimal or no cost to the unemployed population. This could be one of the reasons why only 6.52% (n=26) of patients were recorded as employed.

Table 4-16: Number and percentage of adult patients on HAART according to employment status

Employment status	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Not Known	5	1.25	5	1.25
Pensioner	23	5.76	28	7.01
Student	2	0.50	30	7.51
Unemployed	343	85.97	377	93.48
Employed	26	6.52	399	100.00

Also interesting from the above table is that more than 5% (5.76%) of all adult patients receiving HAART are classified as pensioners. Does this again point towards an older study population, or does it confirm that the world is indeed experiencing ageing populations (WHO, 2010:21)?

4.2.6 Prevalence of HIV/AIDS patients according to consultation category

Wellness (or HIV/AIDS) patients consult at the study facility for more than one reason. A patient can for example be transferred in from another healthcare facility, initiated for the very first time on treatment or merely come to collect a repeat of their chronic prescription. The last non-clinical prevalence category was used to determine the number of patients according to the type of consultation that the patient had at the study facility. Table 4-17 below displays the number of adult patients per different consultation category at their last treatment date.

Table 4-17: Number and percentage of adult patients on HAART according to type of consultation category at last treatment date

Category of consultation	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Down-referral to PHC	49	12.28	49	12.28
Initiation at Hospital	30	7.52	79	19.80
Repeat at Hospital	285	71.43	364	91.23
Transfer in	24	6.02	388	97.24
Transfer out	11	2.76	399	100.00

Table 4-17 shows that more than 70% or 285 (71.43%, n=285) of the 399 (N=399) adult patients receiving treatment at the study facility came to the hospital during the data collection period for a review of their prescription and/or refill of their monthly medication. During this period 30 adult patients (7.52%) were newly initiated on ARV treatment and 49 patients (12.28%) were down-referred to primary healthcare facilities for continued chronic care and collection of medication. When a patient is "permanently referred" to another facility, the patient is transferred and in this study 24 (n=24) adult patients were transferred into the study facility from other healthcare facilities and only 11 (n=11) adult patients were transferred out to other healthcare facilities during the data collection period.

Table 4-18: Number and percentage of paediatric patients on HAART according to type of consultation category at last treatment date

Category of consultation	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Down-referral to PHC	1	0.62	1	0.62
Initiation at Hospital	9	5.59	10	6.21
Repeat at Hospital	149	92.55	159	98.76
Transfer in	2	1.24	161	100.00

Due to the increasing number of paediatric HIV/AIDS patients it became necessary that these children be cared for at the PHC level. In fact, according to the SA guidelines for management of HIV in children (Department of Health, 2010b:29), it is now expected from PHC facilities to initiate and supply both adult and paediatric patients with chronic ARV medication. According to the data in table 4-18 above, no children were transferred out to PHC facilities during the data collection period. Only one (n=1, 0.62%) paediatric patient was down-referred to a PHC facility and two (n=2, 1.24%) children were transferred in from other facilities. Nine (n=9, 5.59%) paediatric patients were initiated

on HAART during the data collection period. The majority by far were the 149 (92.55%) children that only came for a review of their prescription and/or refill of their monthly medication. From this data it is already evident that the down-referral and transfer-out systems are not successfully implemented with regard to the paediatric patients.

4.2.7 Prevalence of HIV/AIDS patients according to the number of consultations

Table 4-19 and Table 4-20 below aim to show how many of the patients currently receiving treatment during the data collection period were initiated on treatment within the year preceding the data collection period. The methodology indicated that data was collected for each patient during the selected data collection period and retrospectively for up to one year (depending on how long a patient was already on treatment). Their date for first time collection of treatment (initiation) at the study site was also determined.

Table 4-19: Number of adult patients receiving HAART in relation to the number of consultations documented

Number of consultations	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
1	54	13.53	54	13.53
2	80	20.05	134	33.58
3	18	4.51	152	38.10
4	26	6.52	178	44.61
5	18	4.51	196	49.12
6	14	3.51	210	52.63
7	7	1.75	217	54.39
8	11	2.76	228	57.14
9	14	3.51	242	60.65
10	19	4.76	261	65.41
11	21	5.26	282	70.68
12	22	5.51	304	76.19
13	30	7.52	334	83.71
14	42	10.53	376	94.24
15	22	5.51	398	99.75
16	1	0.25	399	100.00

The above table indicates that 76.19% (n=304) of all adult patients collecting their medication at the study site were in fact initiated on treatment within the twelve months prior to data collection. The remaining 23.81% (n=95) of patients have been on treatment for more than one year and have collected more than twelve repeats of their

medication. Also of interest for the stakeholders of the Wellness programme at the hospital is the fact that just over a third (33.58%, n=134) of patients were initiated or seen for the first time at this facility either during the data collection period or one month prior to it. More than half (52.63%, n=210) of the patients collecting HAART were initiated on treatment within the last six months before the start of this study, which means that many or most of these patients will according to policy still be down-referred or transferred out to PHC facilities if their review at the seventh consultation shows them to be eligible and stable patients. However, the paediatric data table below shows a different image.

Table 4-20: Number of paediatric patients receiving HAART in relation to the number of consultations documented

Number of consultations	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
1	10	6.17	10	6.17
2	5	3.09	15	9.26
3	2	1.23	17	10.49
4	2	1.23	19	11.73
5	1	0.62	20	12.35
6	5	3.09	25	15.43
7	1	0.62	26	16.05
8	2	1.23	28	17.28
9	5	3.09	33	20.37
10	6	3.70	39	24.07
11	14	8.64	53	32.72
12	12	7.41	65	40.12
13	21	12.96	86	53.09
14	37	22.84	123	75.93
15	35	21.60	158	97.53
16	4	2.47	162	100.00

From Table 4-20 above it is again evident that the down-referral and transfer-out systems are not yet entirely implemented in relation to the paediatric patients (also refer to table 4-18). Only about 40% (40.12%, n=65) of all paediatric patients were initiated at the facility in the 12 months prior to data collection. The majority of paediatric patients (59.88%, n=97) have been collecting HAART at the study facility for more than one year and about 15% (n=25) of paediatric patients have been on treatment for six months (consultations) or less. The data in Table 4-20 is just cause for investigating why paediatric patients are not transferred out to their local PHC facility. The question comes

up as to why paediatric patients are reluctant to go or perhaps healthcare workers are reluctant to send paediatric patients to PHC facilities; could it perhaps be a lack of trust in the skills or knowledge at a lower level of care, or maybe a shortage of medication or healthcare professionals at these facilities?

It must be noted that the first column in both Table 4-19 and Table 4-20 indicates the number of consultations and not the months on treatment and also that the remarks in this paragraph is based on the assumption that all these patients came to collect medication every month without defaulting treatment (thus more than 95% adherence to treatment).

4.2.8 Defaulting of HAART by HIV/AIDS patients

There is common agreement that at least 95% adherence to ARV drugs is needed to avoid viral resistance and produce the best possible results from ARV treatment (Department of Health, 2010b:28). It is therefore very important that almost perfect adherence to ARV drugs is achieved, because viral mutations can consequently modify the response to antiviral agents (Balint, 2001:23). 'Defaulter' is the most widely used term to describe a patient who does not comply with more than 95% adherence to treatment (approximately 1.5 days without treatment per month). Table 4-21 below shows the number of adult patients receiving treatment at the facility that have at some stage during their chronic treatment of HIV/AIDS defaulted treatment.

Table 4-21: Number of adult patients that have defaulted HAART during the data period

Gender	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Female	57	61.96	57	61.96
Male	35	38.04	92	100.00

Out of the total number of adult patients receiving treatment (N=399) at the facility, ninety two adult patients have defaulted treatment at some time during the data period. This meant that an astonishing quarter (23%) of all adult patients have somewhere during the data period defaulted their HAART. Calculating the defaulting rate for the different genders shows whether or not there are significant differences in defaulting treatment between male and female patients. Fifty seven (n=57) female patients of the possible total 276 female patients receiving treatment have already defaulted treatment

at least once during the data period. Thirty five (n=35) male patients out of the possible total 123 adult male patients have defaulted treatment during the same period. It therefore means that one in every five women (20.65%) has somewhere been identified as a treatment defaulter and slightly more than one in every four men (28.46%) currently on HAART have already defaulted treatment during the data period.

Table 4-22: Number of adult patients that have defaulted HAART during the data period according to age group

Age group in years	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
≥ 18 and ≤ 25	7	7.61	7	7.61
> 25 and ≤ 35	31	33.70	38	41.30
> 35 and ≤ 45	33	35.87	71	77.17
> 45 and ≤ 55	15	16.30	86	93.48
> 55	6	6.52	92	100.00

The above Table 4-22 indicates the number of adult patients that have defaulted HAART according to age group. Grouping patients according to their age and indicating the number of defaulters per group is as important as determining the defaulting rate between different genders. This is done, as was discussed under the age groupings earlier in this chapter, to determine the most vulnerable group or groups of patients in this rural setting. The following Table 4-23 indicates the percentage of patients in each age group that have defaulted HAART at least once during the data period.

Table 4-23: Number of adult patients that have defaulted HAART during the data period as a percentage of the total number of patients on treatment per age group

Age group in years	Number of adult patients (n) that have defaulted HAART	Total number of adult patients on HAART	Percentage
≥ 18 and ≤ 25	7	19	36.84
> 25 and ≤ 35	31	110	28.18
> 35 and ≤ 45	33	157	21.02
> 45 and ≤ 55	15	79	18.99
> 55	6	33	18.18

Table 4-23 shows that the highest prevalence of defaulting occurred in the youngest age category where 36.84% of patients currently on treatment have already defaulted

HAART during the data period. The lowest percentage of defaulters were in the older than 55 years category, which is also the highest age category, where only six (n=6) patients have defaulted treatment (18.18%). The older than 25 years and younger or equal to 35 years group had the second highest defaulting rate with 28.18% of this group that have defaulted HAART during the data period. From this data it seems as if age does play a significant role in adult patients' adherence to ARV treatment.

The following table was created to indicate all the consultations after an episode of defaulting and also to show the period that a patient has defaulted before returning to hospital for treatment.

Table 4-24: Number of consultations after adult defaulting, as well as an indication of the defaulting period.

Period of defaulting	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
Not Known	1	0.70	1	0.70
1.5 months	1	0.70	2	1.40
10 months	4	2.80	6	4.20
11 months	3	2.10	9	6.29
12 months	4	2.80	13	9.09
18 months	1	0.70	14	9.79
1 month	68	47.55	82	57.34
1 week	3	2.10	85	59.44
21 months	1	0.70	86	60.14
24 months	2	1.40	88	61.54
2 months	17	11.89	105	73.43
2 weeks	10	6.99	115	80.42
3 months	9	6.29	124	86.71
3 weeks	3	2.10	127	88.81
4 months	4	2.80	131	91.61
5 months	7	4.90	138	96.50
6 months	2	1.40	140	97.90
8 months	1	0.70	141	98.60
9 months	2	1.40	143	100.00

From Table 4-24 above it is quite evident that the most patients by far defaulted treatment for one month. At sixty eight (n=68) of all the consultations after a period of defaulting was it calculated that the patient has not had treatment for one month. This number accounts for almost half (47.55%) of all the consultations after defaulting. The second highest period of defaulting was two months without treatment. At seventeen

(n=17, 11.89%) consultations have patients defaulted HAART for two months and at ten (n=10, 6.99%) consultations were it calculated that a patient have not been receiving treatment for two weeks. Notable is the number of adult patients that have returned for treatment after a longer period of defaulting. Forty (n=40) consultations showed patients that have returned after defaulting for more than two months. In only one (n=1) instance was the period of defaulting not known.

In paediatric patients the same criteria applies for defaulting and at least 95% adherence to treatment is necessary to comply with good adherence criteria. Table 4-25 below provides information on the number of paediatric patients that have defaulted HAART during the data period.

Table 4-25: Number of paediatric patients that have defaulted HAART during the data period

Gender	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Female	22	37.93	22	37.93
Male	36	62.07	58	100.00

Again the total number of patients on treatment is used to determine the percentage of paediatric patients that have defaulted treatment. As can be seen earlier in this chapter, there were 161 (N=161) paediatric patients on treatment at the time of data collection. From this total number of paediatric patients fifty eight patients have defaulted ARV treatment during the data period. Hard toconceive is that the percentage of paediatric patients that have defaulted treatment is even higher than the adult defaulting rate. An astounding 36.03% of all the paediatric patients on treatment at the time of data collection have defaulted HAART during the data period. Twenty two (n=22) of the female paediatric patients have defaulted treatment and thirty six (n=36) male children defaulted treatment. Although the gender is not as important in paediatrics when it comes to defaulting (since children are dependent on an adult to collect medication), it can still be noted that 34.38% of female paediatric patients and 37.11% of male paediatric patients defaulted ARV treatment.

Knowing the number of defaulting patients according to age groups is also not that essential in paediatric patients for the same reason that the gender does not matter when a child has to rely on an adult to go for collection of treatment. However, the

following two tables were created only as insightful information regarding defaulting in the different age groups amongst paediatric patients.

Table 4-26: Number of paediatric patients that have defaulted HAART during the data period according to age group

Age group in years	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
≤ 5	15	25.86	15	25.86
> 5 and ≤ 9	17	29.31	32	55.17
> 9 and ≤ 14	20	34.48	52	89.66
> 14	6	10.34	58	100.00

Table 4-27: Number of paediatric patients that have defaulted HAART during the data period as a percentage of the total number of patients on treatment per age group

Age group in years	Number of paediatric patients (n) that have defaulted HAART	Total number of paediatric patients on HAART	Percentage
≤ 5	15	40	37.5
> 5 and ≤ 9	17	56	30.36
> 9 and ≤ 14	20	50	40.00
> 14	6	15	40.00

In both the older than 9 years and younger or equal to 14 years (n=20) as well as the older than 14 years (n=6) old age group have 40% of these patients already defaulted ARV treatment. Although the study population of defaulted paediatric patients is relatively small, it does nonetheless seem as if the older age groups are more inclined to defaulting treatment than the younger children. As mentioned before, there are however a number of reasons why children default treatment, of which the most important is the reliability or responsibility of the parent or caregiver.

The following table indicates all the consultations after an episode of defaulting and also shows the period that a paediatric patient has defaulted before returning to hospital for treatment.

Table 4-28: Number of consultations after paediatric defaulting, as well as an indication of the defaulting period

Period of defaulting	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
Not Known	1	1.05	1	1.05
12 days	1	1.05	2	2.11
1 month	41	43.16	43	45.26
1 week	10	10.53	53	55.79
2 months	15	15.79	68	71.58
2 weeks	12	12.63	80	84.21
3 months	4	4.21	84	88.42
3 weeks	2	2.11	86	90.53
4 months	3	3.16	89	93.68
5 months	3	3.16	92	96.84
7 months	2	2.11	94	98.95
9 months	1	1.05	95	100.00

Interestingly, the results are very similar to the adult defaulting period data. The same as with the adult data, this table indicates the number of consultations after patients have defaulted, meaning also that one patient could have defaulted more than once during the data collection period. The most consultations after a patient has defaulted treatment (n=41) again indicated that they have defaulted for one month. The second highest was once more where patients have defaulted for two months and the third highest prevalence of a defaulting period was two weeks. Slightly fewer paediatric patients than adult patients have defaulted treatment for more than two months. Only thirteen patients have returned for treatment after defaulting for more than two months.

4.2.9 Medicine treatment patterns

For this, very central, section of chapter four the focus is on identifying the medicine treatment patterns as prescribed to all HIV/AIDS patients at the study facility.

The foremost important aspect in medicine treatment patterns is providing a complete depiction of the different regimens that are prescribed at the study facility according to the National protocols. The following table does exactly that by providing the number and percentage of adult patients receiving treatment according to the different adult HAART regimens.

Table 4-29: Number and percentage of adult patients according to adult HAART regimen

HAART Regimen	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
1a Stavudine (D4T, 30mg bd) Lamivudine (3TC, 150mg bd) Efavirenz (EFV, 600mg nocte)	83	20.80	83	20.80
1atn Tenofovir (TDF, 300mg nocte) Lamivudine (3TC, 300mg nocte) Efavirenz (EFV, 600mg nocte)	209	52.38	292	73.18
1az Zidovudine (AZT, 300mg bd) Lamivudine (3TC, 150mg bd) Efavirenz (EFV, 600mg nocte)	8	2.01	300	75.19
1b Stavudine (D4T, 30mg bd) Lamivudine (3TC, 150mg bd) Nevirapine (NVP, 200mg bd)	39	9.77	339	84.96
1bt Tenofovir (TDF, 300mg nocte) Lamivudine (3TC, 150mg bd) Nevirapine (NVP, 200mg bd)	48	12.03	387	96.99
1bz Zidovudine (AZT, 300mg bd) Lamivudine (3TC, 150mg bd) Nevirapine (NVP, 200mg bd)	6	1.50	393	98.50
1da Abacavir (ABC, 300mg bd) Lamivudine (3TC, 150mg bd) Lopinavir/Retonavir (LPV/r, 400mg/100mg bd)	1	0.25	394	98.75
1dt Tenofovir (TDF, 300mg nocte) Lamivudine (3TC, 150mg bd) Lopinavir/Retonavir (LPV/r, 400mg/100mg bd)	1	0.25	395	99.00
2AA25 Zidovudine (AZT, 300mg bd) Didanosine (ddI, 250mg daily) Lopinavir/Retonavir (LPV/r, 400mg/100mg bd)	1	0.25	396	99.25

HAART Regimen	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
2AA40 Zidovudine (AZT, 300mg bd) Didanosine (ddI, 400mg daily) Lopinavir/Retonavir (LPV/r, 400mg/100mg bd)	3	0.75	399	100.00

Although Tenofovir (TDF) was only implemented as part of the first line regimen for all new adult patients needing treatment in 2010 (Department of Health, 2010c:9), almost 65% (64.66%, n=258) of all adult patients collecting treatment at the study facility by 2012 was already receiving TDF as part of their treatment regimen. This percentage was calculated by adding together all patients on a TDF containing regimen [regimen 1atn (52.38%, n=209) plus regimen 1bt (12.03%, n=48) plus regimen 1dt (0.25%, n=1)]. The regimen that had the single most patients on a specific treatment protocol was regimen 1atn, which is a Tenofovir, Lamivudine (3TC) and Efavirenz (EFV) combination. The second most prescribed regimen was regimen 1a, which was the regimen prescribed as first choice for initiating most patients in the previous SA guidelines, with 20.80% (n=83) of all patients collecting treatment during the data collection period on this regimen containing Stavudine (d4T), Lamivudine and Efavirenz. The third most patients were on regimen 1bt (Tenofovir, Lamivudine and Nevirapine) and along with the forth most prescribed regimen 1b (Stavudine, Lamivudine and Nevirapine) they were particularly important in the initiation of pregnant women mainly because of the substitution of what was believed at that stage the possible teratogenic Efavirenz for Nevirapine (NVP). It was also prescribed to patients already on other psychoactive drugs where EFV was contra-indicated. The only other two significantly important regimens appeared to be 1az (Zidovudine, Lamivudine and Efavirenz) and 1bz (Zidovudine, Lamivudine and Nevirapine) and these are basically the same as the standard regimen 1a and 1b, but were largely prescribed to patients with contra-indications to either TDF (renal disease) or d4T (drug toxicity such as lactic acidosis and lipoatrophy) in which case one of the before mentioned drugs would be substituted for Zidovudine (AZT).

These six possible combinations of the adult first line regimens made up 98.5% (n=393) of the total number of patients receiving treatment; this meant that only six patients were not on a first line regimen. Just to clarify, this is actually either a very good sign that patients are responding well to treatment and that their CD4 counts are going up while

their viral loads are going down and while they have very few side-effects that could not be solved within a first line regimen, or it means that this is not the case and that patients could possibly be experiencing for example virological failure without the caregivers or physicians knowing about it. As already mentioned, there were only six patients not on a first line regimen. Four of these six patients were receiving second line therapy (2AA25 and 2AA40) including the Protease inhibitors Lopinavir (LPV) and Retonavir (RTV) in both the regimens but only in different dosages and the other two patients were receiving a salvage therapy regimen (1da and 1dt) containing Didanosine (ddI).

The two tables (4-30 and 4-31) below elaborate a little more on the changing of treatment regimen. The first table (4-30) below indicates whether a patient has changed from one regimen to another. This is done by using all consultations from all adult patients to determine at how many consultations the physician changed the treatment regimen of patients.

Table 4-30: Number and percentage of consultations where the HAART regimen of adult patients were changed

Regimen changed	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
No	2770	98.30	2770	98.30
Yes	48	1.70	2818	100.00

The above Table 4-30 shows that at 48 (n=48) different consultations the treatment regimens of adult patients were changed during the data period. In Table 4-31 below the same number of consultations were used, but rather than indicating only whether or not the treatment regimen was changed, the researcher included the reason as to why the regimen of a patient was changed at the consultation.

Table 4-31: Consultations where the HAART regimen of an adult patient was changed and indicating the reason for change

Reason for change	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
3TC at night only	2	0.07	2	0.07
Not Applicable	2771	98.33	2773	98.40
Not Known	3	0.11	2776	98.51
Pregnancy	4	0.14	2780	98.65
Side-effects	37	1.31	2817	99.96
Virological Failure	1	0.04	2818	100.00

Table 4-31 provides very valuable information regarding treatment regimens and can be used to determine the vigilance of identifying problems with treatment. According to this information only one (n=1) adult patient was switched to another regimen due to virological failure (VF). Virological failure, as explained in chapter 2 according to the South African National guidelines for the management of adult and adolescent patients with HIV infection (Department of Health, 2010c:9), is what happens to a patient if he/she is placed on a certain HAART regimen and after 3 months on treatment the patient still has a viral load of more than 1000 copies/mm^3. That means that the treatment regimen is not effectively suppressing the virus replication and the patient will then need to be placed on another regimen. The following table will better indicate to which regimen the patient was changed to.

Table 4-32: Consultations at which the HAART regimen of an adult patient was changed including the reason for change and which new regimen it was changed to.

Reason for change	New HAART Regimen						
Number (n) Percentage Row % Column %	**1atn**	**1az**	**1b**	**1bt**	**1bz**	**2AA40**	**Total (n)**
3TC at night only (3TC nocte)	2 4.17 100.00 6.45	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	2 4.17
Not Applicable (N/A)	1 2.08 100.00 3.23	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 2.08

Reason for change	New HAART Regimen						
Number (n) Percentage Row % Column %	1atn	1az	1b	1bt	1bz	2AA40	Total (n)
Not Known (N/K)	3 6.25 100.00 9.68	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	3 6.25
Pregnancy (P)	0 0.00 0.00 0.00	0 0.00 0.00 0.00	2 4.17 50.00 66.67	2 4.17 50.00 22.22	0 0.00 0.00 0.00	0 0.00 0.00 0.00	4 8.33
Side-effects (SE)	25 52.08 67.57 80.65	2 4.17 5.41 100.00	1 2.08 2.70 33.33	7 14.58 18.92 77.78	1 2.08 2.70 100.00	1 2.08 2.70 50.00	37 77.08
Virological Failure (VF)	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 2.08 100.00 50.00	1 2.08
Total	31 64.58	2 4.17	3 6.25	9 18.75	1 2.08	2 4.17	48 100.00

This table indicates that the adult patient who experienced virological failure was in fact switched to regimen 2AA40, which is a second line therapy. From all these consultations only four patients were changed from an Efavirenz-based regimen 1a to Nevirapine-based regimen 1b or 1bt due to the patient falling pregnant while on regimen 1a. Two of the patients were merely switched from using Lamivudine (3TC) twice daily to using it only at night (3TC nocte). At three (n=3) of the consultations patients were changed from one regimen to another (1atn), but the reason for change was not recorded and is thus not known (N/K). Most patients who had to change regimen had to do so due to side-effects from their initial regimen. Of the thirty seven (n=37) patients that changed regimen due to drug side-effects (SE), only five did not change due to adverse drug reactions to Stavudine, meaning that 32 patients was switched from a regimen containing Stavudine to a regimen using Tenofovir (1atn or 1bt) because of this. Of the five patients with side-effects to other drugs; two patients changed from a Stavudine regimen to a Zidovudine regimen (1 patient to 1az and 1 patient to 1bz), one patient changed from an Efavirenz first line regimen to a new 2nd line regimen containing the Protease inhibitors Lopinavir (LPV) and Retonavir (RTV) and one changed from a Tenofovir regimen to a Zidovudine regimen (this is the other patient from the two that was changed to regimen 1az). What makes this table exceptional is the fact that it shows that the major reason for changing treatment regimens in this

facility was due to adult patients experiencing side-effects to drugs (77.08%) and the second most common reason was pregnancy (8.33%).

Paediatric patients have somewhat different first line regimens, especially for children younger than three years old. In Table 4-33 below the number and percentage of paediatric patients receiving treatment according to the different paediatric HAART regimens are provided.

Table 4-33: Number and percentage of paediatric patients according to paediatric HAART regimen

HAART Regimen	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
1atn Tenofovir (TDF, 300mg nocte) Lamivudine (3TC, 300mg nocte) Efavirenz (EFV, 600mg nocte)	2	1.24	2	1.24
1bt Tenofovir (TDF, 300mg nocte) Lamivudine (3TC, 150mg bd) Nevirapine (NVP, 200mg bd)	1	0.62	3	1.86
P1a Stavudine (D4T) Lamivudine (3TC) Lopinavir/Retonavir (LPV/r)	45	27.95	48	29.81
P1aa Abacavir (ABC) Lamivudine (3TC) Lopinavir/Retonavir (LPV/r)	16	9.94	64	39.75
P1b Stavudine (D4T) Lamivudine (3TC) Nevirapine (NVP)	1	0.62	65	40.37
P1ba Abacavir (ABC) Lamivudine (3TC) Nevirapine (NVP)	2	1.24	67	41.61
P1c Stavudine (D4T) Lamivudine (3TC) Efavirenz (EFV)	73	45.34	140	86.96

HAART Regimen	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
P1ca Abacavir (ABC) Lamivudine (3TC) Efavirenz (EFV)	21	13.04	161	100.00

Note from Table 4-33 above that only the two adult regimens had fixed dosages because the paediatric regimens were given in dosages according to the weight of the child. The HAART protocol with the most paediatric patients was regimen P1c, containing Stavudine, Lamivudine and Efavirenz (which is also the same three ARV drugs that is in the adult regimen 1a). In truth, almost half (45.34%, n=73) the paediatric patients were still using this regimen at the time of data collection. It also used to be the first choice in the previous paediatric guidelines for initiating children older than three years. The second largest number of paediatric patients were receiving regimen P1a, which contains Stavudine, Lamivudine and the Protease inhibitors Lopinavir (LPV) and Retonavir (RTV). Regimen P1a was also the first choice in the previous paediatric guidelines for initiating children younger than three years of age. However, due to the toxicity profile, patients are rapidly changing from the Stavudine-based regimen P1c and P1a to the Abacavir (ABC)-based regimen P1ca and P1aa. In actuality, regimen P1ca was already the third most used regimen with 13.04% (n=21) of paediatirc patients using this as treatment regimen and regimen P1aa was the fourth most prescribed paediatric regimen (9.94%, n=16). Together, these four regimens form 96.27% of all paediatric treatment regimens issued. Of the remaining six patients, two were already on the current adult first line regimen 1atn (TDF, 3TC and EFV), one was on the adult regimen 1bt (TDF, 3TC and NVP), one was on the paediatric P1b regimen (D4T, 3TC and NVP) and two patients were on paediatric regimen P1ba (ABC, 3TC and NVP).

The table below was created to indicate the number of consultations at which the prescriber changed the regimen of patients as was done with the data on adults.

Table 4-34: Number and percentage of consultations where the HAART regimen of paediatric patients were changed

Regimen changed	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
No	1823	98.06	1823	98.06
Yes	36	1.94	1859	100.00

Although the number of times that a regimen was changed (n=36) looks insignificantly low (a mere 1.94% of consultations), it must be remembered that these changes presumably also represent the number of patients that changed regimen, since it is most likely that patients only changes regimen once. This implies that approximately 36 out of the possible 161 paediatric patients have changed regimen, which shows a different picture given that this means that more than 22% of paediatric patients have changed regimen for some reason. Table 4-35 below points out the reasons as to why these patients switched regimens.

Table 4-35: Consultations at which the HAART regimen of a paediatric patient was changed including the reason for change

Reason for change	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
Not Applicable	1823	98.06	1823	98.06
Not Known	7	0.38	1830	98.44
Side-effects	28	1.51	1858	99.95
Virological Failure	1	0.05	1859	100.00

Table 4-35 above shows that there are fewer reasons for changing the regimen of a paediatric patient than that of the adult patients. Twenty eight (1.51%, n=28) paediatric patients' regimens were changed due to drug side-effects, only one patient was changed due to virological failure (VF) and at seven (n=7) consultations were the regimen of a child changed without the reason being documented.

The following table (Table 4-36) will indicate to which new regimen the paediatric patients who did experience a change in regimen was changed to.

Table 4-36: Consultations where the HAART regimen of a paediatric patient was changed including the reason for change and which new regimen it was changed to.

Reason for change	New HAART Regimen				
Number (n) Percentage % Row % Column %	1atn	P1aa	P1c	P1ca	Total (n)
Not Known (N/K)	0 0.00 0.00 0.00	1 2.78 14.29 9.09	3 8.33 42.86 50.00	3 8.33 42.86 16.67	7 19.44
Side-effects (SE)	1 2.78 3.57 100.00	10 27.78 35.71 90.91	2 5.56 7.14 33.33	15 41.67 53.57 83.33	28 77.78
Virological Failure (VF)	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 2.78 100.00 16.67	0 0.00 0.00 0.00	1 2.78
Total	1 2.78	11 30.56	6 16.67	18 50.00	36 100.00

Yet again, this table provides some interesting answers as to why the treatment regimen of paediatric patients was changed. As discussed under Table 4-33 above, it is evident that more and more paediatric patients are switching from the Stavudine-based regimen P1c and P1a to the Abacavir (ABC)-based regimen P1ca and P1aa. This table confirms that twenty five of the twenty eight patients that changed regimen due to drug side-effects actually changed from a Stavudine-based regimen P1c or P1a to the Abacavir (ABC)-based regimens P1ca and P1aa. However, according to the unrefined data the patient that experienced virological failure switched from a regimen P1a to this documented regimen P1c. The patient was initiated on regimen P1a in 2009 when he was only about two and a half years old and had a regimen change in 2011 because his viral load had increased to 77393copies/mm^3. Although there were seven patients that did not have a reason documented as to why their regimen was changed, one can derive from table 4.36 that the one patient now on regimen P1aa and the three patients now on regimen P1ca probably changed treatment regimen for the same reason the other twenty five patients above did. One can speculate that the three (N/K) patients who changed to regimen P1c probably merely outgrew their Lopinavir (LPV) and Retonavir (RTV) suspension regimen and switched to an EFV capsule-based regimen.

4.2.10 Most commonly recorded complaints of HIV/AIDS patients

As part of the data collection tools (see appendices 1 & 2), the researcher also collected data on the most commonly recorded complaints of HIV/AIDS patients (perhaps due to side-effects of the ARV drugs or the disease itself). However, the data were not used as the basis for further discussions. The complete data is provided in appendix 9 and is published in the order and combinations in which they were recorded.

4.2.11 Prophylactic treatment of HIV/AIDS patients

As discussed in chapter 2, the profound suppression of the immune system due to HIV infection can render patients infected with HIV ultimately vulnerable to numerous opportunistic infections. Once the CD4 count drops below 400/μL (cells per microliter of blood) a person becomes much more vulnerable to opportunistic infections (Weiss, 2000:A13). The CD4 count can thus be utilised as an indicator for determining the susceptibility of an infected person to opportunistic infections. The CD4 count of a normal healthy person is between 800 and 1300 cells per microliter of blood (Berkow *et al*., 1997:926). Co-trimoxazole (trimethoprim-sulphamethoxazole) has a proven broad spectrum prophylactic action against some general bacterial pathogens (Zachariah *et al*., 2007:686). Probably the most important prophylactic use of Co-trimoxazole is against *Pneumocystis* pneumonia (PCP), an often life-threatening disease in immune-compromised patients (Ingraham & Ingraham, 2000:591). The South African treatment guidelines for adult and adolescent HIV-infected patients provide clear guidelines on initiating Co-trimoxazole prophylaxis to patients. For full guidelines refer to chapter 2, but the following are important points to consider in view of the study results (Department of Health, 2010c:30-31):

- Co-trimoxazole prophylaxis should be given to all patients with a CD4 count < 200 cells/mm^3 or WHO clinical stage 2, 3 or 4 disease.
- Co-trimoxazole prophylaxis can be stopped once a patient has stabilized on ARV treatment and the CD4 count is >200cells/mm^3.
- Co-trimoxazole prophylaxis can be restarted if a patient develops a new opportunistic infection or the CD4 count again goes down to < 200cells/mm^3.

The following two tables (4-37 and 4-38) were created to monitor the vigilance of prescribing Co-trimoxazole to adult HIV/AIDS patients in the study facility by looking at

all consultations and determining at which consultations this prophylaxis was prescribed.

Table 4-37: Prevalence of prescribing Co-trimoxazole as prophylaxis to adult patients on HAART with a CD4 count of more than 200cells/mm^3

Co-trimoxazole prescribed	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
Allergic (No)	9	0.60	9	0.60
No	220	14.77	229	15.37
Yes	1261	84.63	1490	100.00

The table above shows that although Co-trimoxazole is only required for adult HIV/AIDS patients with a CD4 count of less than 200cells/mm^3 according to the South African treatment guidelines (Department of Health, 2010c:31), Co-trimoxazole was issued at almost 85% (84.63%, n=1261) of consultations for patients with a CD4 count of more than 200cells/mm^3. This could indicate some issues. Firstly, there could be many patients with a CD4 count >200cells/mm^3, but who perhaps have a WHO clinical stage 2, 3 or 4 disease/opportunistic infection and therefore qualifies to receive Co-trimoxazole as prophylaxis. The other alternative is that prescribers have perhaps come into the habit of randomly prescribing Co-trimoxazole as prophylaxis to almost all HIV/AIDS patients regardless of CD4 count. With all this said, a mere 15% (15.37%, n=229) of all consultations of patients with a CD4 count >200cells/mm^3 did not result in the patient getting Co-trimoxazole as prophylaxis. At nine (n=9) of the 229 consultations were patients found to be allergic to Co-trimoxazole and the drug was not issued. The table below looks at how attentively Co-trimoxazole was prescribed as prophylaxis for eligible patients with a CD4 count of less than 200cells/mm^3.

Table 4-38: Prevalence of prescribing Co-trimoxazole as prophylaxis to adult patients on HAART with a CD4 count of less than 200cells/mm^3

	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
Allergic (No)	5	0.38	5	0.38
No	37	2.79	42	3.16
Yes	1286	96.84	1328	100.00

The above Table 4-38 shows meaningful use of Co-trimoxazole as prophylaxis in adult patients with a CD4 count of < 200cells/mm^3. Out of a possible 1328 eligible

consultations, at more than 95% (96.84%, n=1286) of these consultations have Co-trimoxazole been prescribed according to the guidelines. At only 3.17% of these consultations were Co-trimoxazole not prescribed and one of these patients was allergic to Co-trimoxazole and the drug was replaced with Dapsone. This accounts for 0.38% or 5 (n=5) of the consultations.

The South African national guidelines for giving Co-trimoxazole to paediatric patients (Department of Health, 2010b:20) shows that administering Co-trimoxazole prophylaxis to infants and young children is much more complex than with the adults (refer to table 2-13 in chapter 2). Since prescribing Co-trimoxazole prophylaxis to children is categorised according to age as well as different CD4 counts or percentages per age group, the results in this study will only provide an overall look at the prevalence of prescribing Co-trimoxazole as prophylaxis to paediatric patients per consultation.

Table 4-39: Prevalence of prescribing Co-trimoxazole as prophylaxis to paediatric patients on HAART

Co-trimoxazole prescribed	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
Allergic (No)	4	0.215	4	0.215
No	37	1.990	41	2.205
Yes	1818	97.795	1859	100.00

One child was identified as allergic to Co-trimoxazole, accounting for four (n=4) of the total consultations. This patient was indeed, as with the adult patient that was allergic to Co-trimoxazole, given Dapsone. At barely less than 2% (1.99%, n=37) of all consultations were Co-trimoxazole not prescribed, nor issued, to paediatric HIV/AIDS patients. At an astounding 98% (97.795%, n=1818) of all consultations, Co-trimoxazole was indeed prescribed and issued to paediatric patients. Again the question arises whether there are actually so many paediatric patients that were eligible for Co-trimoxazole prophylaxis, or if it could be a case of a prescribing habit.

Although not mandatory, the South African treatment guidelines (Department of Health, 2010c:28) do make note of the use of multivitamin supplements in the routine and chronic management of HIV/AIDS patients. The use of a multivitamin supplement is recommended especially when a patient shows signs of weight loss or when a patient has loss of appetite. The following two tables (4-40 and 4-41) provide an analysis of the fondness of prescribers to also prescribe multivitamin supplements.

Table 4-40: Prevalence of prescribing multivitamin supplements to adult patients on HAART

Multivitamin prescribed	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
No	396	14.05	396	14.05
Yes	2422	85.95	2818	100.00

Even though, as already indicated, the prescription of multivitamin supplements is not as essential as the preescription of Co-trimoxazole it is almost astounding to see how often multivitamins are prescribed. At roughly 86% (85.95%, n=2422) of all adult consultations did patients also receive multivitamin supplements as part of their treatment regimen. This is almost the same as the total number of consultations at which Co-trimoxazole was issued to adult patients (90.38%, n=2547).

The following table indicates at how many consultations were multivitamin supplements prescribed to paediatric patients.

Table 4-41: Prevalence of prescribing multivitamin supplements to paediatric patients on HAART

Multivitamin prescribed	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
No	65	3.50	65	3.50
Yes	1794	96.50	1859	100.00

Of all the consultations that paediatric patients attended during the study period, multivitamin supplements were prescribed at 96.5% (n=1794) of these consultations. This signifies that at only sixty five (n=65, 3.5%) of the total 1859 consultations were multivitamin supplements not issued to children with HIV/AIDS. Although malnourishment of children are common (MDG SA, 2010:32) in the rural North West province, this is still a staggeringly high number. The question again seems to be whether all paediatric patients need these vitamins or if prescribers are purely in the custom of issuing these supplements as a standard protocol to all paediatric HIV/AIDS patients.

4.2.12 TB treatment and TB prophylactic treatment of HIV/AIDS patients

The WHO (2004:16) indicates in their progress report on the global plan to stop tuberculosis (TB) that South Africa has one of the highest HIV and TB co-infection rates in the world. Mortality rates in dual TB-HIV infected patients are high especially due to a

number of opportunistic infections (Grimwade *et al*., 2005:164). Although the majority of patients with active Tuberculosis are expected to collect their TB medication at the primary healthcare (PHC) facility there are a number of HIV/AIDS patients who find it more convenient to collect their TB medication on the same day and at the same place that they collect their ARV treatment. The following table shows the number of adult patients that have collected their TB treatment at the study facility and also indicates the type of TB regimen and dosages that were used.

Table 4-42: Number of adult patients on HAART that have received TB medication, also indicating through abbreviation the TB regimen and dosage of treatment

TB drugs prescribed	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
2RH300	6	4.35	6	4.35
2RHZE	2	1.45	8	5.80
3RH150	3	2.17	11	7.97
3RHZE	21	15.22	32	23.19
4RHZE	14	10.14	46	33.33
5RHZE	1	0.72	47	34.06
H300	90	65.22	137	99.28
PHC	1	0.72	138	100.00

Refer to appendix 3 for a full description of abbreviations and dosages of TB drugs

A cumulative total of forty seven (n=47) adult HIV/AIDS patients received medication for the treatment of active TB during the data period. This is a large number of people to be treated for active TB, considering the data period covers just over one year of data. This also means that almost 12% of adult patients (that was recorded) were dual TB-HIV infected during this period.

Tuberculosis has been shown to accelerate HIV disease progression and this dual infection is also the reason why TB is the most common cause of morbidity and mortality in HIV-infected patients (Department of Health, 2010e:2). In 2010 around 350 000 people worldwide died due to HIV-associated Tuberculosis (WHO, 2012c:14). It is therefore clear that preventing TB-infection in HIV positive individuals will be very beneficial to patients and reduce morbidity and mortality amongst HIV-infected individuals. According to the guidelines for tuberculosis preventive therapy among HIV-infected individuals in South Africa (Department of Health, 2010e:3), TB preventive

therapy can be given to all HIV-infected patients without any signs and symptoms of active TB. Included in Table 4-42 above is the number of adult patients that received TB prophylactic treatment. According to the data, ninety adult patients (n=90) received Isoniazid 300mg once daily (H300) as TB prophylaxis. This means that besides the patients that have collected this prophylactic treatment (or even TB treatment) at the PHC facilities, there are still almost a quarter of the adult patients (22.55%) that needed and received TB preventative therapy due to them having close contact with active TB patients.

In Table 4-43 below the same product is used as TB prophylactic treatment in children. There are a number of different dosages that are prescribed to paediatric patients according to their weight.

Table 4-43: Number of paediatric patients on HAART that have received TB medication, also indicating through abbreviation the TB regimen and dosage of treatment

TB drugs prescribed	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
0.5RHZ	1	1.89	1	1.89
1.5RH	1	1.89	2	3.77
1.5RHZ	7	13.21	9	16.98
1RH	1	1.89	10	18.87
1RHZ	10	18.87	20	37.74
2.5RHZ	1	1.89	21	39.62
2RHZ	3	5.66	24	45.28
3RH	3	5.66	27	50.94
3RHZ	4	7.55	31	58.49
3RHZE	1	1.89	32	60.38
4RH	1	1.89	33	62.26
4RHZ	2	3.77	35	66.04
5RHZ	1	1.89	36	67.92
H100	2	3.77	38	71.70
H150	3	5.66	41	77.36
H200	5	9.43	46	86.79
H25	1	1.89	47	88.68
H250	2	3.77	49	92.45
H300	3	5.66	52	98.11
Not Known	1	1.89	53	100.00

Refer to appendix 4 for a full description of abbreviations and dosages of TB drugs

A cumulative total of thirty seven (n=37) paediatric HIV/AIDS patients receiving HAART at the study facility also received medication for the treatment of active TB during the data period. This shows that almost 23% (22.98%) of paediatric patients on HAART were also treated for TB during this period. Of the thirty seven paediatric patients receiving TB treatment, one (n=1) patient received TB treatment, but the TB drugs that were prescribed was not documented (Not known). TB preventive therapy is equally important in paediatric patients as was discussed under the adult TB data above. Sixteen paediatric patients received Isoniazid once daily as TB prophylaxis. The Isoniazid dosage differs according to the weight of a child (H25 up to H300) and is prescribed at a dosage of 10mg/kg/day to a maximum of 300mg daily (Department of Health, 2010e:5). These sixteen patients meant that besides the 23% (22.98%) that received treatment for active TB, another 10% (9.94%) of paediatric patients received TB prophylactic treatment.

Table 4-44: Number of paediatric patients on HAART diagnosed with TB Meningitis

TB Meningitis	Number of patients (n)	Percentage	Cumulative number	Cumulative percentage
No	160	99.38	160	99.38
Yes	1	0.62	161	100.00

During the data period only one (n=1) paediatric HIV/AIDS patient was treated for TB Meningitis.

4.2.13 Other related medication prescribed to HIV/AIDS patients

As part of the data collection tools (see appendices 1 & 2), the researcher also collected data on all other medication that was prescribed to HIV/AIDS patients. However, the data were not used as the basis for further discussions. The complete data is provided in appendix 8 and is published in the order and combinations in which they were prescribed.

4.3 Clinical indicator results

This section of the results chapter looks at the more clinical objectives of the study. The focus falls especially on three main indicators for the objectives of this study namely patients' weight, CD4 count and viral load.

4.3.1 Weight in HIV/AIDS patients

One of the first clinically important aspects of HIV/AIDS patients for any clinician is a patient's weight. This is even truer for paediatric patients. There are a number of reasons why it is so important to keep a patient's weight in mind at every consultation. The following is a brief discussion on the importance of weight monitoring in HIV/AIDS patients.

Unexpected weight loss has been described as one of the main symptoms that could point towards an HIV/AIDS patient having TB co-infection (Department of Health, 2010c:23). The South African National Treatment Guidelines for HIV/AIDS Patients (Department of Health, 2010c:28) strongly recommend that any unintentional weight loss of more than 1.5kg per month should be thoroughly investigated. The guidelines also advocate that weight must be measured at each visit, and the weight should also be used to calculate the BMI (body mass index) at every consultation (Department of Health, 2010c:12). The Department of Health has even developed a guideline called the South African National Guidelines for People Living with HIV, AIDS, TB and Other Debilitating Conditions in 2007, specifically for patients that have lost a significant amount of weight.

Dosages of medicine for the treatment of HIV/AIDS are in many,or most, instances directly linked to the weight of a patient. The weight of a patient is imperative for calculating dosages, particularly for paediatric patients. Yet another reason why monitoring weight in HIV/AIDS patients is important is because weight forms part of many other calculations relevant to the treatment of an HIV/AIDS patient. One example of this is that patients should have a creatinine clearance of more than 50ml/min to receive Tenofovir (TDF) as part of their treatment regimen. Although serum creatinine can provide a good indication of renal function, it is very plausible for a patient to have considerably reduced renal function and still have a serum creatinine level in the high-normal range. This is specifically true in patients with a low body weight or older patients where serum creatinine is not a good indicator of renal function (Department of Health, 2010c:10). It is necessary to have the weight, age and gender of a patient to be able to calculate the creatinine clearance from the serum creatinine level.

The following table indicates the average weight of all adult patients partaking in this study at their respective dates of initiation of ARV treatment according to gender.

Table 4-45: Average weight of adult patients according to gender on initiation of HAART

Gender	Number of patients (n)	Mean weight (kg)	Minimum weight (kg)	Maximum weight (kg)
Female	231	57.1801	28.3000	143.2
Male	92	55.8663	30.2000	85.6000
Difference (female - male)		1.3138		

Worth highlighting from the above table is the minimum weight for both the male and female adult patients. An adult patient that weighs 30kg or less must certainly alert healthcare workers to the importance of monitoring the weight of HIV/AIDS patients and also highlights the importance of nutritional programmes for these patients.

Table 4-46: Average weight of adult patients according to gender on initiation of HAART, also indicating the 95% Confidence Intervals (CI) and the Standard Deviation (SD)

Gender	Mean weight (kg)	95% CI Mean weight (kg)		Standard Deviation	95% CI Standard Deviation	
Female	57.1801	55.1343	59.2258	15.7805	14.4608	17.3675
Male	55.8663	53.7597	57.9729	10.1721	8.8847	11.8992

Table 4-46 shows that the average adult male HIV/AIDS patient in this population weighed less than the average female patient on initiation of HAART. The average initiation weight of female patients (57.1801 ± 15.78kg) was around 1.3kg higher than the average initiation weight of the male patients (55.8663 ±10.17kg). As with the prevalence of HIV/AIDS between the genders, could this again mean that men present at a later stage of disease when perhaps more weight loss has already taken place?

The following graphs (Figure 4-6) aim to provide a more translucent look at the distribution of weight between the adult male and female patients on initiation of HAART.

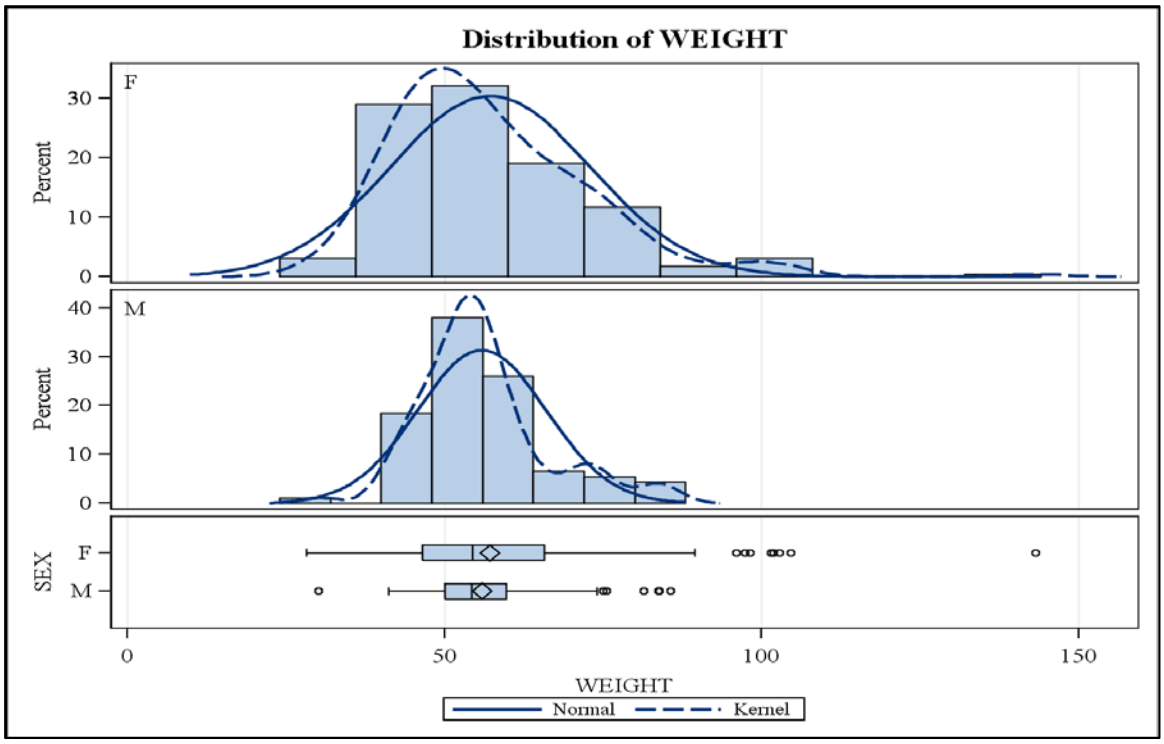

Figure 4-6: Average weight of adult HIV/AIDS patients according to gender on initiation of HAART

From the above graphical presentation of the average adult weight according to gender on initiation of HAART it does seem as if, for the most part, the average male and female patient weighs very much the same. The biggest contributor towards the female patients having a higher average initiation weight seems to come from a couple of female patients in the maximum weight range that were perhaps somewhat severely overweight.

The following table will determine whether the difference in weight between the genders is statistically significant or not.

Table 4-47: Indication of the calculated *p*-value for adult patient weight according to gender on initiation of HAART

Method	Variances	DF	t Value	Pr > |t| (*p*-value)
Pooled	Equal	321	0.74	0.4602

As can be seen from the calculated table above the attained probability (*p*-value) was 0.4602 and since a reference probability (α-level) of 0.05 was chosen for this study this means that the *p*-value was more than the α-level. This indicates that the difference between the average weight of the female and male adult patients on initiation of

HAART were not statistically significant. The practical significance of the effect sizes were calculated at 0.083 (*d*=0.083), which indicates that the difference between the initiation weight of adult male and female patients were also practically insignificant.

The following table illustrates the most recently measured weights at last date of receiving treatment for both male and female adult patients.

Table 4-48: Average weight of adult patients on HAART according to gender at last treatment date

Gender	Number of patients (n)	Mean weight (kg)	Minimum weight (kg)	Maximum weight(kg)
Female	250	61.3604	29.0000	148.0
Male	99	57.8717	36.8000	107.6
Difference (female - male)		3.4887		

Although the data in Table 4-48 also includes some recently initiated patients, it is already evident that the weight of patients on treatment has increased from their initiation weight.

The average weight of female patients receiving HAART at the last treatment date was 61kg (61.3604 ± 17.23kg, n=250) and the average weight for male patients at the last treatment date was also higher than their average initiation weight and was calculated at almost 58kg (57.8717 ± 11.89kg, n=99).

Table 4-49: Average weight of adult patients on HAART according to gender at last treatment date, also indicating the 95% Confidence Intervals (CI) and the Standard Deviation (SD)

Gender	Mean weight (kg)	95% CI Mean weight (kg)		Standard Deviation	95% CI Standard Deviation	
Female	61.3604	59.2148	63.5060	17.2251	15.8359	18.8834
Male	57.8717	55.4999	60.2435	11.8920	10.4348	13.8260

The full details of weight changes due to treatment will be discussed in the section on changes in the selected clinical indicators further on in this chapter. These tables and figure merely present the differences in weight according to gender.

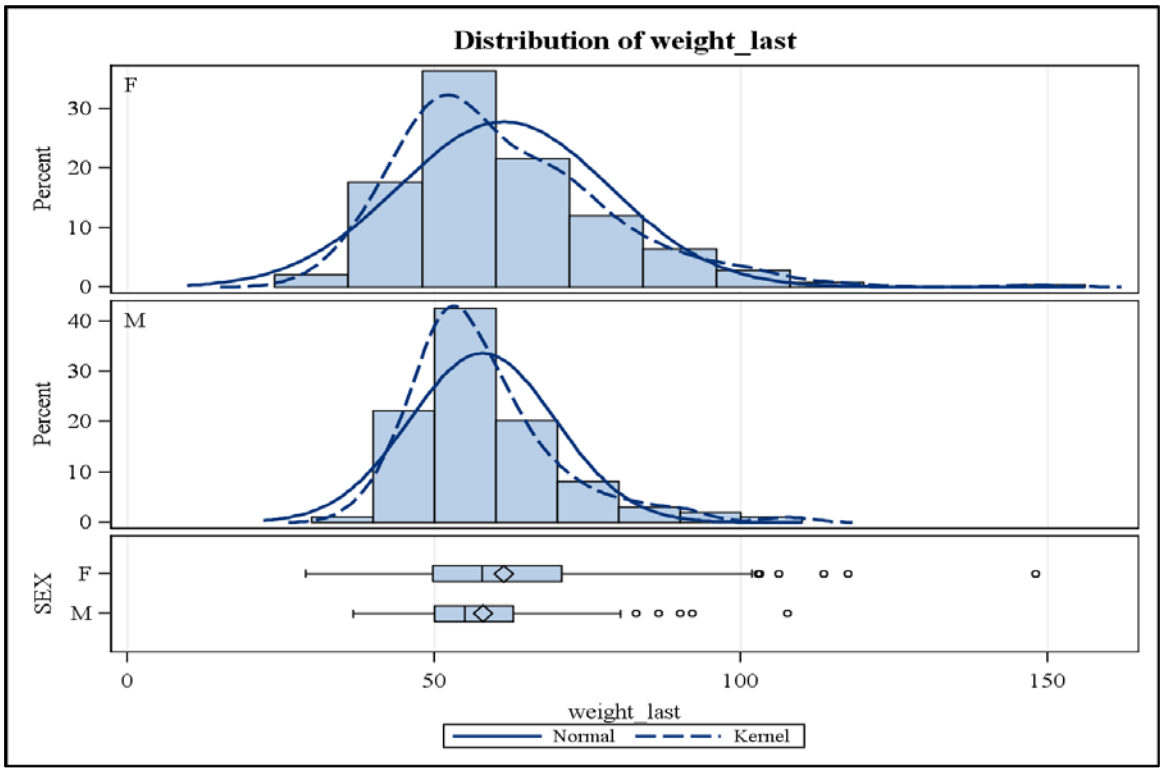

Figure 4-7: Average weight of adult patients on HAART according to gender at last treatment date

Even though the weight of both male as well as female patients went up after initiation of treatment, it seems as if the gap between the weight of male and female patients have grown bigger. At the last date of receiving treatment there was a difference of 3.5kg (3.4887kg) between the weight of the average female and male patients. Again there are some fairly overweight patients that influence the average weight of patients.

The weight of paediatric patients is much more complicated due to age differences. The following two tables are purely to indicate and compare the results of the average weight for female and male paediatric patients side-by-side.

Table 4-50: Average weight of paediatric patients according to gender on initiation of HAART

Gender	Number of patients (n)	Mean weight (kg)	Minimum weight (kg)	Maximum weight (kg)
Female	56	15.5375	3.2000	57.2000
Male	90	14.9920	5.7000	32.7000
Difference (Female-Male)		0.5455		

The average weight of paediatric patients obviously differs tremendously between different ages because as these patients grow older they will also gain weight. The minimum weight for both the female and male paediatric patients is notable. The patient with the lowest weight on initiation of HAART at the facility is a female baby that weighed only 3.2kg and the male patient with the lowest initiation weight weighed 5.7kg.

Table 4-51: Average weight of paediatric patients on HAART according to gender at last treatment date

Gender	Number of patients (n)	Mean weight (kg)	Minimum weight (kg)	Maximum weight (kg)
Female	64	17.0438	3.2000	57.2000
Male	97	15.5647	5.7000	42.7000
Difference (Female-Male)		1.4790		

Very significant is the fact that all the paediatric patients (N=161) currently on treatment at the facility did have their weight available on the last date of receiving treatment. Taking into account the importance of measuring weight in paediatric patients, this is a momentous accomplishment. As mentioned before, the average weight cannot be used to determine whether or not these patients had normal weight for their age if the age is not also taken into consideration. Table 4-51 does however demonstrate that the average weight of paediatric patients at the last treatment date were higher than their average initiation weight. It also shows that the majority of paediatric patients were in the lower weight categories, since the average weight was closer to the minimum than maximum weight range.

4.3.2 CD4 counts in HIV/AIDS patients

CD4 positive T-lymphocytes (or CD4 T-cells), as discussed in chapter two, are so-called helper cells. According to the fact sheet published by the UNAIDS in 2008 (UNAIDS, 2008:1) HIV infects cells of the human immune system, destroying or impairing its functions. An infected person's immune system is then considered impaired or deficient when the virus has managed to progressively destroy the immune system (and with it the CD4 T-cells) to a point where it is unable to fight of infection and diseases. The number of CD4 positive T-helper cells per microliter of blood (CD4 T-cell count or simply CD4 count) and the plasma HIV RNA concentration (viral load) is seen as vital instruments in the prognosis of an infected individual (Sweetman, 2011:945).

InTable 4-52 below the results of the average CD4 counts from all the adult patients that were initiated at the study facility are shown according to gender.

Table 4-52: Average CD4 count of adult HIV/AIDS patients according to gender on initiation of HAART

Gender	Number of patients (n)	Mean CD4 count (cells/mm^3)	Minimum CD4 count (cells/mm^3)	Maximum CD4 count (cells/mm^3)
Female	232	160.5	5.0000	516.0
Male	101	130.3	3.0000	422.0
Difference (Female-Male)		30.1918		

As with most of the other results already shown, it is again the male patients that started treatment at the facility that had the lowest value. The average male patient was initiated on HAART with a CD4 count of 130cells/mm^3 (± 99.45cells/mm^3) while the average CD4 count for females on initiation was 160cells/mm^3 (± 96.52cells/mm^3). The minimum or lowest CD4 count for both genders is extremely low. However the maximum CD4 counts indicate that some adult patients had to be initiated on HAART due to their clinical disease stage while their CD4 counts are above the eligibility limits.

Table 4-53: Average CD4 count of adult HIV/AIDS patients according to gender on initiation of HAART, also indicating the 95% Confidence Intervals (CI) and the Standard Deviation (SD)

Gender	Mean CD4 count (cells/mm^3)		95% CI Mean CD4 count (cells/mm^3)	Standard Deviation		95% CI Standard Deviation
Female	160.5	148.0	173.0	96.5154	88.4596	106.2
Male	130.3	110.7	149.9	99.4523	87.3730	115.4

The difference in CD4 counts between the genders seems obvious, but the question remains on whether it is significant or not? The following table shows the calculated *p*-valueand will indicate the statistical significance of the difference.

Table 4-54: Indication of the calculated *p*-value for adult patients' CD4 count according to gender on initiation of HAART

Method	Variances	DF	t Value	Pr > |t| (*p*-value)
Pooled	Equal	331	2.60	0.0097

According to the calculated *p*-value (*p*=0.0097) there is a noteworthy statistical significant difference between the CD4 counts of adult male and female patients on

initiation of treatment. The practical significance of this was calculated at *d*=0.304, which indicates that although there is a statistical significant difference, there is only a very small and insignificant practical significance.

The following graphical representation provides a better understanding of the distribution of CD4 counts between genders.

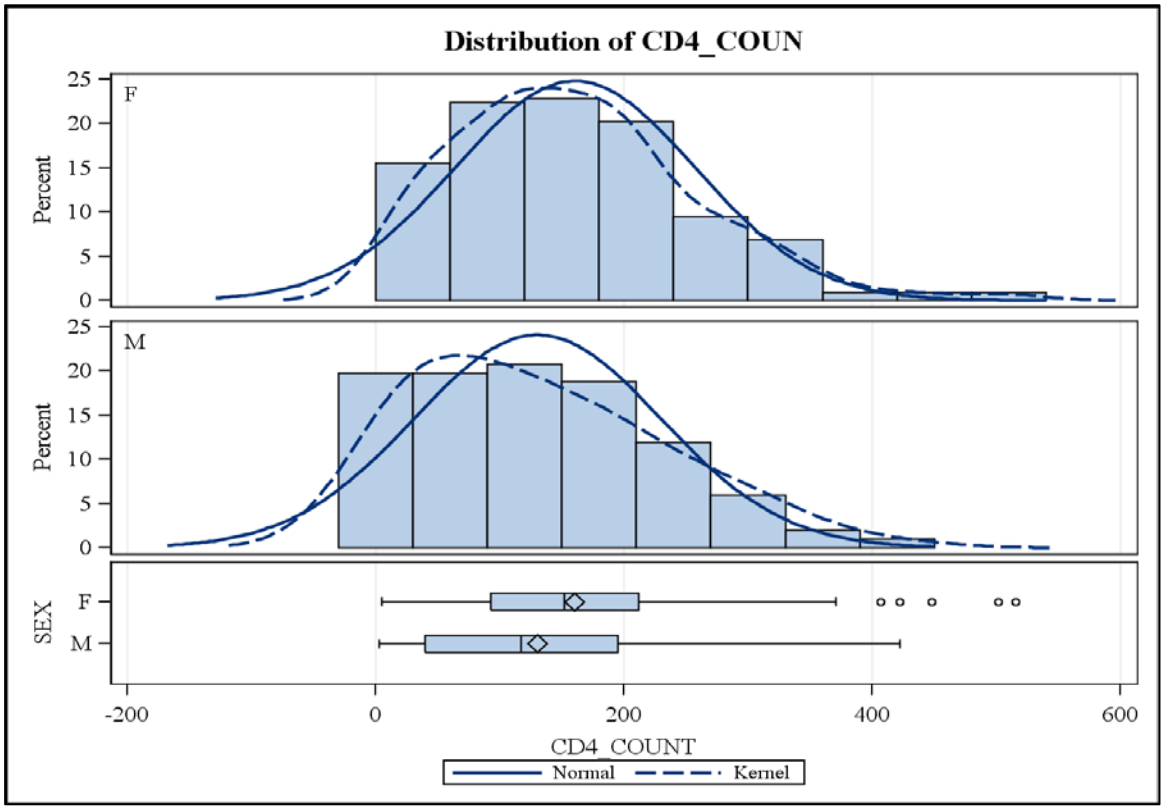

Figure 4-8: CD4 counts of adult HIV/AIDS patients according to gender on initiation of HAART

The graphs in Figure 4-8 above evidently shows that the average male patient definitely came in for initiation of treatment at lower CD4 counts than the CD4 counts at which the adult female patients were initiated. These graphs also verify that the SA protocol (Department of Health, 2010c:8) for initiating all adult patients with a CD4 count < 200cells/mm^3 irrespective of clinical stage was followed, because by far the majority of patients had a CD4 count of less than 200cells/mm^3 at the time of initiation. The higher average CD4 count of the female patients could perhaps also have something to do with the higher CD4 count initiation criteria for pregnant females.

To provide up-to-date results the table below was created to illustrate the most recently recorded CD4 counts of adult HIV/AIDS patients according to gender.

Table 4-55: Average CD4 count of adult patients on HAART according to gender at last treatment date

Gender	Number of patients (n)	Mean CD4 count (cells/mm^3)	Minimum CD4 count (cells/mm^3)	Maximum CD4 count (cells/mm^3)
Female	259	317.2	6.0000	1609.0
Male	116	208.9	5.0000	879.0
Difference (Female-Male)		108.2		

The data in Table 4-55 shows the average CD4 counts of adult HIV/AIDS patients at the last date of receiving treatment. Remarkable from the CD4 count data at last treatment date is that 375 (n=375) of the total 399 (N=399) adult patients had a valid CD4 count available. This signifies that only about 6% of these patients did not have a CD4 count obtainable for reference. The changes in CD4 counts after initiation of HAART will be discussed further on in this chapter, but it can already be seen that there must be an improvement in the CD4 counts simply by comparing Table 4-52 and Table 4-55.

Table 4-56: Average CD4 count of adult patients on HAART according to gender at last treatment date, also indicating the 95% Confidence Intervals (CI) and the Standard Deviation (SD)

Gender	Mean CD4 count (cells/mm^3)		95% CI Mean CD4 count (cells/mm^3)	Standard Deviation		95% CI Standard Deviation
Female	317.2	289.6	344.7	224.8	207.0	246.1
Male	208.9	181.8	236.1	147.6	130.7	169.4

From Table 4-55 and Table 4-56 above it seems as if the difference in CD4 counts between male and female patients increased. The average CD4 count for female patients at the last date of treatment was 317.2cells/mm^3 (± 224.8cells/mm^3), while the average CD4 count for male patients at this point was still barely above the 200cells/mm^3 eligibility mark with an average of 208.9cells/mm^3 (± 147.6cells/mm^3). One reason for this could be due to the fact that more adult male than female patients have defaulted treatment during the data period (refer to section 4.2.8).

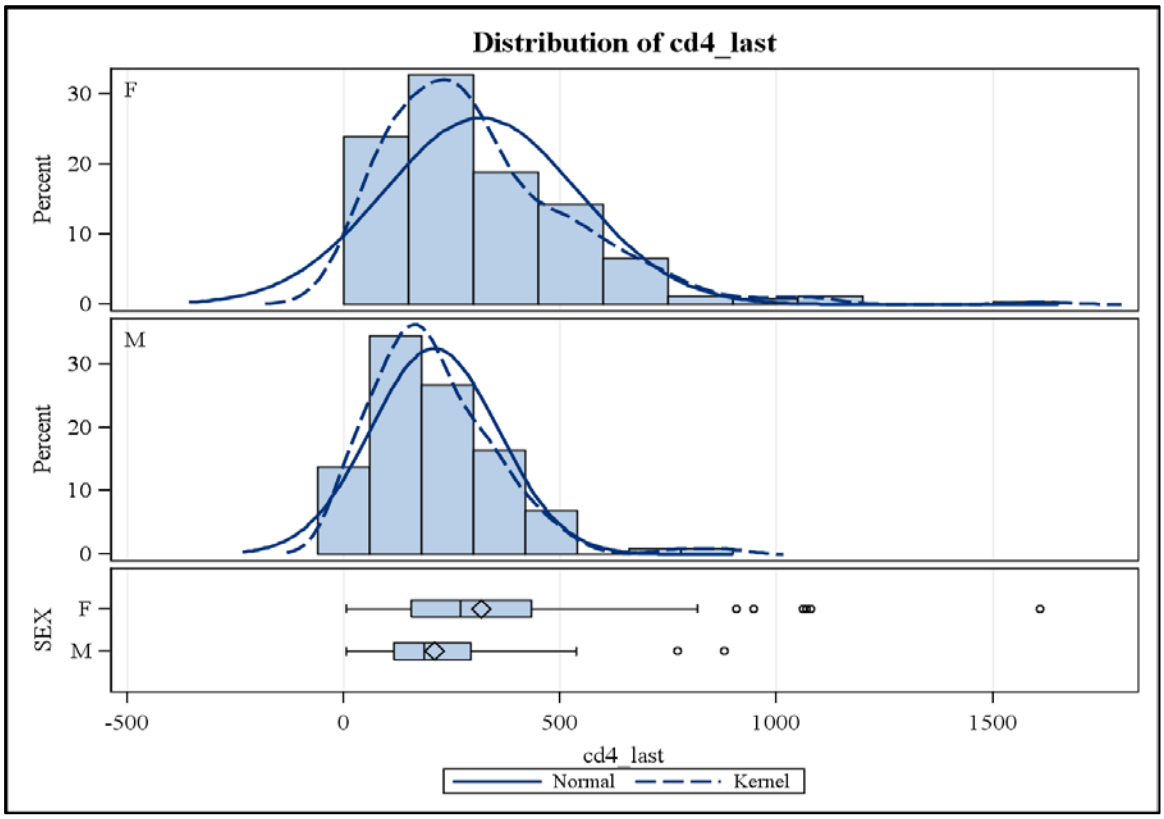

Figure 4-9: CD4 counts of adult patients on HAART according to gender at last treatment date

Figure 4-9 and Table 4-55 reveal that the difference in CD4 count between male and female patients remains obvious even long after initiation of treatment. At the last date of treatment the average CD4 count for the female patients is 108.2cells/mm^3 more than the average CD4 count of the male patients.

Except for infants younger than one year of age, it is important to consider clinical criteria and CD4 counts in children before initiating HAART; this is according to the SA guidelines for the management of HIV in children (Department of Health, 2010b:28). The clinical and CD4 count criteria for initiating children is different from the adult guidelines and is linked to different age categories. The following table was adapted from the paediatric guidelines and serves as a reminder of what to expect when looking at the CD4 count data of children.

Table 4-57: Clinical Criteria for initiating paediatric patients on ARV treatment after confirmation of HIV infection

Age of child	Eligibility criteria
Children younger than one year	All children <12 months should be initiated on ART
1 to 5 years	Symptomatic (stage III or IV) or CD4 ≤ 25% or absolute CD4 count <750 cells/mm^3
≥ 5 years	Symptomatic (stage III or IV) or CD4 count <350 cells/mm^3

The table above clearly indicates that there are significantly different eligibility criteria for the different paediatric age groups. The following table below will provide the average CD4 count for all paediatric patients (regardless of age) on initiation of HAART.

Table 4-58: Average CD4 count of paediatric HIV/AIDS patients according to gender on initiation of HAART

Gender	Number of patients (n)	Mean CD4 count (cells/mm^3)	Minimum CD4 count (cells/mm^3)	Maximum CD4 count (cells/mm^3)
Female	45	477.3	8.0000	1802.0
Male	81	509.1	4.0000	3230.0
Difference (male-female)		31.7630		

The average CD4 count on initiation of HAART did not reveal much difference between the male and female paediatric patients. It was calculated that male paediatric patients started treatment at a CD4 count that were around 30cells/mm^3 higher than the average female paediatric patient. The minimum CD4 count for both female and male paediatric patients on initiation of HAART was very low. The lowest initiation CD4 count for a male paediatric patient was 4cells/mm^3 and the lowest initiation CD4 count for a female paediatric patient was 8cells/mm^3. This means that these patients were already severely immune compromised when initiated on ARV treatment. What is interesting is that only 126 (n=126) paediatric patients had a CD4 count available on initiation of HAART. This shows that some of the paediatric patients were initiated on treatment without a CD4 count result, either due to their clinical stage or due to them being younger than one year old and automatically qualifying for ARV treatment regardless of CD4 count.

Table 4-59: Average CD4 count of paediatric patients on HAART according to gender at last treatment date

Gender	Number of patients (n)	Mean CD4 count (cells/mm^3)	Minimum CD4 count (cells/mm^3)	Maximum CD4 count (cells/mm^3)
Female	52	572.3	8.0000	3838.0
Male	86	533.2	4.0000	3230.0
Difference (female-male)		39.0250		

Remarkable from Table 4-59 above is that the difference in average CD4 count of paediatric patients between the genders remains relatively the same. Both the male and female paediatric patients with the lowest CD4 counts were recently initiated on treatment, since the valid CD4 count is still the same. The maximum or highest CD4 count of the female paediatric patients was 3838cells/mm^3 and the highest CD4 count for the male patients was 3230cells/mm^3 at the last date of receiving treatment.

4.3.3 Viral loads in HIV/AIDS patients

The plasma HIV RNA concentration (viral load) is another vital instrument in determining the prognosis of an infected patient, as well as determining the effectiveness of the treatment regimen of the patient. The ideal according to the SA treatment guidelines (Department of Health, 2010c:19) is that the viral load of any patient should be undetectable six months after starting ARV therapy. The following table looks at the viral loads of the adult study population on initiation of HAART.

Table 4-60: Average viral load of adult HIV/AIDS patients according to gender on initiation of HAART

Gender	Number of patients (n)	Mean viral load (copies/mm^3)	Minimum viral load (copies/mm^3)	Maximum viral load (copies/mm^3)
Female	40	103046	23.0000	839061
Male	13	416600	65.0000	1315141
Difference (male-female)		313554		

Only a relatively small number (n=53) of the total number of adult patients (N=399) had a viral load available on initiation of HAART. This could be due to the fact that the results for viral load testing takes slightly longer to reach the Wellness clinic than some other results, orperhaps more importantly because viral load is not a decisive factor in the decision to initiate treatment or not, whereas CD4 count is part of the eligibility

criteria. For this last reason it is also likely that the test is not always ordered by the physician nor done on initiation of therapy. However, to determine the success of treatment at follow-up visits it would be necessary to also have what is called a baseline viral load at the time of initiation with which to compare the latest (or follow-up) results.

Table 4-61: Average viral load of adult HIV/AIDS patients according to gender on initiation of HAART, also indicating the 95% Confidence Intervals (CI) and the Standard Deviation (SD)

Gender	Mean viral load (copies/mm^3)	95% CI Mean Viral load (copies/mm^3)		Standard Deviation	95% CI Standard Deviation	
Female	103046	42554.5	163538	189146	154941	242870
Male	416600	150864	682336	439746	315335	725903

The two tables above (Table 4-60 and Table 4-61) comprehensibly point out that most probably due to the lower CD4 count of male patients compared to female patients on initiation of treatment, the average viral load of male patients was drastically higher than the average viral load of the female patients on initiation of HAART. The average viral load for female patients starting ARV treatment at the study facility was 103046copies/mm^3 (± 189146copies/mm^3), whereas the average viral load for male patient starting treatment was 416600copies/mm^3 (± 439746copies/mm^3). The male average viral load was more than four times as much as the average viral load of the females.

Table 4-62: Indication of the calculated *p*-value for adult patient viral load according to gender on initiation of HAART

Method	Variances	DF	t Value	Pr > |t| (*p*-value)
Pooled	Equal	51	-3.64	0.0006

The calculated *p*-valuewas much less than 0.05 and whenever the *p*-value is less than the reference probability (α-level) of 0.05 it means that this difference was statistically significant. A practical significance of *d*=0.713 was calculated and this indicates that there is in fact also an observable practical significance between the viral loads of male and female adult patients on initiation of HAART.

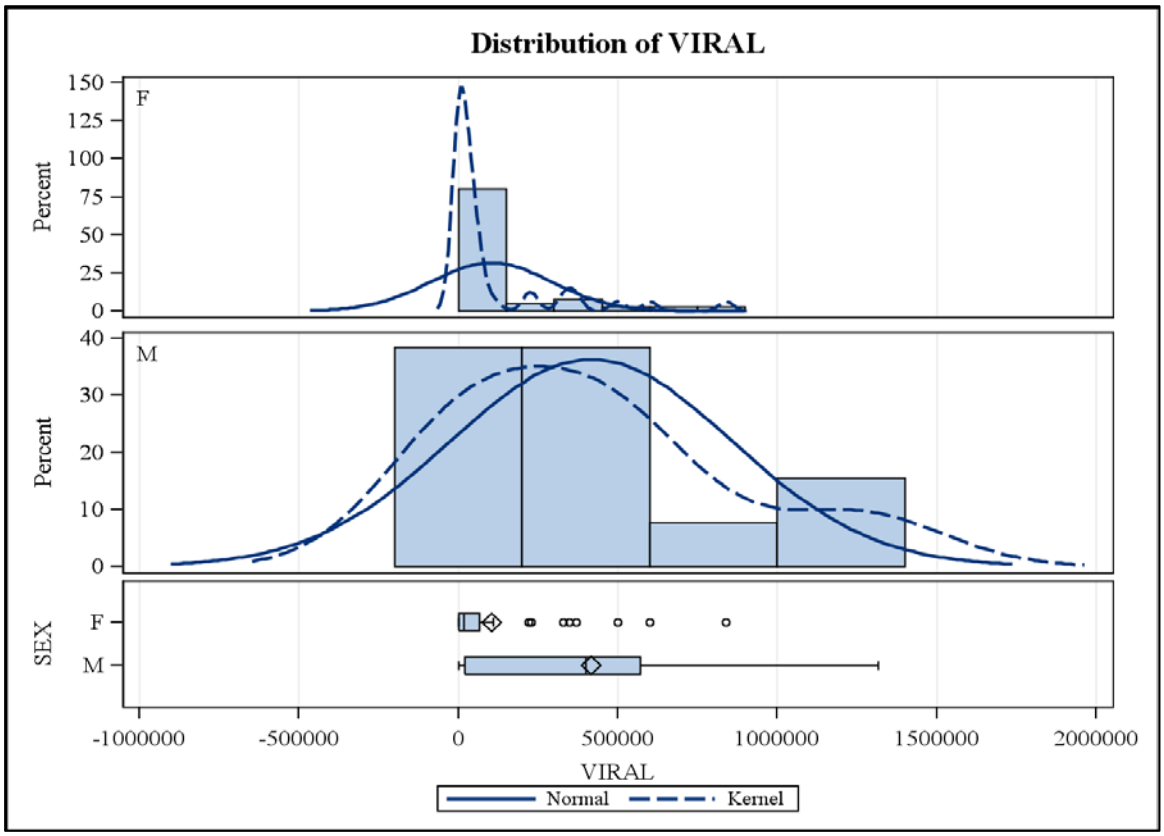

Figure 4-10: Average viral loads of adult patients according to gender on initiation of HAART

Again the graphs are used to visually show the significant difference between the average viral loads of adult female patients compared to the average viral load of adult male patients on initiation of HAART. Unfortunately the male patient sample size (n=13) was slightly too small to really make a proper hypothesis regarding the reasons for these high viral loads.

Because of the enormous difference between the minimum (or lowest) and the maximum (or highest) viral load for both genders, Table 4-63 below had to be created to provide a better understanding of all the recorded viral loads of adult patients on initiation of ARV treatment.

Table 4-63: All recorded viral loads for adult patients on initiation of HAART

Viral load (copies/mm^3)	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
23	1	1.89	1	1.89
38	1	1.89	2	3.77
65	1	1.89	3	5.66

Viral load (copies/mm^3)	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
140	1	1.89	4	7.55
310	1	1.89	5	9.43
400	1	1.89	6	11.32
520	1	1.89	7	13.21
1800	2	3.77	9	16.98
2000	2	3.77	11	20.76
2476	1	1.89	12	22.64
3000	1	1.89	13	24.53
3300	1	1.89	14	26.42
3500	1	1.89	15	28.30
4200	2	3.77	17	32.08
4600	1	1.89	18	33.96
6900	1	1.89	19	35.85
9300	1	1.89	20	37.74
9600	1	1.89	21	39.62
15000	1	1.89	22	41.51
17600	1	1.89	23	43.40
19000	1	1.89	24	45.28
20991	1	1.89	25	47.17
25000	1	1.89	26	49.06
31000	1	1.89	27	50.94
32802	1	1.89	28	52.83
39000	1	1.89	29	54.72
42430	1	1.89	30	56.60
45000	1	1.89	31	58.49
50000	1	1.89	32	60.38
52600	1	1.89	33	62.26
53000	1	1.89	34	64.15
62000	1	1.89	35	66.04
68294	1	1.89	36	67.92
110257	1	1.89	37	69.81
220000	1	1.89	38	71.70
230000	1	1.89	39	73.58
330000	1	1.89	40	75.47
349424	1	1.89	41	77.36
369877	1	1.89	42	79.25
370000	1	1.89	43	81.13
400000	1	1.89	44	83.02
420000	1	1.89	45	84.91
430000	1	1.89	46	86.79

Viral load (copies/mm^3)	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
500000	1	1.89	47	88.68
570000	1	1.89	48	90.57
600000	1	1.89	49	92.45
650000	1	1.89	50	94.34
839061	1	1.89	51	96.23
1200000	1	1.89	52	98.11
1315141	1	1.89	53	100.00

One of the aims of ARV treatment, as already mentioned, is to lower the patient's viral load to less than 1000copies/mm^3 within three months and to attempt to reach undetectable viral copies within six months. From the complete list of available viral loads on initiation, it can be seen that the majority of adult patients that started HAART had very high viral loads and should benefit greatly from ARV therapy. A mere seven adult patients had viral loads of less than 1000copies/mm^3 when they were initiated on HAART. Besides these fifty three (n=53) patients in the above table, another thirteen patients had viral loads that were lower than detectable level (LDL) on initiation and could therefore not be included in the mathematical calculations. They could, however, be included in the group of patients with a viral load of less than 1000copies/mm^3, bringing the total number of patients initiated on HAART with a viral load of less than 1000copies/mm^3 to twenty.

To show the last recorded viral loads at the start of data collection, thus providing the most up to date information, an analysis was done on the most recent laboratory results for viral loads per patient. The following table provides the latest available viral load results at the last date of receiving treatment.

Table 4-64: Average viral load of adult patients on HAART according to gender at last treatment date

Gender	Number of patients (n)	Mean viral load (copies/mm^3)	Minimum viral load (copies/mm^3)	Maximum viral load (copies/mm^3)
Female	81	130385	23.0000	5430000
Male	35	191215	47.0000	1877746
Difference (female-male)		60830		

Although the data in Table 4-64 still indicates large numbers for viral loads, this data cannot be used to determine the efficacy of HAART on viral loads because it includes a

number of patients that were initiated on HAART just before the data collection period or at the last date of receiving treatment. This data can still be used to illustrate the difference (if any) between the viral loads of different genders. This table shows that the number of available viral loads was still considerably low. Only a 116 (n=116) of the possible 399 (N=399) adult patients had a valid (not more than six months old) viral load available. It means that more than two thirds of all the adult patients did not have a currently valid viral load result available. With the viral loads on initiation of treatment it is almost justifiable, due to the reasons mentioned, that only such a small number of patients had a viral load result. With the last date of treatment this small number of patients with a recent viral load is objectionable. How does a healthcare worker see the evidence that viral suppression has occurred or that the objective of obtaining a lower than detectable viral load has been achieved if no laboratory results confirming this is available? Could this perhaps explain why there has only been one adult patient that has changed treatment regimen due to virological failure?

Table 4-65: Average viral load of adult patients on HAART according to gender at last treatment date, also indicating the 95% Confidence Intervals (CI) and the Standard Deviation (SD)

Gender	Mean viral load (copies/mm^3)	95% CI Mean viral load (copies/mm^3)		Standard Deviation	95% CI Standard Deviation	
Female	130385	-6424.5	267195	618719	535922	732012
Male	191215	51828.5	330601	405768	328214	531638

Although not all patients had a documented viral load at last date of treatment, it is still true that the male patients had a higher average viral load than the female patients even at the last date of receiving treatment. This is seen in both Table 4-65 and also on the graphs in Figure 4-11 below.

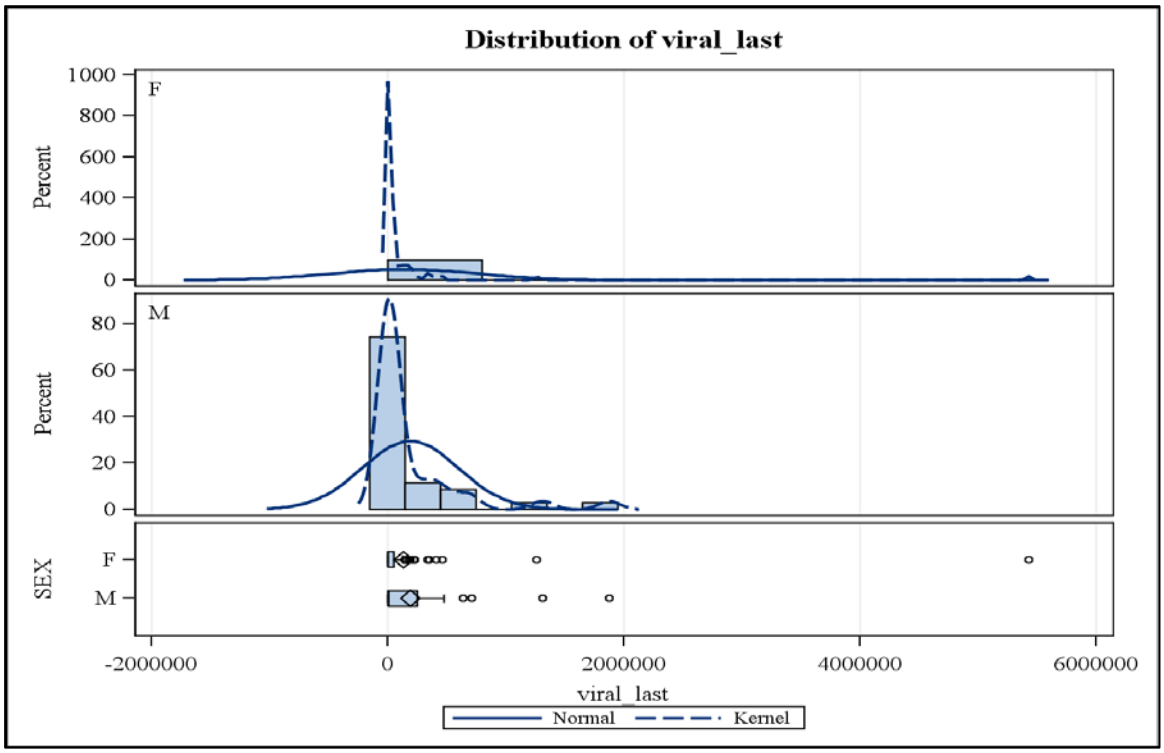

Figure 4-11: Average viral loads of adult patients on HAART according to gender at last treatment date

Figure 4-11 shows that except for a handful of the adult patients, the majority of viral loads were relatively close together. However, the female patient with the extremely high viral load (5430000copies/mm^3) must be noted, and since this high viral load was not indicated on initiation of treatment, it can be assumed that this patient is experiencing severe virological failure.

The same category of data was collected for the paediatric patients and the following table indicates the average as well as minimum and maximum viral loads for paediatric patients on initiation of ARV treatment.

Table 4-66: Average viral load of paediatric patients according to gender on initiation of HAART

Gender	Number of patients (n)	Mean viral load (copies/mm^3)	Minimum viral load (copies/mm^3)	Maximum viral load (copies/mm^3)
Female	14	242207	145.0	2700000
Male	31	329734	27.0000	2900000
Difference (male-female)		87527.7		

Very few paediatric patients had a viral load available on initiation of treatment. Only forty five (n=45) of the 161 (N=161) paediatric patients had a valid viral load at the time of initiating therapy, which is less than a third (27.9%) of the paediatric patients that were initiated at the facility. Again it must be said that although not part of the eligibility criteria for initiating paediatric patients, it is still part of the recommended baseline information (Department of Health, 2010b:30) that should be recorded in all patients' files on initiation of ARV treatment. The average initiation viral loads of both the male and female paediatric patients were far above the ideal of having a viral load of less than 1000copies/mm^3. The maximum or highest viral loads for both genders should be noted and to illustrate these viral loads the following graph is used.

Table 4-67: Average viral load of paediatric HIV/AIDS patients according to gender on initiation of HAART, also indicating the 95% Confidence Intervals (CI) and the Standard Deviation (SD)

Gender	Mean viral load (copies/mm^3)	95% CI Mean viral load (copies/mm^3)		Standard Deviation	95% CI Standard Deviation	
Female	242207	-167234	651648	709133	514089	1142443
Male	329734	82314.2	577155	674532	539026	901628

The average viral load for female paediatric patients on initiation of HAART was 242207copies/mm^3 (± 709133copies/mm^3) and the average viral load for male paediatric patients was 329734copies/mm^3 (± 674532copies/mm^3). These results were actually unexpected, mainly because the male paediatric patients had a higher average CD4 count on initiation of treatment than the female children. Since the female paediatric patients had a lower CD4 count on initiation of HAART, one would have assumed that they would have a higher viral load.

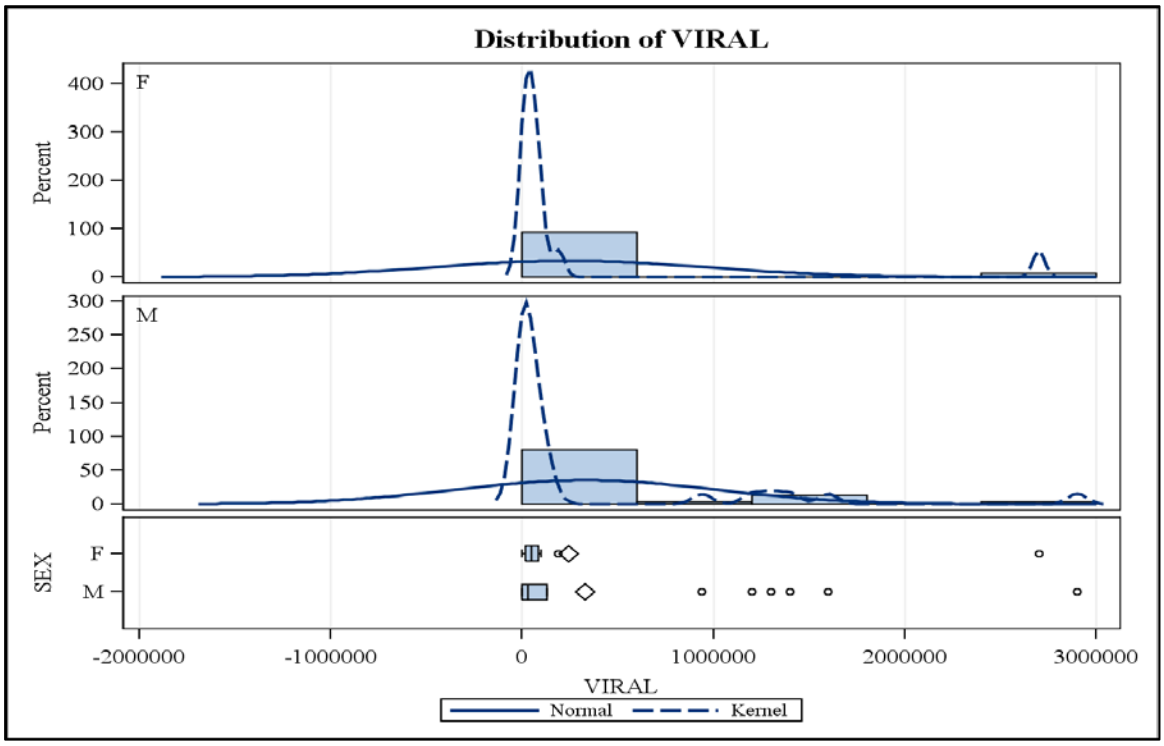

Figure 4-12: Average viral loads of paediatric patients according to gender on initiation of HAART

The viral loads of the majority of patients were again grouped relatively close together. There were only a few viral loads that were exceedingly high and far removed from the bulk of the viral loads. Especially the maximum viral load for both the male and female paediatric patients had distinctively high viral loads.

Again the following method was used to determine whether there was any statistical significance between the average viral load of male and female paediatric patients on initiation of HAART.

Table 4-68: Indication of the calculated *p*-value for the viral load of paediatric patients according to gender on initiation of HAART

Method	Variances	DF	t Value	Pr > |t| (*p*-value)
Pooled	Equal	43	-0.40	0.6935

According to the *p*-value (0.6935) there weren't any statistical significant difference between the viral loads of the male and female paediatric patients on initiation of HAART. A practical significance of *d*=0.123 was calculated and this indicates that there was in fact also no practical significance to the viral loads of male and female paediatric patients on initiation of HAART. The following table was created to further demonstrate

exactly how the viral loads were spread between the lowest and the highest viral load for all paediatric patients.

Table 4-69: All recorded viral loads for paediatric patients on initiation of HAART

Viral load (copies/mm^3)	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
27	1	2.13	1	2.13
37	1	2.13	2	4.26
66	1	2.13	3	6.38
103	1	2.13	4	8.51
130	2	4.26	6	12.77
145	1	2.13	7	14.89
200	1	2.13	8	17.02
610	1	2.13	9	19.15
3046	1	2.13	10	21.28
4100	1	2.13	11	23.40
5100	1	2.13	12	25.53
5364	1	2.13	13	27.66
9000	1	2.13	14	29.79
11000	1	2.13	15	31.91
12000	1	2.13	16	34.04
17000	1	2.13	17	36.17
24000	1	2.13	18	38.30
27000	1	2.13	19	40.43
32000	2	4.26	21	44.68
35986	1	2.13	22	46.81
39000	1	2.13	23	48.94
44000	2	4.26	25	53.19
49000	1	2.13	26	55.32
54000	1	2.13	27	57.45
59117	1	2.13	28	59.57
67000	1	2.13	29	61.70
73000	1	2.13	30	63.63
74000	1	2.13	31	65.95
84500	1	2.13	32	68.09
97000	1	2.13	33	70.21
110000	2	4.26	35	74.47
129000	1	2.13	36	76.60
130000	1	2.13	37	78.72
190000	1	2.13	38	80.85
940000	1	2.13	39	82.98
1200000	1	2.13	40	85.11

Viral load (copies/mm^3)	Number of consultations (n)	Percentage	Cumulative number	Cumulative percentage
1300000	1	2.13	41	87.23
1400000	1	2.13	42	89.36
1600000	1	2.13	43	91.49
2700000	1	2.13	44	93.62
2900000	1	2.13	45	95.74
>3000000	2	4.26	47	100.00

Only nine paediatric patients had a viral load of less than 1000copies/mm^3 on initiation of HAART. Table 4-69 above shows that besides the 45 available viral loads in table 4-66, there were another two patients from which the laboratory results only indicated a viral load of more than 3 million (>3000000) copies/mm^3. Since these two readings are not exact numerical figures, it could not be included in the calculations.

As with the adult patients, equally important would be to monitor the viral loads of the paediatric patients after initiation of therapy. The table below indicates the viral load of all paediatric patients at the last date of receiving treatment.

Table 4-70: Average viral load of paediatric patients on HAART according to gender at last treatment date

Gender	Number of patients (n)	Mean viral load (copies/mm^3)	Minimum viral load (copies/mm^3)	Maximum viral load (copies/mm^3)
Female	21	81612.0	42.0000	1385000
Male	47	72989.5	53.0000	2170000
Difference (male-female)		8622.6		

Sixty eight (n=68) paediatric patients had a valid viral load available at the last date of receiving treatment. Although an improvement on the number of children that had a valid viral load on initiation of HAART, it still constitutes less than 45% (42.24%) of the total one hundred and sixty one (N=161) paediatric patients on HAART. This denotes that less than half of paediatric patients on treatment had a viral load available at the time of data collection. Again this complicates monitoring the effect that ARV treatment has on a patient.

Table 4-71: Average viral load of paediatric patients on HAART according to gender at last treatment date, also indicating the 95% Confidence Intervals (CI) and the Standard Deviation (SD)

Gender	Mean viral load (copies/mm^3)	95% CI Mean viral load (copies/mm^3)		Standard Deviation	95% CI Standard Deviation	
Female	81612.0	-54865.3	218089	299822	229382	432964
Male	72989.5	-20174.7	166154	317305	263672	398530

At the last date of receiving treatment the male paediatric patients had a lower average viral load than the female paediatric patients. The male paediatric patients had an average viral load of 72989.5copies/mm^3 (± 317305copies/mm^3) and the female average viral load for paediatric patients at the last date of receiving HAART were 81612copies/mm^3 (± 299822copies/mm^3). A good sign is that both these average viral loads were lower than the average initiation viral loads. The following figure better demonstrates the distribution of viral loads between the genders.

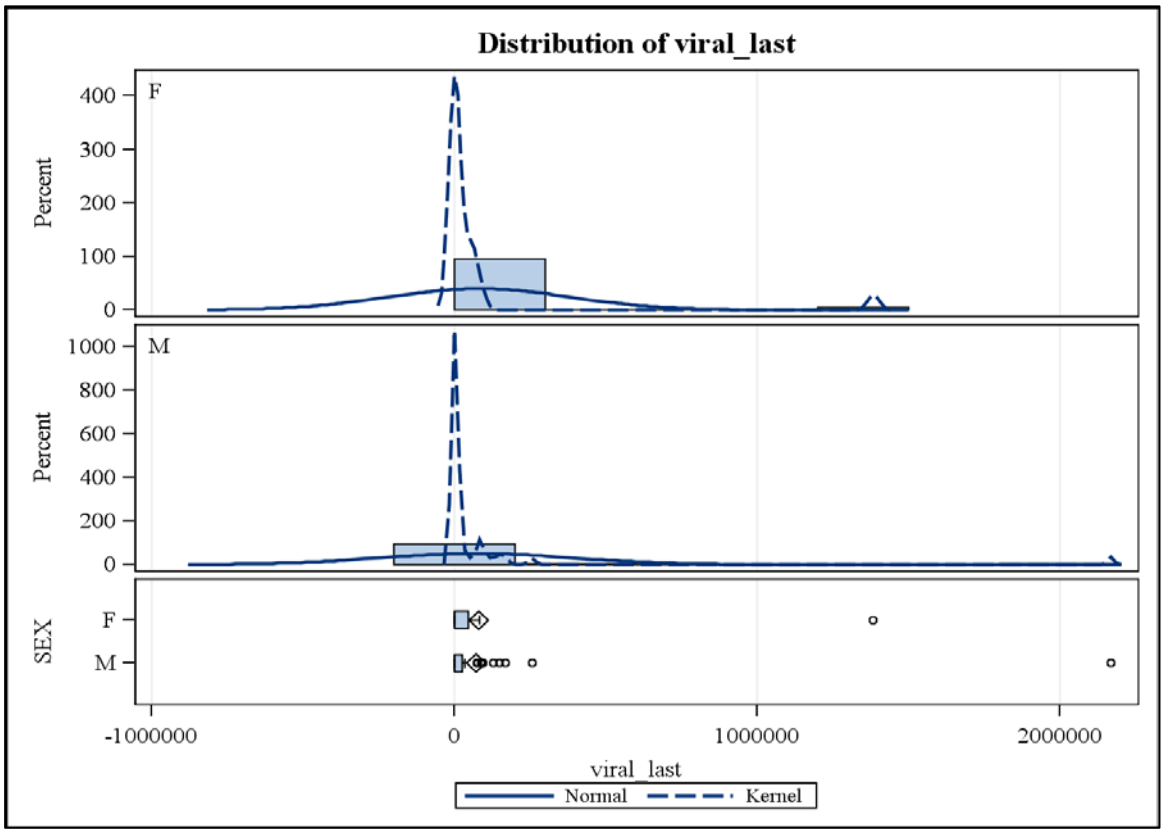

Figure 4-13: Average viral loads of paediatric patients on HAART according to gender at last treatment date

This graph is similar to Figure 4-12 that shows the viral loads of paediatric patients on initiation of treatment. From this graph it can be seen that there were a few paediatric patients that were either initiated on very high viral loads or were experiencing virological failure even on treatment. There are however, especially in the male children, fewer paediatric patients with such extremely high viral loads than what was seen on initiation of HAART.

4.4 Changes in the clinical indicators

Numerous benefits for patients using ART are mentioned in the treatment section of chapter two. The following section focuses on investigating the effect of HAART on the selected clinical indicators (variables) of this study.

The aim of ARV treatment at this point in time is still to completely suppress viral replication and obtain a lower than detectable plasma virus level. In practice, viral load is then used primarily to monitor the success of ARV treatment, but a higher viral load is also associated with rapid CD4 cell loss and a faster disease progression (Sweetman, 2011:945). In view of the fact that the primary function of CD4 positive T-helper cells is to assist CD8-positive cytotoxic T-lymphocytes in eliminating other cells expressing foreign antigens, it is directly associated with the immune system of the host. The CD4 count can thus be utilised as an indicator for determining the susceptibility of an infected person to opportunistic infections.

To achieve realistic results, both adult and paediatric patients were divided into groups according to the period of time that these patients have been on ARV treatment. Because tests for determining the viral load and CD4 count of a patient are usually performed every six months, it was decided to create only the following two categories:

- Patients on HAART for between 6 and 12 consultations
- Patients on HAART for more than 12 consultations

This means that patients who have had fewer than six consultations of receiving treatment will be excluded from the following results, because it can not yet be expected that these patients will have any new comparable test results available after the initiation (baseline) results.Also keep in mind that the number of patients will only include patients who had a valid viral load available on initiation of treatment, as well as at the last treatment date.

4.4.1 Changes in the selected indicators for adult patients

The first table indicating the effect that HAART has had on the selected variables of HIV/AIDS patients shows the results for adult patients on treatment for more than six months, but less or equal to twelve months.

Table 4-72: Effect of HAART on the selected variables of adult patients on treatment for more than six consultations and fewer or equal to twelve consultations

Clinical indicator (Variable)	Number of patients (n)	Mean	Standard Deviation	95% CI Mean	
Weight (kg)	82	3.22	8.83	1.29	5.16
CD4 count (cells/mm^3)	90	133.21	161.79	99.33	167.10
Viral load (copies/mm^3)	10	27239.80	180250.58	-101703.70	156183.30

Even though these patients have only been on treatment for between six to twelve months, the positive effects of using HAART are already evident. These adult patients have gained an average of 3.22kg (± 8.83kg) of body weight since initiation of HAART. The average adult patient have in more than six months and less or equal to one year on treatment, had an increase of 133.21cells/mm^3 (± 161.79cells/mm^3) in CD4 count. The data in Table 4-72 above does however show a mean (average) increase in viral load of 27239.80copies/mm^3 (± 180250.58copies/mm^3) for patients on treatment for this period. The fact that these adult patients' average viral load has increased is not a good sign because, as mentioned earlier, the aim of ARV treatment is to suppress viral replication and therefore the viral load should ideally decrease after initiation of therapy. The following table illustrates the difference between the mean and median values.

Table 4-73: Effect of HAART on the selected variables of adult patients on treatment for more than six consultations and fewer or equal to twelve consultations, also indicating the median and minimum/maximum levels

Clinical indicator (Variable)	Number of patients (n)	Mean	Median	Minimum	Maximum
Weight (kg)	82	3.22	2.15	-17.40	34.00
CD4 count (cells/mm^3)	90	133.21	83.00	-125.00	773.00
Viral load (copies/mm^3)	10	27239.80	-239.00	-299000.00	423131.00

The median according to Waning & Montagne (2001:83) is defined as the middle value when a dataset is sorted in an ascending order from the lowest to the highest value. The median value for the change in viral load of these patients was -239copies/mm^3. The purpose of including the median in this table was to illustrate that although the mean was a positive value that indicated an average increase in viral load, the median was in fact a negative value, indicating that at least half or more than half of these patients had a reduced viral load since initiation. The negative minimum levels of the weight and CD4 count in Table 4-73 above point out that there were in fact at this stage also adult patients that experienced a decrease in weight and CD4 count. Once more the median confirms that at least more than half of patients had indeed experienced the preferred effects of their ARV treatment.

In Table 4-74 below the same variables as in Table 4-72 and Table 4-73 above were monitored, only this time it was for adult patients who had collected HAART for more than 12 consultations.

Table 4-74: Effect of HAART on the selected variables of adult patients on treatment for more than twelve consultations

Clinical indicator (Variable)	Number of patients (n)	Mean	Standard Deviation	95% CI Mean	
Weight (kg)	85	3.43	8.11	1.68	5.17
CD4 count (cells/mm^3)	94	214.71	248.24	163.87	265.56
Viral load (copies/mm^3)	8	-170944.50	191854.69	-331339.03	-10549.97

According toTable 4-74 above, adult patients that had received HAART at more than 12 occasions (consultations) had an average weight gain of 3.43kg (± 8.11kg) since initiation of treatment. This group of adult patients also showed an average increase of 214.71cells/mm^3 (± 248.24cells/mm^3) inCD4 count and an average reduction in viral load of 170944copies/mm^3 (± 191854.69copies/mm^3) since the day they started HAART up to the last date of receiving treatment. Table 4-75 below provides a more transparent look at the data by including the minimum and maximum levels.

Table 4-75: Effect of HAART on the selected variables of adult patients on treatment for more than twelve consultations, also indicating the median and minimum/maximum levels

Clinical indicator (Variable)	Number of patients (n)	Mean	Median	Minimum	Maximum
Weight (kg)	85	3.43	3.00	-14.20	35.90
CD4 count (cells/mm^3)	94	214.71	147.50	-390.00	1513.00
Viral load (copies/mm^3)	8	-170944.50	-84684.00	-419678.00	-1791.00

Again the researcher decided to add the median as well as the minimum and maximum data levels for the clinical indicators. For patients that had received HAART at more than 12 consultations it is clear that all the adult patients in this group experienced a reduction in viral load. This is evident in Table 4-75 above where the minimum as well as the maximum change in viral load since initiation of HAART are negative values. As was discussed under Table 4-73, there are yet again patients that have had a negative change in their weight and CD4 count. The column indicating the minimum level for these variables makes this apparent. The mean and median value of all the clinical indicators signifies that the majority of these patients did experience the intended effects of HAART.

4.4.2 Changes in the selected indicators for paediatric patients

The identical clinical indicators were used to observe the changes that paediatric patients experienced on HAART. The next table shows these changes in the children who had received medication for more than six consultations and fewer or equal to twelve consultations.

Table 4-76: Effect of HAART on the selected variables of paediatric patients on treatment for more than six consultations and fewer or equal to twelve consultations

Clinical indicator (Variable)	Number of patients (n)	Mean	Standard Deviation	95% CI Mean	
Weight (kg)	17	4.84	2.76	3.42	6.25
CD4 count (cells/mm^3)	35	316.71	499.63	145.09	488.34
Viral load (copies/mm^3)	7	1278.71	61086.05	-55216.46	57773.89

Although it can be expected that children would gain weight as they grow older, it is still significant to see that these paediatric patients had an average weight increase of 4.84kg (± 2.76kg) since initiation of HAART. The CD4 count of paediatric patients also increased with an average of 316.71cells/mm^3 (± 499.63cells/mm^3) and the viral load showed a disappointing average increase of 1278.71copies/mm^3 (± 61086.05copies/mm^3). The number of paediatric patients with a valid viral load available was unfortunately very low.

Table 4-77: Effect of HAART on the selected variables of paediatric patients on treatment for more than six consultations and fewer or equal to twelve consultations, also indicating the median and minimum/maximum levels

Clinical indicator (Variable)	Number of patients (n)	Mean	Median	Minimum	Maximum
Weight (kg)	17	4.84	3.80	1.90	11.4
CD4 count (cells/mm^3)	35	316.71	214.00	-712.00	2066.00
Viral load (copies/mm^3)	7	1278.71	0.00	-108933.00	86267.00

The median levels in Table 4-77 above also shows positive results for both the weight and CD4 count of this group of patients. The median value for the viral load indicates that the middle most patient actually had no change in viral load during this period. It would be advisable to also look at the minimum and maximum levels to further explain the results.

Table 4-78 below again uses the same indicators, only these results are for paediatric patients on treatment for more than one year (twelve consultations).

Table 4-78: Effect of HAART on the selected variables of paediatric patients on treatment for more than twelve consultations

Clinical indicator (Variable)	Number of patients (n)	Mean	Standard Deviation	95% CI Mean	
Weight (kg)	36	6.56	3.75	5.30	7.83
CD4 count (cells/mm^3)	89	396.63	594.53	271.39	521.87
Viral load (copies/mm^3)	19	-538369.37	948634.46	-995596.54	-81142.19

The paediatric patients on treatment for more than twelve consultations showed very positive results since commencing HAART. These children had an average weight gain of 6.56kg (± 3.75kg) from initiation of ARV treatment to the last treatment date. They also showed an average increase in CD4 count of 396.63cells/mm^3 (± 594.53cells/mm^3) and a very encouraging average decrease (therefore the negative value) of 538369.37copies/mm^3 (± 948634.46copies/mm^3) in the viral load. Noteworthy is that there is a significantly higher number of children on treatment for more than twelve consultations that had valid values available for the selected indicators. As was discussed under Table 4-66 and Table 4-76 it was again the viral load where an undesirably small number of patients had an applicable laboratory value available.

Table 4-79: Effect of HAART on the selected variables of paediatric patients on treatment for more than twelve consultations, also indicating the median and minimum/maximum levels

Clinical indicator (Variable)	Number of patients (n)	Mean	Median	Minimum	Maximum
Weight (kg)	36	6.56	5.75	1.70	20.30
CD4 count (cells/mm^3)	89	396.63	377.00	-1720.00	2427.00
Viral load (copies/mm^3)	19	-538369.37	-61128.00	-2899882.00	82977.00

The minimum value of the CD4 count and maximum value of the viral load for this group of patients did expose the fact that at least one paediatric patient had a decrease in CD4 count and at least one child had an increase in viral load (82977.00copies/mm^3).

Nonetheless, both the mean and median values for all the variables indicated that the majority of paediatric patients on HAART for more than twelve consultations (at least one year) had experienced the ideal outcomes from ARV treatment.

4.5 Chapter summary

This chapter delineated results of the empirical investigation. The results were presented according to the research objectives of the study. The first section described the prevalence results of the study according to the selected markers. Thenext section focused on the general objective of the study and provided the medicine treatment patterns of the hospital. The last section illustrated the influence that HAART had on the selected clinical indicators of the specific research objectives. In chapter 5 the conclusions, recommendations and limitations of the study will be discussed.

Chapter 5: Conclusions, Recommendations and Limitations

5.1 Conclusions

5.1.1 Conclusions with regard to the literature review

The first research objective of the literature review was to attain a certain degree of clinical knowledge regarding the concept of the HI-virus and AIDS, including the pathogenesis of HIV and the pathography of AIDS, as well as a thorough explanation of CD4 T-cell counts and viral loads.

This was done by thoroughly researching existing knowledge of the clinical aspects of HIV/AIDS. The pathogenesis (cellular events, reactions and other pathological mechanisms occurring in the development of a disease) of HIV and the pathography (history or description of a disease) of AIDS were summarized by firstly describing the structure of the human immunodeficiency (HI) virus, after which the life cycle of the HI virus was methodically explained. The immunopathogenesis of HIV was explained and the history and development of AIDS was discussed. The role of CD4-positive helper cells (CD4 T-cells) in HIV/AIDS was highlighted. Finally the amount of CD4-positive T helper cells per microliter of blood (CD4 T-cell count or CD4 count) and the plasma HIV RNA concentration (viral load) was described in sufficient detail to make the meaning of these terms easily comprehensible.

The second research objective of the literature review was to briefly explain the modes of transmission, the risk factors that contribute to the epidemic, the signs and symptoms of HIV/AIDS and the diagnosis of HIV-infection.

The second research objective of the literature review was achieved by providing a concise but complete clarification of how HIV is spread, thus explaining the modes of transmission. The term risk factors became clear from the next section of chapter two when a magnification of the factors influencing the probability of transmission of HIV was given. The signs and symptoms of HIV/AIDS were explained according to disease stage after infection. To complete the objective a short description of the diagnostic tests available and currently in use for the detection of HIV infection was provided.

The third research objective of the literature review was to explain the different stages of HIV/AIDS according to the WHO.

This objective was achieved by researching the World Health Organization's (WHO) standardised protocols. After thorough research, the WHO clinical staging model was found to be the foremost standard guideline available for reference to HIV/AIDS clinical disease staging. The description of the four disease stages of HIV/AIDS was presented according to clinical events, including symptoms and opportunistic infections as described by the WHO. The discussion pointed out that the standard list does allow for some additional inclusions or exclusions of conditions according to country. The clinical staging list used in RSA was presented for both the adults as well as paediatric patients. Some symptoms and diseases specific to HIV/ AIDS children were also noted.

The fourth research objective of the literature review was to describe and classify the ARV drug classes, supply the SA treatment guidelines, as well as to provide some insight regarding adherence to treatment and to describe the most common side-effects of these drugs.

To achieve the fourth research objective of the literature review a detailed description of the different ARV drug classes were given and their diverse mechanisms of inhibiting HIV replication was explained per drug class. The names of all the known and accessible drugs for each drug class were provided. Both the adult and paediatric SA treatment guidelines used in the treatment of HIV infected individuals were made available and explained thoroughly. Through vast literature study an in-depth summary of the importance of adherence to chronic HIV/AIDS treatment was given. Due to the direct influence that treatment adherence, drug resistance and adverse drug reactions (side-effects of drugs) have on one another, a collaborated section was written in chapter two that fully explains each of these terms and also indicated the association between them.

The fifth research objective of the literature review was to summarise the prevalence of the HIV/AIDS epidemic in the world and to then focus on the HIV/AIDS prevalence in South Africa, and more specifically the burden of disease on the North West Province.

The section on prevalence of HIV/AIDS began by explaining the Millennium Development Goals (MDG), in particular MDG number 6, which specifically addresses

the HIV/AIDS epidemic. The literature chapter then summarised the global epidemic and the burden that HIV/AIDS has placed on healthcare through for example highlighting the insufficient coverage of ART in low-and middle-income countries. The following section provided a very thorough view of the history and burden of HIV/AIDS in SA. Prevalence, Infant Mortality Rate (IMR), Life expectancy and the PMTCT program in SA were amongst other discussed. Focus was then placed on the North West province and all relevant demographics were presented. The section concluded with a segment on education, employment and the health profile of the North West province.

The sixth and last research objective of the literature review was to investigate very briefly the cost implications of the fast growing number of HIV/AIDS patients on specifically pharmaceutical resources in the public health care sector and to present a look at the estimated cost of providing ARV drugs in RSA over the next five years.

To achieve the last research objective of the literature study the most important research reference was the National Strategic Plan (NSP) for HIV/AIDS and STIs in RSA. This document was used to describe the long-term goals and strategic objectives of the RSA government for 2012 to 2016. The total estimated cost for all four the main objectives were stated and then pharmaceutical resources were identified as the main cost driver for the department of health. The estimated cost of providing ARV drugs to patients in RSA was provided for each year from 2012 to 2016.

5.1.2 Conclusions with regard to the empirical investigation

The first research objective of the empirical study was to analyse the prevalence of HIV/AIDS patients receiving HAART according to gender, age and other demographic factors.

In order to achieve this research objective of the empirical study, a complete analysis had to be performed on all patients receiving HAART at the study facility. The total number of adult patients collecting ARV treatment at the study facility was three hundred and ninety nine (N=399) and the total paediatric patients on treatment were one hundred and sixty one (N=161). Firstly, the prevalence according to gender was determined. The adult female patients accounted for almost 70% (n=276, 69.17%) and the adult male patients for only 30% (n=123, 30.83%) of the total adult patients on

HAART. With the children it was the male paediatric patients that made up just over 60% (n=97, 60.25%) of the total paediatric patients on HAART whereas the female paediatric patients comprised less than 40% (n=64, 39.75%) of the children on treatment. These statistics does show a disproportionate prevalence of patients on HAART between genders; the question however should be investigated as to why the female adult and the male paediatric patients had such high prevalence?

When the prevalence according to age categories were determined, it was found that the highest prevalence among the adult patients on HAART were in the older than 35 years and younger or equal to 45 years old age group. This is not in line with most of the well-known prevalence reports in South Africa that indicate the highest HIV/AIDS prevalence rates among the 25-29 year or 30-34 year age groups (Department of Health, 2008b:31; Department of Health, 2011:47). Future investigations should focus on why the highest number of patients on ARV treatment is not also the highest HIV/AIDS prevalence age group. The average age of adult patients on initiation of HAART revealed that the average adult male (40.88 ± 10.91 years) patient started treatment at roughly three and a half years (3.53years) older than the average female (37.35 ± 9.76 years) patient. Although the results for the difference between the age of adult male and female patients on initiation of HAART was statistically significant (p=0.0032), it only had a small effect and relatively insignificant practical importance (d=0.323). The highest prevalence of paediatric patients receiving HAART at the last date of receiving treatment was in the older than 5 years and younger or equal to 9 years age group (n=56, 34.78%). The average initiation age of children did not show any statistical (p=0.793) or practical (d=0.038) significant difference between the genders. Both the female children (5.44 ± 4.39 years) as well as the male children (5.27 ± 3.30 years) were initiated on HAART at an average age of around 5 years.

Two comparative Table 4-11 and Table 4-12 indicated that the majority of adult patients were unmarried (n=323, 80.95%) and this group of patients were also by far the youngest group (36.38years) of patients on treatment. The conclusion was that whether due to the younger age or due to being unmarried, this group was definitely a key population at the highest risk of HIV transmission. The group with a known marital status with the second youngest average age (46.1 years) was the married group and still they were almost 10 years (9.72 years) older than the single (unmarried) group.

The majority of both adult and paediatric patients receiving HAART at the study facility resided in the Bodibe Village, Itsoseng Zone III and Itsoseng Zone I areas. Together these three areas accounted for half (49.88%, n=199) of all adult patients receiving treatment at the study facility and more than two thirds (67.7%, n=109) of all paediatric patients lived in one of these three areas. Again the conclusion was made that when compared to the actual population sizes of each area, both the data for adult as well as paediatric patients can help indicate high risk areas or areas of high HIV transmission.

Employment status amid the adult population was identified from the literature review as one of the risk factors related to the spread of HIV/AIDS. When the employment status was determined for all adult patients on HAART it was deplorable to see that almost 86% (85.96%, n=343) of adult patients were registered as unemployed. A mere 6.52% (n=26) was actually registered as employed in their patient records. On the other hand, it was noted that the employment status statistics are probably biased towards unemployed people due the study being conducted in a government healthcare facility where services are provided at minimal or no cost to the unemployed population. Slightly more than the employed group was the group classified as pensioners. In fact, 5.76% (n=23) of all adult patients receiving HAART at the study facility were classified as pensioners and the conclusion was drawn that perhaps this too indicates an older population than what would have been expected from the literature review.

National policies such as the policy on down-referring and transferring patients from a hospital to collect treatment at a primary health care facility were created to alleviate the burden of HIV/AIDS on any one facility by redistributing patients across many healthcare facilities and also most importantly to ease access to treatment for patients, since they can then collect treatment closer to their homes. To monitor the implementation of these policies and to see how many of the HIV/AIDS patients are collecting HAART chronically at the study facility, tables were created to indicate what type of consultation the patients had at their last date of receiving treatment. Among the adult patients, just over 70% (71.43%, n=285) came for a review of their prescription and/or refill of their monthly medication. During the data collection period only eleven (n=11, 2.76%) adult patients were transferred out to other healthcare facilities, thirty (n=30, 7.52%) adult patients were newly initiated on HAART and forty nine (n=49, 12.28%) adult patients were down-referred to PHC facilities.

The adult statistics were found to be relatively reasonable. However, the paediatric table indicated a completely different set of data. A staggering 92.55% (n=149) of children came to the hospital for a review of their prescription and/or refill of their monthly medication. Nine (n=9, 5.59%) children were newly initiated on HAART, two (n=2, 1.24%) were transferred in from other facilities and only one (n=1, 0.62%) paediatric patient was down-referred to a PHC facility for continuation of care. No child was transferred out from the study facility during the data collection period.

These findings were confirmed by calculating both the adult and paediatric number of patients in relation to the number of consultations they have attended. The results showed that 76.19% (n=304) of all adult patients collecting their medication at the study site were initiated on HAART within the last twelve months prior to data collection. On the other hand it was found that only about 40% (40.12%, n=65) of all paediatric patients were initiated at the facility within the 12 months prior to data collection. From this data, as well as the data that indicated that no paediatric patient was transferred out, one can conclude that the down-referral and transfer-out systems are not yet entirely implemented amongst the paediatric patients (refer to Table 4-18 and Table 4-20). The question has to be asked as to why paediatric patients are reluctant to go, or perhaps healthcare workers are reluctant to send paediatric patients to PHC facilities?

The second research objective of the empirical study was to determine the number of both adult and paediatric patients that have defaulted ARV treatment during the data period, as well as to provide a glance at the periods of defaulting.

The second research objective of the empirical study was achieved by calculating the number of patients that have somewhere during the data period not collected their ARV medication as prescribed and have therefore defaulted their chronic treatment. Ninety two (n=92, 23.06%) of the adult patients and fifty eight (n=58, 36.03%) paediatric patients defaulted treatment during the defined period. These findings were further investigated and the results were sorted according to gender as well. It was found that fifty seven (n=57) adult female patients and thirty five (n=35) adult male patients have defaulted treatment during this period. This means that one in every five adult women (20.65%) and slightly more than one in every four adult men (28.46%) currently on HAART have already defaulted treatment in this short defined data period of just more than one year. Notably, the results from the adult defaulting data showed that more men than women have defaulted ARV treatment.

Twenty two (n=22) of the female paediatric patients have defaulted treatment and thirty six (n=36) male children defaulted treatment, which indicated that 36.03% of all paediatric patients on HAART have defaulted their treatment during the data period. These statistics showed that 34.38% of female paediatric patients and 37.11% of male paediatric patients have defaulted ARV treatment. It was however clearly noted that the defaulting data for children by gender is not that vital, since children are usually dependent on an adult to collect medication and it would not matter whether more girls or more boys have defaulted treatment.e

Since a great deal of focus have fallen on identifying groups at higher risk of transmitting HIV/AIDS, the defaulting data was also presented by age group. The highest prevalence of defaulting amongst the adult patients occurred in the youngest age category between 18 and 25 years, where 36.84% of patients in this age group have already defaulted treatment during the data period. The lowest percentage of adult defaulters were in the older than 55 years category, which is also the highest or oldest age category, where only six (n=6) patients have defaulted treatment (18.18%). The data contained in Table 4-23 indicated that age does seem to play a significant role in patients' adherence to ARV treatment; in fact, there was a very clear constant drop in the percentage of patients that have defaulted treatment from the youngest to the eldest adult patient groups. These results were also determined for the paediatric patients. However, it was again noted that the defaulting per age group results for children are not significant as children are reliant on a parent or caregiver for collection of medication. It did, however, seem as if older children were more inclined to default treatment.

To provide a glance into the periods that patients default ARV treatment, two tables were created to illustrate all the consultations after an episode of defaulting and also to show the time period that a patient has defaulted before returning to hospital for treatment. The first table showed the adult data and it was very clear that at almost half (47.55%, n=68) of the 143 consultations after defaulting, patients had defaulted treatment for one month. The second highest number of adult consultations (n=17, 11.89%) after defaulting showed that treatment was not taken for two months and at ten (n=10, 6.99%) consultations it was calculated that a patient have not been receiving treatment for two weeks. Unexpected was the number of adult patients that have returned for treatment after a longer period of defaulting. Forty (n=40, 27.97%)

consultations showed adult patients that have returned to collect HAART after defaulting for longer than two months.

Table 4-28, indicating the paediatric data, presented very similar results to the adult data. The largest number of consultations (n=41, 43.16%) after a child has defaulted treatment again indicated that they have defaulted for one month, while the second highest (n=15, 15.79%) were once more when patients have defaulted for two months and the third highest (n=12, 12.63%) prevalence of defaulting period was two weeks. Thirteen paediatric patients have returned for treatment after defaulting for more than two months, which is somewhat less than the adult patients that have returned to collect medication after defaulting treatment for more than two months. Of note is that both these tables indicate the number of consultations after patients have defaulted, meaning also that one patient could have defaulted more than once during the data period. Also noteworthy is that again no conclusions were drawn regarding the defaulting period of paediatric patients for the same reason that defaulting did not matter by age group or gender in paediatric patients.

The third and probably the most central research objective of the empirical study were to investigate the medicine treatment patterns of HAART at a district hospital.

Since there are numerous ARV drugs available and combined in numerous regimens, both the adult and paediatric standard regimens according to the SA guidelines first had to be explained and coded for ease of reference. For further details on the regimen codes and dosages of drugs refer to appendices 1 and 2. The results from the investigation into the adult medicine treatment patterns revealed that more than half (52.38%, n=209) of all the adult patients were receiving regimen 1atn (EFV, TDF and 3TC). The second most adult patients (n=83, 20.80%) were receiving regimen 1a (EFV, d4T and 3TC), the third most patients (n=48, 12.03%) received regimen 1bt (NVP, TDF and 3TC) and the fourth highest number of adult patients (n=39, 9.77%) were prescribed regimen 1b (NVP, d4T and 3TC). Sixteen adult patients were given either regimen 1az, 1bz, 1da or 1dt. The remaining four adult patients were on second line therapy and were prescribed either regimen 2AA25 or 2AA40. It was concluded that almost 65% (64.66%) of adult patients were receiving a regimen containing TDF rather than d4T, which is in line with the SA guidelines for managing HIV/AIDS patients.

The paediatric patients have other treatment protocols for managing children with HIV/AIDS and therefore different codes were created to describe the treatment regimens. The most paediatric patients (n=73, 45.34%) on any single regimen were on regimen P1c (EFV, d4T and 3TC) and the second most paediatric patients (n=45, 27.95%) were on regimen P1a (d4T, 3TC and LPV/r). The third most prescribed regimen (n=21, 13.04%) for children was regimen P1ca (ABC, 3TC and EFV) and the fourth most paediatric patients (n=16, 9.94%) were on regimen P1aa (ABC, 3TC and LPV/r). The remaining six children were prescribed either paediatric regimen P1b or P1ba, or weighed enough to be prescribed adult regimen 1atn or 1bt. Again it was concluded that, due to the toxicity profile of d4T, even paediatric patients are rapidly changing from the old d4T based first line regimen to a new ABC based paediatric regimen.

To append some additional value on the medicine treatment patterns (regimens) of both adult and paediatric patients; data was provided on the number of consultations at which the medicine treatment protocol of patients had been changed, as well as providing the reason for changing the regimen. It was calculated that at forty eight (n=48) different consultations the treatment regimen of adult patients were changed. The reason for changing the ART regimen of adult patients at thirty seven (n=37, 77.08%) of these consultations were due to ARV medication side-effects or ADRs experienced by patients. At four (n=4) consultations the regimen was changed because of pregnancy and only one adult patient switched ART regimen due to virological failure during the data period.

The regimen of children was changed at thirty six (n=36) of the paediatric consultations. Again side-effects to ARV drugs appeared to be the major reason for changing the HAART regimen of patients and at twenty eight (n=28) of the consultations have the regimen of children been changed due to these side-effects. A little concerning was the fact that at seven (n=7) consultations the reason for changing the regimen of children was not known. Virological failure was only identified at one (n=1) consultation when the regimen of a child was changed.

The fourth research objective of the empirical study was to examine the vigilance with prescribing prophylactic treatment such as Co-trimoxazole and Isoniazid.

To achieve the first part of this objective and ensure that the results are practically significant, the adult patients had to be divided into two groups to investigate the appropriate prescription of Co-trimoxazole. The first group included all adult patients that had a CD4 count of more than 200cells/mm^3 and according to the literature review it was not compulsory or necessary to prescribe Co-trimoxazole as prophylactic treatment for this group of patients. It was however revealed, that in this group, at almost 85% (84.63%, n=1261) of consultations Co-trimoxazole was issued as part of their monthly treatment regimen. The question had to be asked whether many of these patients had a WHO clinical stage 2, 3 or 4 disease/opportunistic infection and therefore qualified to receive Co-trimoxazole as prophylaxis, or could it be that prescribers have perhaps come into the habit of randomly prescribing Co-trimoxazole as prophylaxis to almost all HIV/AIDS patients regardless of CD4 count?

The second group of adult patients included all patients with a CD4 count of less than 200cells/mm^3 and therefore automatically qualifies to receive Co-trimoxazole as prophylaxis according to the guidelines. In this group, out of a possible 1328 eligible consultations, Co-trimoxazole was in fact prescribed as prophylaxis at more than 95% (96.84%, n=1286) of consultations. This indicated the correct vigilant prescription of this drug as prophylactic treatment.

Guidelines for prescribing Co-trimoxazole prophylaxis to children is categorised according to age as well as different CD4 counts or percentages per age group and therefore the results only provided an overall view of the prevalence of prescribing Co-trimoxazole as prophylaxis to paediatrics per consultation. It was astounding that at 98% (97.795%, n=1818) of all consultations, Co-trimoxazole was indeed prescribed and issued to paediatric patients as part of their treatment. As with the adult patients with a CD4 count of more than 200cells/mm^3, this pointed towards irrational use of Co-trimoxazole as prophylactic treatment in paediatric patients and again there is need to investigate this phenomenon.

As discussed in chapter two, there are very encouraging benefits to especially preventing an HIV/AIDS patient from getting TB. To determine how many patients were eligible for TB prophylactic treatment it was first of all important to rule out patients who

have active TB, and therefore all patients that were taking curative treatment for TB also had to be determined for both the adult and paediatric populations. The empirical investigation found that ninety (n=90) adult patients received Isoniazid as TB prophylactic treatment, while forty seven adult patients received treatment for active TB during the data period. Combined this meant that slightly more than a third (34.33%) of the adult patients on HAART also received either TB prophylactic treatment or curative treatment for active TB infection. The research into the paediatric data revealed that thirty seven children were treated for active TB infection and another sixteen paediatric patients were issued Isoniazid as TB prophylactic treatment during the data period. The combined paediatric results also indicated that roughly a third (32.92%) of the children on HAART at the study facility had received either TB prophylactic treatment or curative treatment for active TB infection during the data period.

Although not essential, the researcher also investigated the incidence of prescribing multivitamin supplements to both adult and paediatric patients. These supplements are not compulsory in the treatment of HIV/AIDS patients, but as described in chapter four it is recommended for certain symptoms or conditions. A review of the results from this investigation showed that, as mentioned before, although not compulsory, there was still a surprisingly high frequency of multivitamins prescribed. Multivitamin supplements were prescribed at 85.95% (n=2422) of all documented adult consultations and 96.5% (n=1794) of the total paediatric consultations. These statistics could be signified as astoundingly high and should most likely be probed.

The fifth research objective of the empirical study was to compare body weight, CD4 T-cell counts and viral loads between genders.

This objective was achieved by first determining the same date for each patient and both genders, so the weight, CD4 T-cell counts (CD4 counts) and viral loads of patients on initiation of HAART were to be used for comparisons. The results of investigating the initiation weight of adult patients receiving HAART revealed that the average adult female patient weighed 57.18kg (± 15.78kg) and the average adult male patient weighed 55.87kg (± 10.17kg) on initiation of HAART. The difference in initiation weight between the genders for adult patients was around 1.3kg and it was concluded that this difference was statistically (p=0.4602) as well as practically (d=0.083) insignificant. Both the female and male adult patient with an initiation weight of around 30kg was noted as particularly low. The results from the paediatric weight data were provided, but

described as incomparable between genders due to the fact that age differences could influence these results significantly. However, one can applaud the fact that all the children had accurately measured weights available on both initiation of HAART, as well as on the last date of receiving treatment.

Because CD4 counts, as described in chapter two and four, can help to determine the disease progression or clinical stage of HIV/AIDS patients; it stands to reason that it can also be used to compare how immune-compromised patients between different genders were on initiation of HAART. It was established that the average adult male patient was initiated on HAART with a CD4 count of 130cells/mm^3 (± 99.45cells/mm^3) while the average CD4 count for adult females on initiation was 160cells/mm^3 (± 96.51 cells/mm^3). The difference between the average CD4 count of the female and male adult patients on initiation of HAART were in fact statistically significant (p=0.0097). Although a statistical significance was found, it was determined that this difference was practically very small and non-significant (d=0.304). The conclusion that there is a statistical significant difference between the CD4 counts of adult female and male patients does however balance on the actuality that there is a window of opportunity for pregnant women to be initiated on HAART at a CD4 count ≤ 350cells/mm^3, which could mean that a higher CD4 count can be expected for adult females than males.

It became clear that most paediatric data would only be practically comparable if factors such as age are also taken into account at every calculation. The paediatric data indicated that the average male child was initiated at a CD4 count of 509.1cells/mm^3 (± 521.1cells/mm^3) and the average CD4 count for female paediatric patients were 477.3cells/mm^3 (± 422.1cells/mm^3). It was concluded that male paediatric patients started treatment at a CD4 count that is around 30cells/mm^3 higher than the average female paediatric patient on initiation of HAART.

The results for the viral load differences between genders were easier to compare and conclude. The average viral load for adult female patients on initiation of HAART was 103046copies/mm^3 (± 189146copies/mm^3) whereas the average viral load for adult male patients starting treatment was 416600copies/mm^3 (± 439746copies/mm^3). It was clear that this was a vast difference and the objective was accomplished by comparing the statistics and finding that the adult male patients had an average viral load of more than four times as much as the females on initiation of HAART. Due to the calculated p-value (p=0.0006) that was much less than the predetermined 0.05 α-level, the

difference between the viral load of adult female and male patients on initiation of HAART were described as statistically significant. This difference was also determined to be of observable practical significance (*d*=0.713).

The average viral load for female paediatric patients on initiation of HAART was calculated at 242207copies/mm^3 (± 709133copies/mm^3) and the average viral load for male paediatric patients at 329734copies/mm^3 (± 674532copies/mm^3). Again it was established that the male patients came for initiation of HAART at higher viral loads than the female patients. It was determined that there was no statistical (*p*=0.6935) nor practical (*d*=0.123) significant difference between the paediatric male and female viral loads on initiation of HAART.

For all the investigations above, the body weight, CD4 count and viral loads were also determined and presented for the last date of receiving treatment. This was done to ensure that the latest available and relevant data was also published. Sadly, it was noted that there were far too few CD4 counts and especially viral loads available or documented to accurately postulate the effect that treatment had from the initiation date to the last date of treatment.

The sixth and last research objective of the empirical study was to briefly assess the influence of HAART on patients' body weights, CD4 T-cell counts and viral loads.

To achieve this research objective the first priority was to determine the period over which the change in the variables will be monitored. The researcher decided to examine the effects that HAART had on patients over two different periods. It was decided that the first group will include patients that have received treatment at more than six consultations but fewer or equal to twelve consultations. The second group of patients will have been on treatment for more than twelve consultations (more than one year). Patients with fewer than six consultations of receiving treatment were excluded from these results because it could not be expected that these patients will have any comparable test results available after the initiation (baseline) results. Statements were made under the assumption that patients came to collect treatment monthly and one consultation thus equaled one month.

The adults who received treatment at more than six consultations, but fewer or equal to twelve consultations showed encouraging results for both weight and CD4 T-cell count

(CD4 count). This group of adult patients had gained an average of 3.22kg (± 8.83kg) of body weight and experienced a mean increase of 133.21cells/mm^3 (± 161.79cells/mm^3) inCD4 count since initiation of HAART. The data in Table 4-72 showed a mean (average) increase in viral load of 27239.80copies/mm^3 (± 180250.58copies/mm^3) for patients on treatment for this period. This was not seen as a good sign because the aim of ARV treatment is to suppress viral replication and the viral load should ideally have decreased after initiation of therapy. The investigator explained and added the median values to illustrate that although the mean viral load was a positive value that indicated an average increase in viral load, the median was in fact a negative value, indicating that at least half or more than half of these patients had a reduced viral load since initiation.

The second group of adult patients received HAART at more than 12 occasions (consultations) and the results from investigating the selected indicators revealed an average weight gain of 3.43kg (± 8.11kg) since initiation of treatment. This group of adult patients also showed an average increase of 214.71cells/mm^3 (± 248.24cells/mm^3) in CD4 count and an average reduction in viral load of 170944copies/mm^3 (± 191854.69copies/mm^3) since the day they started HAART up to the last date of receiving treatment. In this group a clear reduction in viral load was observed and every one of the patients in this group experienced a decrease in viral load.

The first group of paediatric patients was also created for patients that received treatment for more than six consultations and fewer or equal to twelve consultations. This group of paediatric patients had an average weight increase of 4.84kg (± 2.76kg) since initiation of HAART. The CD4 count of these paediatric patients also increased with an average of 316.71cells/mm^3 (± 499.63cells/mm^3) and the viral load showed a disappointing average increase of 1278.71copies/mm^3 (± 61086.05copies/mm^3).

The second group of paediatric patients was on treatment for more than twelve consultations and showed very optimistic results from HAART. This group of children had an average weight gain of 6.56kg (± 3.75kg) from initiation of ARV treatment to the last treatment date. They also showed an average increase in CD4 count of 396.63cells/mm^3 (± 594.53cells/mm^3) and a very encouraging average decrease of 538369.37copies/mm^3 (± 948634.46copies/mm^3) in the viral load. Noteworthy was the fact that there were significantly more children in the second group than the first group

that had valid values available for the selected indicators. It was only the viral load where there were too few patients that had a proper laboratory result available.

5.2 Recommendations

The researcher would like to make the following recommendations to stakeholders:

- The first inquiry that derived from the study was found in the prevalence results. From the results of the prevalence by gender it became clear that although an uneven distribution of HIV infection was expected between the genders, there is still a need to investigate why so many more female than male adult patients receive treatment. The outcome of such an investigation could either point out that there are in fact more infected adult female patients or it could provide some unknown reasons as to why fewer male than female patients approached healthcare facilities to get tested.
- The second question from the prevalence results that will require some research in the future is why the adults in this study population were initiated on HAART at an age so much higher than the age of the highest HIV/AIDS prevalence age group within the general population? The answer to this question could indicate whether the high initiation age was a unique occurrence in this population or whether perhaps it has something to do with the eligibility criteria that cause patients to only become eligible for treatment long after infection had taken place.
- The results from this study provided stakeholders at the study site as well as the entire sub-district with valuable information on Most-At-Risk-Populations (MARPs). Whether it is a specific age group, marital status group or people living in a certain area, these results can and almost certainly should be used in future to focus prevention efforts on these high risk patients.
- Policies for down-referring or transferring patients to primary healthcare facilities (PHC), as explained in chapter four, were created specifically to ensure that patients will have easy access to HAART. In this study it was found that these policies are adequately implemented among the adult patients, however, there seemed to be a delay in implementing these measures for paediatric patients. This should be investigated and the reason for not implementing such policies among the paediatric patients should be given proper attention to ensure that all patients have equally trouble-free access to ARV treatment close to their homes.

- Defaulting in the facility was found to be unacceptably high, especially among the children. The reasons as to why the defaulting was so high among the paediatric patients should be established. It could very well be that the results from one of the above investigations could provide the answer to many of these challenges, for example it could be that due to patients not being transferred to a nearby PHC facility and having to travel far that they tend to default more?
- At this stage the only pressing problem with the prescription of medication to HAART patients were found in the prescribing of prophylactic treatment. More research should be done as to why Co-trimoxazole, as well as multivitamin supplements was prescribed to almost all patients that received HAART. The examination should provide proper insight into the matter and clarify whether this pointed to irrational use of the products or if there were sufficient reasons for the copious prescribing of these two drugs.
- The results from the difference in CD4 count and viral load between genders can be examined; however, it is far more practically important to inspect the reasons as to why there were so few CD4 counts and especially viral loads available. The importance of having these results available at follow-up visits was emphasized and therefore this is one of the challenges that will need to be dealt with urgently.
- No burning issues were found with the prescription of HAART. The fact that only one adult and one paediatric patient changed treatment regimen due to virological failure did raise some concerning thoughts. The concerns around virological failure proved to be valid since the results from investigating the effects that HAART had on selected indicators did reveal that there were more than only the before mentioned two patients that were in fact experiencing virological failure. The last recommendation that the researcher would like to make would then be to propose a Quality Improvement Project (QIP). This project would evaluate the vigilance of performing tests like viral load at the advocated intervals with the aim to improve monitoring of the effects of HAART and to ensure early detection of virological failure.

5.3 Limitations of the study

- The study was conducted in only one rural district hospital and therefore the results and findings may not generally be applicable to other hospitals.
- The second limitation is that this study used the data from HIV/AIDS patients' records of those who attended the Wellness Clinic during the period 01 February 2012 to 31 March 2012 only. The findings are therefore biased to this group of patients, meaning that it did not include any data from patients not visiting the Wellness Clinic during that period. Patients who were less adherent to their treatment and/or might have received more than two months of HAART before 01 February 2012 was excluded from this study.
- Patients that have passed away or have been transferred out to other health care facilities before 01 February 2012 was also excluded from the data and results.

5.4 Chapter summary

In this chapter the conclusions were separated between the literature review and the empirical study and presented according to the research objectives. Recommendations were made regarding aspects that still need further investigating and the limitations experienced during the data collection and construction of data were explained.

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Data collection tool for adult patients on HAART page 1

Patient nr.	File nr.	Employed	Address	D.O.B	Sex	Pregnant	Marital status	Weight	Date of treatment	Complaints etc.	Initiate, Repeat, DF, TO, TI	Defaulted?	Cd4 count

Data collection tool for adult patients on HAART page 2

Viral Load	Regimen	Remarks on Reg.	Reg. changed	Reason for change	TB drugs	Start date	Multivitamin	Co-trimoxazole	Other Meds related to acute HIV or treatment

Data collection tool for paediatric patients on HAART page 1

Patient nr:	File nr:	Address	D.O.B	Sex	Weight	Date of treatment	Complaints etc.	Initiate, Repeat, DF, TO, TI	Defaulted	Cd4 count / %	Viral Load	Regimen	DDD1	DDD2	DDD3

Data collection tool for paediatric patients on HAART page 2

Reg. changed	Reason	Comments	TB drugs	TBM	R	H	P	ET	Multivitamin	Co-trimoxazole	Other Meds related to HIV or the treatment	Lactic acid

De-coding system for adult data collection tool

Patient Number - Patients numerically numbered from one up to the last patient

File number - Patient's hospital file number

Employed - Defines the patient's employment status

Employed	Code
Patient is unemployed	U/E
Patient is employed	Y
Patient is a full time scholar or student	S
Patient is clasified as a pensioner	P
Employment status is not known	N/K

Address - Area where patient currently resides

Address	Code
Itsoseng Zone 1	A1
Itsoseng Zone 2	A2
Itsoseng Zone 2 extension	A3
Itsoseng Zone 3	A4
Bodibe village	A5
Springbokpan	A6
Meetmekaar	A7
Matile	A8
Shiela Village	A9
Verdwaal I	A10
Verdwaal II	A11
Boikhutso	A12
Bakerville	A13
Coligny	A14
Schoongezicht	A15
Rooigrond	A16
Mafikeng	A17
Shukran	A18
Blaauwbank	A19
Itekeng	A20
Blydeville	A21
Lichtenburg	A22
Klerksdorp	A23
Address of patient was not known	N/K

D.O.B - Patient's date of Birth in CCYYMMDD
- N/K for Date of birth not known

Sex - M for Male and F for Female

Pregnant - Y if patient is pregnant on the date of treatment
- N if patient is not pregnant on the date of treatment
- N/A is for male patients and is not applicable to them

Marital Status - Describes the patient's marital status at the time of opening the hospital file

Marital Status	Code
Married	M
Single	S
Divorced	D
Widowed	W
Marital status not known	N/K

Weight - Weight of patient in Kilograms (Kg)
- N/K for weight of patient not known
- US for weight of patient not known because the patient was unable to stand

Date of Treatment - Date patient received treatment in CCYYMMDD
A duplicate date in bold indicates that the patient received treatment for an additional month

Complaints - Complaints raised by patient on day of treatment and recorded in history sheet

Initiate, Repeat, DF, TO, TI

Initiate, Repeat, DF, TO, TI	Code
Initiation of New patient at Hospital	IN
Repeated treatment at Hospital	RH
Down-referred patient to PHC (Primary Health Care facility)	DF
Transfer out patient to PHC (Primary Health Care facility)	TO
Transferred in from another facility	TI
No treatment was given on that date of treatment	NT

Defaulted - Patients not taking treatment when- and as indicated
- Y for Yes and the period of not having taken treatment
- N for No

CD4 count - Last known valid CD4 count according to laboratory results in cells/mm3
- N/K for no valid CD4 count indicated or not known

Viral load - Last known valid viral load according to laboratory results in copies/mm3
- N/K for no valid viral load indicated or not known

Regimen - (Reg.) The triple combination of antiretroviral (ARV) drugs is called a regimen

Regimen	Code
D4T,3TC,EFV (30mg bd, 150mg bd, 600mg nocte)	1a
AZT,3TC,EFV (300mg bd, 150mg bd, 600mg nocte)	1a**z**
ABC,3TC,EFV (300mg bd, 150mg bd, 600mg nocte)	1a**a**
TDF,3TC,EFV (300mg nocte, 150mg bd, 600mg nocte)	1at**bd**
TDF,3TC,EFV (300mg nocte, 300mg nocte, 600mg nocte)	1at**n**
D4T,3TC,NVP (30mg bd, 150mg bd, 200mg bd)	1b
AZT,3TC,NVP (300mg bd, 150mg bd, 200mg bd)	1b**z**
ABC,3TC,NVP (300mg bd, 150mg bd, 200mg bd)	1b**a**
TDF,3TC,NVP (300mg nocte, 150mg bd, 200mg bd)	1b**t**

Regimen	Code
D4T,3TC,KLT (30mg bd, 150mg bd, 500/100mg bd)	1c
AZT,3TC,KLT (300mg bd, 150mg bd, 500/100mg bd)	1c**z**
ABC,3TC,KLT (300mg bd, 150mg bd, 500/100mg bd)	1c**a**
TDF,3TC,KLT (300mg nocte, 150mg bd, 500/100mg bd)	1c**t**
D4T,3TC,ALU (30mg bd, 150mg bd, 400/100mg bd)	1d
AZT,3TC,ALU (300mg bd, 150mg bd, 400/100mg bd)	1d**z**
ABC,3TC,ALU (300mg bd, 150mg bd, 400/100mg bd)	1d**a**
TDF,3TC,ALU (300mg nocte, 150mg bd, 400/100mg bd)	1d**t**
AZT,DDI,**KLT** (300mg bd, 400mg d, 500/100mg bd)	2A
ABC,DDI,KLT (300mg bd, 400mg d, 500/100mg bd)	2A**a**
TDF,DDI,KLT (300mg nocte, 400mg d, 500/100mg bd)	2A**t**
AZT,DDI,**ALU** (300mg bd, **400mg d**, 400/100mg bd)	2AA40
AZT,DDI,**ALU** (300mg bd, **250mg d**, 400/100mg bd)	2AA25
ABC,DDI,ALU (300mg bd, 400mg d, 400/100mg bd)	2AA**a**
TDF,DDI,ALU (300mg nocte, 400mg d, 400/100mg bd)	2AA**t**
AZT,DDI,**EFV** (300mg bd, 400mg d, 600mg nocte)	2B
AZT,DDI,**NVP** (300mg bd, 400mg d, 200mg bd)	2C

Abbreviations:
D4T = Stavudine
3TC = Lamivudine
EFV = Efavirenz
AZT = Zidovudine
ABC = Abacavir
TDF = Tenofivir
NVP = Nevirapine
KLT = Kaletra (Lopinavir 500mg / Retonavir 100mg)
ALU = Aluvia (Lopinavir 400mg / Retonavir 100mg)
DDI = Didanosine
N/T = No treatment was given on that date of treatment

Remarks on Reg . - Any remarks on the regimen prescribed. These remarks will also include deviations from the dosages described in the regimen and codes above.
- EFV 400mg if patient weighed less than 40kg and received Efavirenz 400mg nocte

Reg. changed - Y for Yes and N for No, whether the prescribed regimen changed from the regimen that the patient received the previous month

Reason for change - The reason why the regimen of the patient was changed.

Reason for change	Code
Side-effects (drug toxicity) from using antiretroviral (ARV) drugs	SE
Due to virological failure (VL>1000 copies/ml on two occasions)	VF
Lamivudine 150mg bd changed to Lamivudine 300mg nocte	3TC nocte
Patient got pregnant on Efavirenz and changed to Nevirapine	Pregnancy
Regimen did not change thus not applicable	N/A
Regimen did change but reason was not indicated or not known	N/K

TB drugs - Anti-Tuberculosis (TB) drugs prescribed

TB drugs	Code
RHZE (150mg, 75mg, 400mg, 275mg) Two Tablets once daily	2RHZE
RHZE (150mg, 75mg, 400mg, 275mg) Three Tablets once daily	3RHZE
RHZE (150mg, 75mg, 400mg, 275mg) Four Tablets once daily	4RHZE
RHZE (150mg, 75mg, 400mg, 275mg) Five Tablets once daily	5RHZE
RH (150mg, 75mg) Two tablets once daily	2RH150
RH (150mg, 75mg) Three tablets once daily	3RH150
RH (300mg, 150mg) Two tablets once daily	2RH300
E (400mg) Two tablets once daily	2E
E (400mg) Three tablets once daily	3E
E (400mg) Four tablets once daily	4E
S (0,5g) 1.5ml daily	S1
S (0,75g) 2.25ml daily	S2
S (1g) 3.0ml daily	S3
H (300mg) once daily as prophylaxis	H300
Patient did not receive any TB drugs from the Hospital	N
Patient collected TB drugs at the Primary Health Care facility	PHC

Abbreviations:
R = Rifampicin
H = Isoniazid
Z = Pyrazinamide
E = Ethambutol
S = Streptomycin

Start date - Date on which the TB treatment was initiated in CCYYMMDD
- N/A if patient did not receive TB treatment at hospital and is thus not applicable
- N/K if patient did receive TB treatment at hospital but starting date is not known

Multivitamin - If prescribed by doctor - Y for Yes and N for No

Co-Trimoxazole - If prescribed by doctor - Y for Yes and N for No
- Allergic - for when a patient was found to be allergic to Co-Trimoxazole

Other meds related to acute HIV or treatment - Other medicine prescribed for treatment of acute diseases associated with HIV infection or for the side-effects of ARV drugs

De-coding system for paediatric data collection tool

Patient Number - Patients numerically numbered from one up to the last patient

File number - Patient hospital file number

Address - Area where patient currently resides

Address	Code
Itsoseng Zone 1	A 1
Itsoseng Zone 2	A 2
Itsoseng Zone 2 extension	A 3
Itsoseng Zone 3	A 4
Bodibe village	A 5
Springbokpan	A 6
Meetmekaar	A 7
Matile	A 8
Shiela Village	A 9
Verdwaal I	A 10
Verdwaal II	A 11
Boikhutso	A 12
Bakerville	A 13
Coligny	A 14
Mafikeng	A 15
Rooigrond	A 16
Schoongezicht	A 17
Itekeng	A 18
Address of patient was not known	A 19

D.O.B - Patient's date of Birth in CCYYMMDD
- N/K for Date of birth not known

Sex - M for Male and F for Female

Weight - Weight of patient in Kilograms (Kg)
- N/K for weight of patient not known

Date of Treatment - Date patient received treatment in CCYYMMDD
A duplicate date in bold indicates that the patient received treatment for an additional month
File missing - No previous entries for this patient could be found due to the old file being lost

Complaints - Complaints raised by patient or gaurdian and recorded on history sheet

Initiate, Repeat, DF, TO, TI	Code
Initiation of New patient at Hospital	IN
Repeated treatment at Hospital	RH
Down-referred patient to PHC (Primary Health Care)	DF
Transfer out patient PHC (Primary Health Care)	TO
Transferred in from another facility	TI
No treatment was given on that date of treatment	NT

Defaulted - Patients not taking treatment when- and as indicated
- Y for Yes and the period of not having taken treatment
- N for No
- N/K for not known

Cd4 count - Cd4 count according to laboratory results in cells/mm3
- N/K for no valid CD4 count indicated or not known

Viral load - Viral load according to laboratory results in copies/mm3
- N/K for no valid viral load indicated or not known

Regimen - The triple combination of antiretroviral (ARV) drugs is called a regimen

Regimen	**Code**
D4T,3TC,KLT	P1a
ABC,3TC,KLT	P1a**a**
AZT,3TC,KLT	P1a**z**
D4T,3TC,NVP	P1b
ABC,3TC,NVP	P1b**a**
AZT,3TC,NVP	P1b**z**
D4T,3TC,EFV	P1c
ABC,3TC,EFV	P1c**a**
AZT,3TC,EFV	P1c**z**
AZT,DDI,**KLT**	P2A
AZT,DDI,**NVP**	P2B
AZT,DDI,**EFV**	P2C
TDF,3TC,EFV (300mg nocte, 300mg nocte, 600mg nocte)	1a**tn**
TDF,3TC,NVP (300mg nocte, 150mg bd, 200mg bd)	1b**t**

Abbreviations:
D4T = Stavudine
3TC = Lamivudine
EFV = Efavirenz
NVP = Nevirapine
ABC = Abacavir
KLT = Kaletra (Lopinavir 80mg / Retonavir 30mg)
DDI = Didanosine
AZT = Zidovudine

DDD1, DDD2, DDD3 - Daily Dose Drug 1, 2, and 3 in miligram (mg) for tablets and capsules or mililiter (ml) for any liquids or suspensions in the exact order as stated in the regimen and codes above

DDD1, DDD2, DDD3	Code
Daily Dose Drug 1	DDD1
Daily Dose Drug 2	DDD2
Daily Dose Drug 3	DDD3

Reg. changed - Y for Yes and N for No, whether the prescribed regimen changed from the regimen that the patient received the previous month

Reason - The reason why the regimen of the patient was changed.

Reason	Code
Side-effects (drug toxicity) from using antiretroviral (ARV) drugs	SE
Due to virological failure (VL>1000 copies/ml on two occasions)	VF
Regimen did not change thus not applicable	N/A
Regimen did change but reason was not indicated or not known	N/K

TB drugs - Tuberculosis (TB) drugs prescribed

Fixed dose combination TB drugs for children up to 8 years	Code
RHZ (60mg, 30mg, 150mg) Half a tablet once daily	0.5RHZ
RHZ (60mg, 30mg, 150mg) One tablet once daily	1RHZ
RHZ (60mg, 30mg, 150mg) One and a half tablet once daily	1.5RHZ
RHZ (60mg, 30mg, 150mg) Two tablets once daily	2RHZ
RHZ (60mg, 30mg, 150mg) Two and a half tablets once daily	2.5RHZ
RHZ (60mg, 30mg, 150mg) Three tablets once daily	3RHZ
RHZ (60mg, 30mg, 150mg) Four tablets once daily	4RHZ
RHZ (60mg, 30mg, 150mg) Five tablets once daily	5RHZ
RHZ (60mg, 30mg, 150mg) Six tablets once daily	6RHZ
RHZ (60mg, 30mg, 150mg) Seven tablets once daily	7RHZ
RH (60mg, 30mg) Half a tablet once daily	0.5RH
RH (60mg, 30mg) One tablet once daily	1RH
RH (60mg, 30mg) One and a half tablet once daily	1.5RH
RH (60mg, 30mg) Two tablets once daily	2RH
RH (60mg, 30mg) Two and a half tablets once daily	2.5RH
RH (60mg, 30mg) Three tablets once daily	3RH
RH (60mg, 30mg) Four tablets once daily	4RH
RH (60mg, 30mg) Five tablets once daily	5RH
RH (60mg, 30mg) Six tablets once daily	6RH
RH (60mg, 30mg) Seven tablets once daily	7RH

Fixed dose combination TB drugs for children 8 years and older	Code
RHZE (150mg, 75mg, 400mg, 275mg) Two Tablets once daily	2RHZE
RHZE (150mg, 75mg, 400mg, 275mg) Three Tablets once daily	3RHZE
RHZE (150mg, 75mg, 400mg, 275mg) Four Tablets once daily	4RHZE
RHZE (150mg, 75mg, 400mg, 275mg) Five Tablets once daily	5RHZE
RH (150mg, 75mg) Two tablets once daily	2RH 150
RH (150mg, 75mg) Three tablets once daily	3RH 150
RH (300mg, 150mg) Two tablets once daily	2RH 300
E (400mg) Two tablets once daily	2E
E (400mg) Three tablets once daily	3E
E (400mg) Four tablets once daily	4E
S (0,5g) 1.5ml daily	S1
S (0,75g) 2.25ml daily	S2
S (1g) 3.0ml daily	S3
H (25mg) once daily as prophylaxis	H25
H (50mg) once daily as prophylaxis	H50
H (75mg) once daily as prophylaxis	H75
H (100mg) once daily as prophylaxis	H100
H (150mg) once daily as prophylaxis	H150
H (200mg) once daily as prophylaxis	H200
H (250mg) once daily as prophylaxis	H250
H (300mg) once daily as prophylaxis	H300
Patient received TB drugs from Hospital; dosages in R,H,Z,ET columns	Y
Patient did not receive any TB drugs from the Hospital	N
Patient collected TB drugs at the Primary Health Care facility	PHC

Abbreviations:
R = Rifampicin
H = Isoniazid
Z = Pyrazinamide
E = Ethambutol
S = Streptomycin

TBM - Y for Yes and N for No whether the patient has Tuberculous Meningitis

R, H, Z, ET - Drugs used for treating TBM and recorded in miligram (mg) as a daily dose
R - The daily dose of Rifampicin in miligram (mg)
H - The daily dose of Isoniazid in miligram (mg)
Z - The daily dose of Pyrazinamide in miligram (mg)
ET - The daily dose of Ethionamide in miligram (mg)

Multivitamin - Prescribed by doctor - Y for Yes and N for No

Co-Trimoxazole -Prescribed by doctor - Y for Yes and N for No
- Allergic for when a patient was found to be allergic to Co-Trimoxazole

Other meds related to acute HIV or treatment -Additional medicine prescribed for treatment of acute diseases associated with HIV infection or for the side-effects of ARV drugs

Appendix 5: Ethical approval - NWU-000049-11-S5

NORTH-WEST UNIVERSITY
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Navorsingsetiekkomittee
Noordwes-Universiteit
Bussie116

24 Junie 2011

Geagte Mnr. Rix

ETIEKAANSOEK: NWU-000049-11-S5

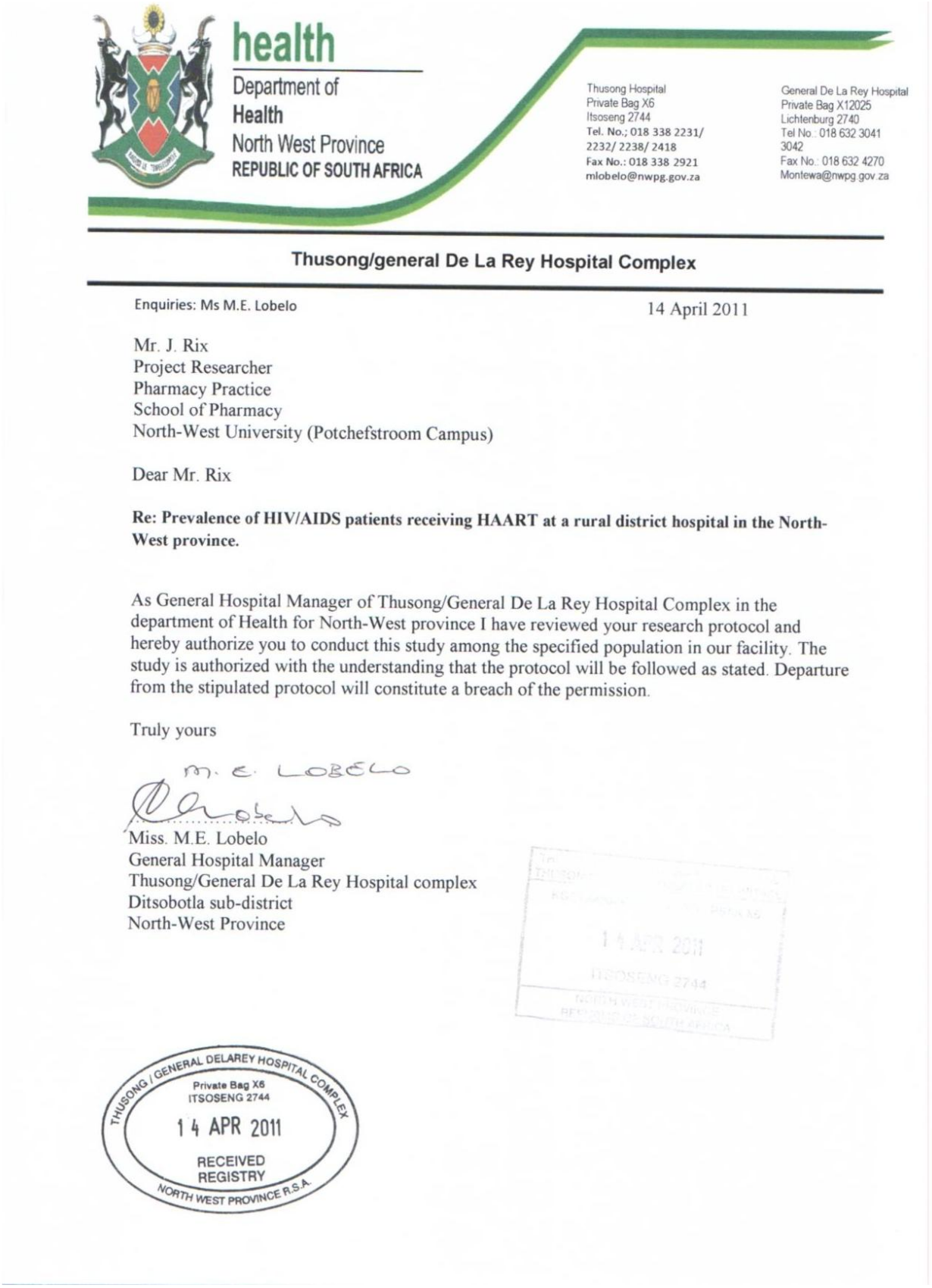
Prevalence of HIV/AIDS patients receiving HAART at a rural district hospital in the North-West Province

Die paneel het bogenoemde aansoek geëvalueer en vind die etiese aspekte in orde. Goedkeuring word dus verleen vir etiekaansoek NWU-000049-11-S5.

Vriendelike groete

PROF. J. DU PLESSIS
DIREKTEUR

Appendix 6: Research approval - Thusong/General De La Rey Hospital



health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

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3042
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Thusong/general De La Rey Hospital Complex

Enquiries: Ms M.E. Lobelo

14 April 2011

Mr. J. Rix
Project Researcher
Pharmacy Practice
School of Pharmacy
North-West University (Potchefstroom Campus)

Dear Mr. Rix

Re: Prevalence of HIV/AIDS patients receiving HAART at a rural district hospital in the North-West province.

As General Hospital Manager of Thusong/General De La Rey Hospital Complex in the department of Health for North-West province I have reviewed your research protocol and hereby authorize you to conduct this study among the specified population in our facility. The study is authorized with the understanding that the protocol will be followed as stated. Departure from the stipulated protocol will constitute a breach of the permission.

Truly yours

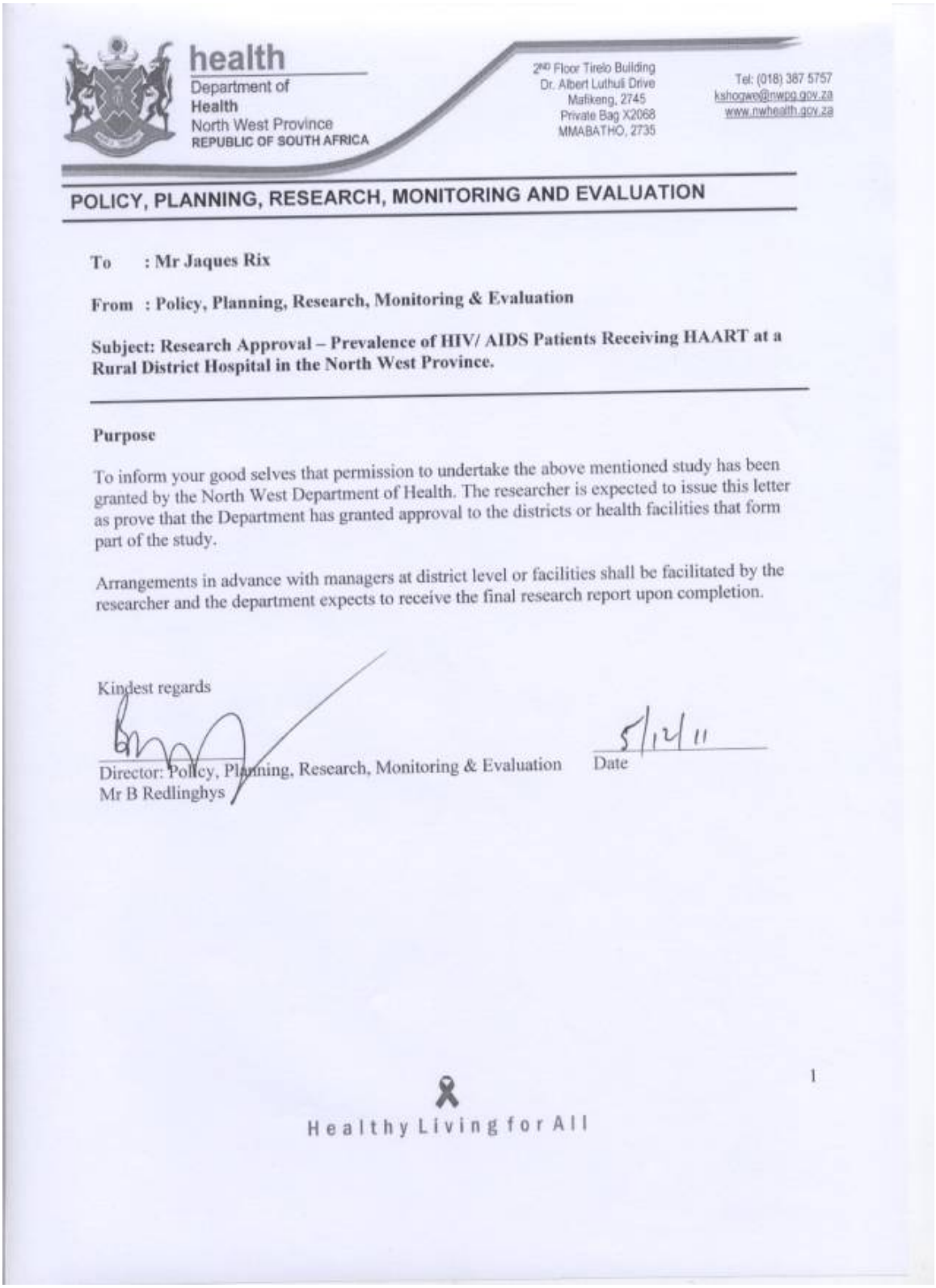
M. E. LOBELO

Miss. M.E. Lobelo
General Hospital Manager
Thusong/General De La Rey Hospital complex
Ditsobotla sub-district
North-West Province

14 APR 2011
ITSOSENG 2744
NORTH WEST PROVINCE
REPUBLIC OF SOUTH AFRICA

THUSONG / GENERAL DELAREY HOSPITAL COMPLEX
Private Bag X6
ITSOSENG 2744
14 APR 2011
RECEIVED
REGISTRY
NORTH WEST PROVINCE R.S.A.

Appendix 7: Research approval - Policy, Planning, Research, Monitoring and Evaluation, NW Department of Health



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POLICY, PLANNING, RESEARCH, MONITORING AND EVALUATION

To : Mr Jaques Rix

From : Policy, Planning, Research, Monitoring & Evaluation

Subject: Research Approval – Prevalence of HIV/ AIDS Patients Receiving HAART at a Rural District Hospital in the North West Province.

Purpose

To inform your good selves that permission to undertake the above mentioned study has been granted by the North West Department of Health. The researcher is expected to issue this letter as prove that the Department has granted approval to the districts or health facilities that form part of the study.

Arrangements in advance with managers at district level or facilities shall be facilitated by the researcher and the department expects to receive the final research report upon completion.

Kindest regards

Director: Policy, Planning, Research, Monitoring & Evaluation
Mr B Redlinghys

5/12/11
Date

1

Healthy Living for All

Appendix 8: List of other related medication most commonly prescribed to HIV/AIDS patients in the study facility - in the order and combinations that they were prescribed

1 List of other related medication prescribed to adult HIV/AIDS patients

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
None	2302	81.69	2302	81.69
Pyridoxine 25mg daily	194	6.88	2496	88.57
Dapsone 100mg daily	17	0.60	2513	89.18
Vitamin Bco 1 daily	11	0.39	2524	89.57
Dapsone 100mg daily, Pyridoxine 50mg daily	9	0.32	2533	89.89
Pyridoxine 25mg bd	6	0.21	2539	90.10
Carbamazepine 200mg bd	4	0.14	2543	90.24
Paracetamol 1g tds	4	0.14	2547	90.38
Amoxicillin 500mg tds	3	0.11	2550	90.49
Dapsone 100mg daily, Chlorpheniramine 4mg tds	3	0.11	2553	90.60
Metoclopramide 10mg tds	3	0.11	2556	90.70
Omeprazole 20mg daily	3	0.11	2559	90.81
Pyridoxine 25mg daily, Paracetamol 1g tds	3	0.11	2562	90.92
Augmentin 375mg tds, Paracetamol 1g tds	2	0.07	2564	90.99
Augmentin 375mg tds, Theophyllin 10ml tds, Paracetamol 1g tds	2	0.07	2566	91.06

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Carbamazepine 400mg bd, Pyridoxine 25mg daily	2	0.07	2568	91.13
Dolorol Forte 2 tds, Diclofenac 50mg tds, Methyl Salicilate oint bd	2	0.07	2570	91.20
Ferrous Sulphate 170mg daily	2	0.07	2572	91.27
Ferrous Sulphate 170mg daily, Folic Acid 5mg daily	2	0.07	2574	91.34
Fluconazole 200mg daily	2	0.07	2576	91.41
Ibuprofen 400mg tds	2	0.07	2578	91.48
Methyl Salicilate oint bd, Paracetamol 1g tds	2	0.07	2580	91.55
Metronidazole 400mg tds, Doxicycline 100mg bd	2	0.07	2582	91.63
Prednisone 40mg daily	2	0.07	2584	91.70
Pyridoxine 25mg daily, Paracetamol 1g tds, Prednisone 40mg daily	2	0.07	2586	91.77
Acyclovir 200mg qid, Carbamazepine 400mg nocte, Paracetamol 1g tds, Diclofenac 75mg inj stat	1	0.04	2587	91.80
Acyclovir 400mg qid, Acyclovir crm qid	1	0.04	2588	91.84
Acyclovir 400mg tds	1	0.04	2589	91.87
Acyclovir 400mg tds, Augmentin 375mg tds, Prednisone 60mg daily	1	0.04	2590	91.91
Acyclovir 800mg tds, Carbamazepine 400mg bd, Diclofenac 50mg tds	1	0.04	2591	91.94

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Acyclovir 800mg tds, Ibuprofen 400mg tds, Paracetamol 1g tds, Carbamazepine 200mg bd, Erythromycin 250mg qid	1	0.04	2592	91.98
Acyclovir 800mg tds, Mupirocin oint bd, Flucloxacillin 500mg qid, Carbamazepine 400mg nocte, Calamine lotion mane	1	0.04	2593	92.02
Acyclovir crm qid, Ketoconazole 200mg daily, Folic acid 5mg daily	1	0.04	2594	92.05
Aluminium Hydroxide gel 10ml tds, Dolorol Forte 2 tds, Augmentin 375mg tds, Buscopan 20mg IMI stat, Metoclopramide 10mg IV stat	1	0.04	2595	92.09
Amitriptyline 25mg nocte	1	0.04	2596	92.12
Amitriptyline 25mg nocte, Augmentin 375mg tds, Paracetamol 1g tds, Mist Exp Stim 10ml tds	1	0.04	2597	92.16
Amitriptyline 25mg nocte, Diclofenac 50mg tds, Piroxicam 20mg daily, Indomethacin 100mg pr daily, Pyridoxine 25mg daily	1	0.04	2598	92.19
Amitriptyline 25mg nocte, Ibuprofen 400mg tds, Chlorpheniramine 4mg tds	1	0.04	2599	92.23
Amitriptyline 25mg nocte, Indomethacin 100mg pr daily, Paracetamol 1g tds, Methyl Salicilate oint bd	1	0.04	2600	92.26
Amitriptyline 25mg nocte, Paracetamol 1g tds	1	0.04	2601	92.30

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Amitriptyline 25mg nocte, Paracetamol 1g tds, Acyclovir crm tds	1	0.04	2602	92.33
Amoxicillin 1g tds, Ibuprofen 400mg tds	1	0.04	2603	92.37
Amoxicillin 500mg tds, Diclofenac 25mg tds, Dolorol Forte 2 tds	1	0.04	2604	92.41
Amoxicillin 500mg tds, Ibuprofen 400mg tds	1	0.04	2605	92.44
Amoxicillin 500mg tds, Loperamide 4mg stat then 2mg prn, Pyridoxine 25mg daily	1	0.04	2606	92.48
Amoxicillin 500mg tds, Paracetamol 1g tds	1	0.04	2607	92.51
Amoxicillin 500mg tds, Paracetamol 1g tds, Chlorpheniramine 4mg tds, Mist Exp Stim 10ml tds	1	0.04	2608	92.55
Amoxicillin 500mg tds, Theopyllin 10ml tds, Dolorol Forte 2 tds	1	0.04	2609	92.58
Angised 0.5mg sl stat then prn, Augmentin 375mg tds, Amoxicillin 250mg tds, Ferrous Sulphate 170mg tds, Folic acid 5mg daily	1	0.04	2610	92.62
Angised 0.5mg sl prn, Folic acid 5mg daily	1	0.04	2611	92.65
Antazoline eye drops tds	1	0.04	2612	92.69
Ascorbic acid 250mg daily, Augmentin 375mg tds, Paracetamol 1g tds	1	0.04	2613	92.73
Ascorbic acid 500mg daily, Metronidazole 400mg tds	1	0.04	2614	92.76
Aspirin 150mg daily	1	0.04	2615	92.80

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Aspirin 150mg daily, Angised 0.5mg sl prn, Dolorol Forte 2 tds	1	0.04	2616	92.83
Augmentin 1.2g IV tds, Miconazole oral gel qid, Fluconazole 200mg daily	1	0.04	2617	92.87
Augmentin 375mg tds, Metronidazole 400mg tds, Paracetamol 1g tds	1	0.04	2618	92.90
Augmentin 375mg tds	1	0.04	2619	92.94
Augmentin 375mg tds, Amoxicillin 250mg tds	1	0.04	2620	92.97
Augmentin 375mg tds, Amoxicillin 250mg tds, Folic acid 5mg daily, Haloperidol 1.5mg daily, Pyridoxine 25mg daily	1	0.04	2621	93.01
Augmentin 375mg tds, Amoxicillin 250mg tds, Paracetamol 1g tds	1	0.04	2622	93.04
Augmentin 375mg tds, Amoxicillin 250mg tds, Paracetamol 1g tds, Amitriptyline 25mg nocte	1	0.04	2623	93.08
Augmentin 375mg tds, Amoxicillin 500mg tds, Chlorpheniramine 4mg tds, Theophyllin 10ml tds, Paracetamol 1g tds	1	0.04	2624	93.12
Augmentin 375mg tds, Amoxicillin 500mg tds, Dolorol Forte 2 tds, Theophyllin 10ml tds, Aspirin 150mg daily	1	0.04	2625	93.15
Augmentin 375mg tds, Amoxicillin 500mg tds, Pyridoxine 25mg daily	1	0.04	2626	93.19

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Augmentin 375mg tds, Chlorpheniramine 4mg tds, Dolorol Forte 2 tds, Theophyllin 10ml tds	1	0.04	2627	93.22
Augmentin 375mg tds, Chlorpheniramine 4mg tds, Theophyllin 10ml tds	1	0.04	2628	93.26
Augmentin 375mg tds, Dolorol Forte 2 tds, Chlorpheniramine 4mg tds, Hydrocortisone 100mg IVstat	1	0.04	2629	93.29
Augmentin 375mg tds, Fluconazole 200mg daily, Hydrocortisone crm bd, Aqueous crm daily	1	0.04	2630	93.33
Augmentin 375mg tds, Loperamide 2mg prn, Gastrolyte daily, Pyridoxine 25mg daily	1	0.04	2631	93.36
Augmentin 375mg tds, Metronidazole 400mg tds, Paracetamol 1g tds, Ciprofloxacin 500mg bd	1	0.04	2632	93.40
Augmentin 375mg tds, Mist Exp Stim 10ml tds, Ibuprofen 400mg tds, Paracetamol 1g tds	1	0.04	2633	93.44
Augmentin 375mg tds, Mupirocin oint bd, Chlorpheniramine 4mg tds	1	0.04	2634	93.47
Augmentin 375mg tds, Paracetamol 1g tds, Folic acid 5mg daily	1	0.04	2635	93.51
Augmentin 375mg tds, Paracetamol 1g tds, Mist exp 10ml tds, Metoclopramide 10mg tds	1	0.04	2636	93.54
Augmentin 375mg tds, Paracetamol 1g tds, Pyridoxine 25mg daily	1	0.04	2637	93.58

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Augmentin 375mg tds, Paracetamol 1g tds, Vitamin Bco 1 daily	1	0.04	2638	93.61
Augmentin 375mg tds, Prednisone 40mg daily, Theophyllin 10ml tds	1	0.04	2639	93.65
Augmentin 375mg tds, Pyridoxine 25mg daily, Paracetamol 1g tds	1	0.04	2640	93.68
Augmentin 375mg tds, Pyridoxine 25mg daily, Prednisone 40mg daily	1	0.04	2641	93.72
Augmentin 375mg tds, Pyridoxine 25mg daily, Theophyllin 50mg(10ml) tds	1	0.04	2642	93.75
Augmentin 375mg tds, Theophyllin 10ml tds, Dolorol Forte 2 tds, Oxymetazoline nose drops tds	1	0.04	2643	93.79
Augmentin 375mg tds, Theophyllin 10ml tds, Pyridoxine 25mg daily	1	0.04	2644	93.83
Augmentin 375mg tds, Theophyllin 10ml tds, Vit Bco 1 daily	1	0.04	2645	93.86
Augmentin 625mg tds, Pyridoxine 25mg daily	1	0.04	2646	93.90
Bethametasone crm bd, Aqueous crm daily, Mist Exp 10ml tds, Paracetamol 1g tds, Folic acid 5mg daily	1	0.04	2647	93.93
Buscopan 10mg tds	1	0.04	2648	93.97
Buscopan 10mg tds, Aluminium Hydroxide gel 10ml tds	1	0.04	2649	94.00
Carbamazepine 400mg bd, Acyclovir 800mg tds, Chloramex eye oint tds, Tramadol 50mg tds	1	0.04	2650	94.04

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Carbamazepine 400mg bd, Diclofenac 50mg tds, Acyclovir 200mg tds	1	0.04	2651	94.07
Cefixime 400mg stat, Doxicycline 100mg bd, Metronidazole 2g stat, Clotrimazole vag crm daily, Chlorpheniramine 4mg tds, Paracetamol 1g tds	1	0.04	2652	94.11
Cefixime 400mg stat, Metronidazole 2g stat, Clotrimazole PV daily, Dolorol Forte 2 tds, Erythromycin 500mg qid	1	0.04	2653	94.14
Cefixime 400mg stat, Metronidazole 2g stat, Doxicycline 100mg bd	1	0.04	2654	94.18
Ceftriaxone 1g IV stat, Ciprofloxacin 500mg bd, Paracetamol 1g tds, Vitamin Bco 2 daily	1	0.04	2655	94.22
Chloramex eye oint tds, Paracetamol 1g tds	1	0.04	2656	94.25
Chlorpheniramine 4mg tds	1	0.04	2657	94.29
Chlorpheniramine 4mg tds, Aqueous crm bd, Betamethasone crm bd	1	0.04	2658	94.32
Chlorpheniramine 4mg tds, Augmentin 375mg tds, Amoxicillin 500mg tds, Tramadol 50mg tds	1	0.04	2659	94.36
Chlorpheniramine 4mg tds, Dapsone 100mg daily	1	0.04	2660	94.39
Chlorpheniramine 4mg tds, Dapsone 100mg daily, Pyridoxine 25mg daily, Mupirocin oint bd	1	0.04	2661	94.43

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Chlorpheniramine 4mg tds, Flucloxacillin 250mg qid, Mupurocin oint tds	1	0.04	2662	94.46
Chlorpheniramine 4mg tds, Hydrocortisone crm bd	1	0.04	2663	94.50
Chlorpheniramine 4mg tds, Hydrocortisone crm bd, Aqueous crm bd, Paracetamol 1g tds	1	0.04	2664	94.54
Chlorpheniramine 4mg tds, Hydrocortisone crm bd, Loperamide 4mg stat then 2mg prn, Metoclopramide 10mg IV stat, Augmentin 375mg tds	1	0.04	2665	94.57
Chlorpheniramine 4mg tds, Hydrocortisone crm bd, Prednisone 20mg daily	1	0.04	2666	94.61
Chlorpheniramine 4mg tds, Spersallerg eye drops tds	1	0.04	2667	94.64
Cimetidine 400mg bd, Aluminium hydroxide gel 10ml tds, Paracetamol 1g tds, Metoclopramide 10mg IV stat	1	0.04	2668	94.68
Cimetidine 400mg bd, Metoclopramide 10mg tds	1	0.04	2669	94.71
Ciprofloxacin 500mg bd, Metronidazole 400mg tds, Doxicycline 100mg bd, Pyridoxine 25mg daily	1	0.04	2670	94.75
Ciprofloxacin 500mg bd, Paractetamol 1g tds	1	0.04	2671	94.78

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Ciprofloxacin 500mg stat, Metronidazole 400mg tds, Doxicycline 100mg bd	1	0.04	2672	94.82
Clotrimazole crm bd	1	0.04	2673	94.85
Clotrimazole vaginal crm bd, Ketoconazole 200mg daily	1	0.04	2674	94.89
DF118 tds, Diclofenac 100mg pr daily, Anusol pr daily, Lactulose 10ml tds	1	0.04	2675	94.93
Dapsone 100mg daily, Mupirocin oint bd, Prednisone 40mg daily, Augmentin 375mg tds, Amoxicillin 250mg tds, Chlorpheniramine 4mg tds	1	0.04	2676	94.96
Dapsone 100mg, Imipramine 100mg daily	1	0.04	2677	95.00
Diclofenac 50mg tds, Pyridoxine 25mg daily, Carbamazepine 200mg bd	1	0.04	2678	95.03
Diclofenac 75mg IM stat, Diclofenac 50mg tds, Dolorol Forte 2 tds, Methyl Salicilate oint bd	1	0.04	2679	95.07
Diclofenac 75mg IM stat, Dolorol Forte 2 tds, Diclofenac 50mg tds, Prednisone 10mg daily, Methyl Salicilate oint bd	1	0.04	2680	95.10
Diclofenac 75mg IM stat, Dolorol Forte 2 tds, Prednisone 20mg daily, Diclofenac 50mg tds	1	0.04	2681	95.14
Diclofenac 75mg IM stat, Paracetamol 1g tds, Pyridoxine 25mg daily, Diclofenac 50mg tds	1	0.04	2682	95.17

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Diclofenac 75mg IM stat, Paracetamol 1g tds	1	0.04	2683	95.21
Diclofenac 75mg IM stat, Ibuprofen 400mg tds, Buscopan IV stat, Buscopan 10mg tds	1	0.04	2684	95.24
Diclofenac 75mg IM stat, Tranexamic acid 500mg IV stat, Tranexamic acid 500mg tds, Ferrous Sulphate 170mg bd	1	0.04	2685	95.28
Diclofenac75mg IM stat, Dolorol Forte 2 tds, Diclofenac 50mg tds, Methyl Salicilate oint bd	1	0.04	2686	95.32
Dolorol Forte 2 tds, Diclofenac 25mg tds	1	0.04	2687	95.35
Dolorol Forte 2 tds, Diclofenac 50mg tds, Prednisone 20mg daily, Methyl Salicilate oint bd	1	0.04	2688	95.39
Dolorol Forte 2 tds, Methyl Salicilate oint bd, Pyridoxine 25mg daily	1	0.04	2689	95.42
Doxicycline 100mg bd	1	0.04	2690	95.46
Doxicycline 100mg bd, Metronidazole 2g stat, Cefixime 400mg stat, Clotrimazole 500mg PV stat, Clotrimazole PV crm bd	1	0.04	2691	95.49
Doxicycline 100mg bd, Metronidazole 2g stat, Cefixime 400mg stat, Paracetamol 1g tds, Clotrimazole PV crm bd	1	0.04	2692	95.53
Erythromycin 500mg qid, Dolorol Forte 2 tds, Methyl Salicilate oint bd	1	0.04	2693	95.56

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Erythromycin 500mg qid, Fluconazole 200mg daily, Metronidazole 400mg tds	1	0.04	2694	95.60
Erythromycin 500mg qid, Paracetamol 1g tds	1	0.04	2695	95.64
Ferrous Sulphate 170mg daily, Folic acid 5mg daily	1	0.04	2696	95.67
Ferrous Sulphate 170mg daily, Folic acid 5mg daily, Doxicycline 100mg bd	1	0.04	2697	95.71
Ferrous Sulphate 170mg daily, Folic acid 5mg daily, Fluconazole 200mg daily, Augmentin 375mg tds	1	0.04	2698	95.74
Ferrous Sulphate 170mg daily, Folic acid 5mg daily, Pyridoxine 25mg daily, Methyl Salicilate oint bd	1	0.04	2699	95.78
Ferrous Sulphate 170mg tds, Ascorbic acid 100mg tds, Albendazole 400mg stat	1	0.04	2700	95.81
Flucloxacillin 500mg qid, Diclofenac 50mg tds, Dolorol Forte 2 tds	1	0.04	2701	95.85
Flucloxacillin 500mg qid, Metronidazole 400mg tds, Ciprofloxacin 500mg bd, Dolorol Forte 2 tds	1	0.04	2702	95.88
Flucloxacillin 500mg qid, Povidone dressings, Diclofenac 50mg tds, Paracetamol 1g tds	1	0.04	2703	95.92
Fluconazole 200mg bd	1	0.04	2704	95.95
Fluconazole 200mg daily, Acyclovir 200mg qid, Dolorol Forte 2 tds	1	0.04	2705	95.99

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Fluconazole 200mg daily, Augmentin 375mg tds	1	0.04	2706	96.03
Fluconazole 200mg daily, Augmentin 625mg tds, Acyclovir 400mg qid	1	0.04	2707	96.06
Fluconazole 200mg daily, Chlorpheniramine 4mg tds, Hydrocortisone crm bd	1	0.04	2708	96.10
Fluconazole 200mg daily, Clotrimazole crm bd, Hydrocortisone crm bd, Nystacid oral qid	1	0.04	2709	96.13
Fluconazole 200mg daily, Clotrimazole vaginal cream nocte	1	0.04	2710	96.17
Fluconazole 200mg daily, Metoclopramide 10mg tds	1	0.04	2711	96.20
Fluconazole 200mg daily, Metoclopramide 10mg tds, Streptomycin 750mg IV daily	1	0.04	2712	96.24
Fluconazole 200mg daily, Miconazole oral gel qid, Buscopan 10mg tds, Augmentin 375mg tds, Loperamide 2mg prn, Gastrolyte daily	1	0.04	2713	96.27
Fluconazole 200mg daily, Nystacid oral drops 1ml qid, Paracetamol 1g tds	1	0.04	2714	96.31
Fluconazole 200mg daily, Paracetamol 1g tds	1	0.04	2715	96.34
Fluconazole 200mg daily, Pyridoxine 25mg daily, Ferrous Sulphate 170mg daily, Folic acid 5mg daily, Vitamin Bco 1 daily	1	0.04	2716	96.38

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Fluoxetine 20mg mane	1	0.04	2717	96.42
Folic acid 5mg daily	1	0.04	2718	96.45
Folic acid 5mg daily, Ferrous Sulphate 170mg daily	1	0.04	2719	96.49
Folic acid 5mg daily, Vitamin Bco 1 daily	1	0.04	2720	96.52
Gastrolyte daily, Amoxicillin 500mg tds, Loperamide 2mg tds, Vitamin Bco 1 daily	1	0.04	2721	96.56
Gastrolyte daily, Augmentin 375 tds, Loperamide 2mg prn, Paracetamol 1g tds	1	0.04	2722	96.59
Gastrolyte daily, Metoclopramide 10mg tds, Buscopan 10mg tds	1	0.04	2723	96.63
Gastrolyte daily, Metronidazole 400mg tds, Amoxicillin 500mg tds, Loperamide 2mg tds	1	0.04	2724	96.66
Griseofulvin 500mg bd, Folic acid 5mg daily	1	0.04	2725	96.70
Hydrocortisone crm bd	1	0.04	2726	96.74
Hydrocortisone crm bd, Chlorpheniramine 4mg tds, Prednisone 20mg daily	1	0.04	2727	96.77
Hydrocortisone crm bd, Paracetamol 1g tds	1	0.04	2728	96.81
Ibuprofen 200mg tds, Methyl Salicilate oint bd	1	0.04	2729	96.84
Ibuprofen 200mg tds, Pyridoxine 25mg daily, Loperamide 2mg tds	1	0.04	2730	96.88

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Ibuprofen 400mg tds, Paracetamol 1g tds, Mist Exp 10ml tds, Amoxicillin 500mg tds, Theophyllin 10ml tds	1	0.04	2731	96.91
Ketoconazole 200mg daily	1	0.04	2732	96.95
Lactulose 30ml nocte, Augmentin 375mg tds, Dolorol Forte 2 tds, Prednisone 10mg daily	1	0.04	2733	96.98
Loperamide 2mg prn, Augmentin 375mg tds, Mist Exp Stim 10ml tds	1	0.04	2734	97.02
Loperamide 2mg prn, Gastrolyte daily, Paracetamol 1g tds, Metronidazole 400mg tds, Amoxicillin 500mg tds	1	0.04	2735	97.05
Loperamide 2mg prn, Metronidazole 500mg IV stat, Augmentin 375mg tds, Paracetamol 1g tds	1	0.04	2736	97.09
Loperamide 2mg prn, Pyridoxine 25mg daily, Augmentin 375mg tds, Carbamazepine 200mg bd	1	0.04	2737	97.13
Loperamide 4mg stat then 2mg prn, Metronidazole 400mg tds	1	0.04	2738	97.16
Methyl Salicilate oint bd, Dolorol Forte 2 tds, Crepe bandages	1	0.04	2739	97.20
Methyl Salicilate oint bd, Dolorol Forte 2 tds, Pyridoxine 25mg daily	1	0.04	2740	97.23
Metoclopramide 10mg IV stat, Metoclopramide 10mg tds, Mebendazole 500mg stat, Ibuprofen 400mg tds	1	0.04	2741	97.27

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Metoclopramide 10mg IV stat, Metoclopramide 10mg tds, Metronidazole 400mg tds, Mebendazole 500mg stat	1	0.04	2742	97.30
Metoclopramide 10mg tds, Buscopan 10mg tds, Paracetamol 1g tds, Augmentin 375mg tds, Cimetidine 200mg tds	1	0.04	2743	97.34
Metoclopramide 10mg tds, Loperamide 2mg tds, Folic acid 5mg daily	1	0.04	2744	97.37
Metoclopramide 10mg tds, Mebendazole 500mg stat	1	0.04	2745	97.41
Metoclopramide 10mg tds, Paracetamol 1g tds	1	0.04	2746	97.44
Metoclopramide 10mg tds, Pyridoxine 25mg daily	1	0.04	2747	97.48
Metoclopramide 10mg tds, Pyridoxine 25mg daily, Augmentin 375mg tds	1	0.04	2748	97.52
Metronidazole 2g stat, Doxicycline 100mg bd, Cefixime 400mg stat, Diclofenac 50mg tds, Loperamide 2mg prn	1	0.04	2749	97.55
Metronidazole 400mg tds, Flucloxacillin 500mg qid, Dolorol Forte 2 tds	1	0.04	2750	97.59
Metronidazole 400mg tds, Loperamide 2mg prn, Theophyllin 10ml tds	1	0.04	2751	97.62
Metronidazole 400mg tds, Loperamide 2mg tds, Gastrolyte daily	1	0.04	2752	97.66

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Metronidazole 400mg tds, Loperamide 2mg tds, Gastrolyte daily, Amoxicyllin 1g tds	1	0.04	2753	97.69
Metronidazole 400mg tds, Loperamide 4mg stat then 2mg prn	1	0.04	2754	97.73
Metronidazole 500mg IVI stat, Ceftriaxone 1g IV stat	1	0.04	2755	97.76
Miconazole oral gel qid, Griseofulvin 500mg bd, Augmentin 375mg tds, Loperamide 2mg prn, Paracetamol 1g tds	1	0.04	2756	97.80
Miconazole vaginal crm nocte, Doxicycline 100mg bd, Metronidazole 2g stat, Ciprofloxacin 500mg bd, Paracetamol 1g tds	1	0.04	2757	97.84
Mist Exp 10ml tds, Augmentin 375mg tds, Metronidazole 400mg tds, Metoclopramide 10mg tds, Paracetamol 1g tds, Mebendazole 500mg stat	1	0.04	2758	97.87
Mist Exp Stim 10ml tds, Vitamin Bco 1 daily	1	0.04	2759	97.91
Nitrofurantoin 50mg tds	1	0.04	2760	97.94
Omeprazole 40mg daily, Aluminium Hydroxide gel 10ml tds, Folic acid 5mg daily, Paracetamol 1g tds	1	0.04	2761	97.98
Orphenadrine 50mg bd, Fluoxetine 20mg mane, Haloperidol 5mg bd, Diazepam 10mg nocte, Ciprofloxacin 500mg bd	1	0.04	2762	98.01

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Oxymethazoline nose drops tds, Ibuprofen 400mg tds, Amoxicillin 500mg tds, Diclofenac 75mg IM stat	1	0.04	2763	98.05
Paracetamol 1g tds, Carbamazepine 200mg bd	1	0.04	2764	98.08
Paracetamol 1g tds, Diclofenac 25mg tds, Folic acid 5mg daily	1	0.04	2765	98.12
Paracetamol 1g tds, Diclofenac 50mg tds	1	0.04	2766	98.15
Paracetamol 1g tds, Flucloxacillin 500mg qid, Ferrous Sulphate 170mg daily, Folic acid 5mg daily	1	0.04	2767	98.19
Paracetamol 1g tds, Hydrocortisone crm bd, Chlorpheniramine 4mg tds	1	0.04	2768	98.23
Paracetamol 1g tds, Ibuprofen 400mg tds, Chlorpheniramine 4mg tds, Diclofenac 75mg IM stat	1	0.04	2769	98.26
Paracetamol 1g tds, Ibuprofen 400mg tds, Metronidazole 400mg tds	1	0.04	2770	98.30
Paracetamol 1g tds, Methyl Salicilate oint bd	1	0.04	2771	98.33
Paracetamol 1g tds, Methyl Salicilate oint bd, Chlorpheniramine 4mg tds	1	0.04	2772	98.37
Prednisone 20mg daily	1	0.04	2773	98.40
Prednisone 30mg daily	1	0.04	2774	98.44
Prednisone 40mg daily, Chlorpheniramine 4mg tds, Hydrocortisone crm bd, Diclofenac 50mg tds	1	0.04	2775	98.47

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Prednisone 40mg daily, Lorazepam 4mg IV stat	1	0.04	2776	98.51
Prednisone 40mg daily, Theophyllin 300mg bd, Augmentin 375mg tds	1	0.04	2777	98.55
Promethazine 25mg tds, Mupirocin oint qid, Flucloxacillin 500mg qid	1	0.04	2778	98.58
Propranolol 40mg daily, Ibuprofen 400mg tds, Prednisone 40mg daily	1	0.04	2779	98.62
Pseudoephedrine 60mg tds	1	0.04	2780	98.65
Pyridoxine 25mg daily, Amitriptyline 25mg nocte	1	0.04	2781	98.69
Pyridoxine 25mg daily, Amoxicillin 500mg tds, Diclofenac 75mg IM stat	1	0.04	2782	98.72
Pyridoxine 25mg daily, Augmentin 375mg tds	1	0.04	2783	98.76
Pyridoxine 25mg daily, Augmentin 375mg tds, Fluconazole 200mg daily, Paracetamol 1g tds	1	0.04	2784	98.79
Pyridoxine 25mg daily, Augmentin 375mg tds, Paracetamol 1g tds	1	0.04	2785	98.83
Pyridoxine 25mg daily, Dapsone 100mg daily	1	0.04	2786	98.86
Pyridoxine 25mg daily, Dolorol Forte 2 tds, Diclofenac 50mg tds	1	0.04	2787	98.90
Pyridoxine 25mg daily, Dolorol Forte 2 tds, Diclofenac 50mg tds, Amitriptyline 25mg nocte	1	0.04	2788	98.94

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Pyridoxine 25mg daily, Dolorol Forte 2 tds, Mebendazole 500mg stat, Metronidazole 400mg tds	1	0.04	2789	98.97
Pyridoxine 25mg daily, Ferrous Sulphate 170mg daily, Folic acid 5mg daily	1	0.04	2790	99.01
Pyridoxine 25mg daily, Ferrous Sulphate 170mg tds, Folic acid 5mg daily	1	0.04	2791	99.04
Pyridoxine 25mg daily, Ferrous Sulphate 170mg tds, Folic acid 5mg daily, Dolorol Forte 2 tds, Augmentin 375mg tds	1	0.04	2792	99.08
Pyridoxine 25mg daily, Flucloxacillin 500mg qid, Ferrous Sulphate 170mg tds, Folic acid 5mg daily	1	0.04	2793	99.11
Pyridoxine 25mg daily, Fluconazole 200mg daily, Amoxicillin 500mg tds	1	0.04	2794	99.15
Pyridoxine 25mg daily, Folic acid 5mg daily	1	0.04	2795	99.18
Pyridoxine 25mg daily, Folic acid 5mg daily, Fluconazole 400mg daily	1	0.04	2796	99.22
Pyridoxine 25mg daily, Folic acid 5mg daily, Haloperidol 1.5mg daily	1	0.04	2797	99.25
Pyridoxine 25mg daily, Ibuprofen 400mg tds, Paracetamol 1g tds, Methyl Salicilate oint bd	1	0.04	2798	99.29
Pyridoxine 25mg daily, Metoclopramide 10mg tds, Mebendazole 500mg stat, Paracetamol 1g tds	1	0.04	2799	99.33

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Pyridoxine 25mg daily, Omeprazole 20mg daily, Dolorol Forte 2 tds, Aluminium Hydroixde gel 10ml tds	1	0.04	2800	99.36
Pyridoxine 25mg daily, Otosporin ear drops bd	1	0.04	2801	99.40
Pyridoxine 25mg daily, Paracetamol 1g tds, Diclofenac 50mg tds	1	0.04	2802	99.43
Pyridoxine 25mg daily, Paracetamol 1g tds, Diclofenac 50mg tds, Methyl Salicilate oint bd	1	0.04	2803	99.47
Pyridoxine 25mg daily, Theophyllin 10ml tds	1	0.04	2804	99.50
Pyridoxine 25mg daily, Tramadol 50mg tds, Diclofenac 50mg tds, Methyl Salicilate oint bd	1	0.04	2805	99.54
Sodium Valproate 300mg bd, Diazepam 10mg nocte	1	0.04	2806	99.57
Theophyllin 10ml tds	1	0.04	2807	99.61
Theophyllin 10ml tds, Augmentin 375mg tds, Amoxicillin 250mg tds, Prednisone 40mg daily, Pyridoxine 25mg daily	1	0.04	2808	99.65
Theophyllin 10ml tds, Augmentin 375mg tds, Paracetamol 1g tds	1	0.04	2809	99.68
Theophyllin 10ml tds, Ferrous Sulphate 170mg daily, Folic acid 5mg daily, Fluconazole 200mg daily	1	0.04	2810	99.72

Other medication most commonly prescribed to adult HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Theophyllin 50mg(10ml) tds, Pyridoxine 25mg daily, Augmentin 375mg tds, Prednisone 40mg daily	1	0.04	2811	99.75
Tramadol 50mg tds	1	0.04	2812	99.79
Tramadol 50mg tds, Diclofenac 50mg tds	1	0.04	2813	99.82
Vit Bco 1daily	1	0.04	2814	99.86
Vitamin Bco 1 daily, Ferrous Sulphate 170mg bd	1	0.04	2815	99.89
Vitamin Bco daily, Folic acid 5mg daily, Ferrous Sulphate 170mg daily	1	0.04	2816	99.93
Zinc oint bd, Ibuprofen 400mg tds	1	0.04	2817	99.96
Zinc oxide oint bd, Doxicycline 100mg bd	1	0.04	2818	100.00

2 List of other related medication prescribed to paediatric HIV/AIDS patients

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Acyclovir 200mg qid, Augmentin 10ml tds, Paracetamol 240mg tds	1	0.05	1	0.05
Acyclovir 200mg qid, Fluconazole 50mg daily, Augmentin 5ml tds	1	0.05	2	0.11
Acyclovir 400mg tds, Calamine lotion bd	1	0.05	3	0.16
Acyclovir crm qid	1	0.05	4	0.22
Albendazole 200mg stat	1	0.05	5	0.27
Albendazole 200mg stat, Folic acid 2.5mg daily	1	0.05	6	0.32
Amoxicillin 125mg tds	1	0.05	7	0.38
Amoxicillin 125mg tds, Paracetamol 120mg tds	1	0.05	8	0.43
Amoxicillin 125mg tds, Paracetaomol 5ml tds	1	0.05	9	0.48
Amoxicillin 250mg tds	1	0.05	10	0.54
Amoxicillin 250mg tds, Mist Tussi 7.5 ml tds	1	0.05	11	0.59
Amoxicillin 250mg tds, Paracetamol 240mg tds, Mist Tussi 5ml tds	1	0.05	12	0.65
Amoxicillin 250mg tds, Paracetamol 240mg tds, Prednisolone 5mg daily	1	0.05	13	0.70
Amoxicillin 250mg tds, Paractamol 250mg tds	1	0.05	14	0.75
Amoxicillin 62.5mg tds, Chlorpheniramine 1mg tds	1	0.05	15	0.81

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Antazoline eye drops tds	2	0.11	17	0.91
Antazoline eye drops tds, Augmentin 10ml tds, Paracetamol 250mg tds	1	0.05	18	0.97
Antazoline eye drops tds, Chlorpheniramine 4mg tds, Erythromycin 250mg qid	1	0.05	19	1.02
Antazoline eye drops tds, Pyridoxine 25mg daily	1	0.05	20	1.08
Aqueous crm bd	1	0.05	21	1.13
Aqueous crm bd, Folic acid 5mg daily	1	0.05	22	1.18
Aqueous crm bd, Gastrolyte daily	1	0.05	23	1.24
Aqueous crm bd, Hydrocortisone crm bd	1	0.05	24	1.29
Augmentin 10ml tds	7	0.38	31	1.67
Augmentin 10ml tds, Albendazole 200mg stat, Paracetamol 240mg tds	1	0.05	32	1.72
Augmentin 10ml tds, Chlorpheniramine 2mg tds	1	0.05	33	1.78
Augmentin 10ml tds, Paracetamol 240mg tds	3	0.16	36	1.94
Augmentin 10ml tds, Paracetamol 240mg tds, Mist Tussi 10ml tds, Chlorpheniramine 2mg tds	1	0.05	37	1.99
Augmentin 10ml tds, Prednisolone 15mg daily, Paracetamol 120mg tds	1	0.05	38	2.04
Augmentin 2.5ml tds, Folic acid 2.5mg daily, Clotrimazole crm bd	1	0.05	39	2.10

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Augmentin 2.5ml tds, Paracetamol 2.5ml tds, Prednisolone 5mg daily	1	0.05	40	2.15
Augmentin 2.5ml tds, Paracetamol 60mg tds	1	0.05	41	2.21
Augmentin 375mg tds, Amoxicillin 250mg tds, Paracetamol 500mg tds	1	0.05	42	2.26
Augmentin 375mg tds, Metronidazole 200mg tds	1	0.05	43	2.31
Augmentin 375mg tds, Metronidazole 400mg tds, Paracetamol 1g tds	1	0.05	44	2.37
Augmentin 375mg tds, Theophyllin 10ml tds	1	0.05	45	2.42
Augmentin 375mg tds, Theophyllin 10ml tds, Paracetamol 500mg tds	1	0.05	46	2.47
Augmentin 375mg tds, Theophyllin 5ml tds	1	0.05	47	2.53
Augmentin 375mg tds, Theophyllin 7.5ml tds	1	0.05	48	2.58
Augmentin 5ml tds	2	0.11	50	2.69
Augmentin 5ml tds, Acetic acid 1% ear drops tds, Paracetamol 120mg tds, Ibuprofen 100mg tds	1	0.05	51	2.74
Augmentin 5ml tds, Chlorpheniramine 2mg tds	1	0.05	52	2.80
Augmentin 5ml tds, Chlorpheniramine 2mg tds, Paracetamol 120mg tds	1	0.05	53	2.85

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Augmentin 5ml tds, Chlorpheniramine 2mg tds, Theophyllin 5ml tds, Prednisolone 15mg daily	1	0.05	54	2.90
Augmentin 5ml tds, Nystacid drops 1ml qid, Paracetamol 5ml tds	1	0.05	55	2.96
Augmentin 5ml tds, Paracetamol 120mg tds, Whitfield oint bd	1	0.05	56	3.01
Augmentin 5ml tds, Paracetamol 250mg tds	1	0.05	57	3.07
Augmentin 5ml tds, Paracetamol 250mg tds, Acetic acid 1% ear drops tds	1	0.05	58	3.12
Augmentin 5ml tds, Paracetamol 5ml tds	2	0.11	60	3.23
Augmentin 5ml tds, Prednisolone 5ml daily, Paracetamol 1g tds	1	0.05	61	3.28
Augmentin 7.5ml tds	1	0.05	62	3.34
Augmentin 7.5ml tds, Albendazole 200mg stat, Gastrolyte daily, Metronidazole 100mg tds	1	0.05	63	3.39
Augmentin 7.5ml tds, Paracetamol 240mg tds, Saline nose drops tds, Chlorpheniramine 2mg tds	1	0.05	64	3.44
Benzyl benzoate, Tetmosol soap	1	0.05	65	3.50
Cerumol ear drops daily	1	0.05	66	3.55
Cerumol ear drops daily, Flucloxacillin 250mg qid	1	0.05	67	3.60

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Chloramex eye oint bd, Whitfield oint bd	1	0.05	68	3.66
Chloramex eye oint bd, Paracetamol 120mg tds	1	0.05	69	3.71
Chloramex eye oint qid, Chlorpheniramine 2mg tds	1	0.05	70	3.77
Chlorpheniramine 2mg tds	2	0.11	72	3.87
Chlorpheniramine 2mg tds, Calamine lotion bd	1	0.05	73	3.93
Chlorpheniramine 2mg tds, Erythromycin 250mg qid, Hydrocortisone crm bd	1	0.05	74	3.98
Chlorpheniramine 2mg tds, Hydrocortisone crm bd	2	0.11	76	4.09
Chlorpheniramine 2mg tds, Miconazole oral gel qid	1	0.05	77	4.14
Chlorpheniramine 2mg tds, Pen VK 250mg tds	1	0.05	78	4.20
Chlorpheniramine 2mg tds, Vitamin Bco 5ml daily	1	0.05	79	4.25
Chlorpheniramine 4mg tds, Aqueous crm bd, Hydrocortisone crm bd	1	0.05	80	4.30
Chlorpheniramine 4mg tds, Mupirocin oint tds	1	0.05	81	4.36
Clotrimazole crm bd, Griseofulvin 125mg daily, Hydrocortisone crm bd	1	0.05	82	4.41
Clotrimazole crm bd, Ketoconazole 100mg daily, Chlorpheniramine 4mg tds	1	0.05	83	4.46

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Dapsone 100mg daily	3	0.16	86	4.63
Dapsone 100mg daily, Mupirocin oint tds	1	0.05	87	4.68
Diazepam 5mg nocte, Amitriptyline 25mg nocte, Erythromycin 250mg qid	1	0.05	88	4.73
Dolorol Forte 2 tds	1	0.05	89	4.79
Erythromycin 250mg qid	1	0.05	90	4.84
Erythromycin 7.5ml qid	1	0.05	91	4.90
Ferrous Gluconate 5ml daily, Folic acid 2.5mg daily, Paracetamol 120mg tds	1	0.05	92	4.95
Flucloxacillin 125mg qid, Paracetamol 180mg tds	1	0.05	93	5.00
Flucloxacillin 250mg qid, Griseofulvin 100mg tds, Clotrimazole crm bd, Paracetamol 250mg qid	1	0.05	94	5.06
Flucloxacillin 250mg qid, Paracetamol 240mg tds	1	0.05	95	5.11
Fluconazole 100mg daily	3	0.16	98	5.27
Fluconazole 100mg daily, Bactroban ung bd	1	0.05	99	5.33
Fluconazole 100mg daily, Clotrimazole crm bd, Flucloxacillin 250mg qid, Hydrocortisone crm bd	1	0.05	100	5.38
Fluconazole 100mg daily, Gastrolyte daily	1	0.05	101	5.43

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Fluconazole 100mg daily, Hydrocortisone crm bd, Erythromycin 125mg qid	1	0.05	102	5.49
Fluconazole 200mg daily, Clotrimazole crm bd, Pyridoxine 25mg daily	1	0.05	103	5.54
Fluconazole 200mg daily, Miconazole oral gel qid, Paracetamol 1g tds	1	0.05	104	5.59
Fluconazole 35mg daily, Paracetamol 60mg tds	1	0.05	105	5.65
Fluconazole 50mg daily	4	0.22	109	5.86
Fluconazole 50mg daily, Clotrimazole crm bd	1	0.05	110	5.92
Fluconazole 50mg daily, Gastrolyte daily, Vitamin Bco 10ml daily	1	0.05	111	5.97
Fluconazole 50mg daily, Mist Tussi 5ml tds, Augmentin 5ml tds, Paracetamol 120mg tds	1	0.05	112	6.02
Fluconazole 50mg daily, Paracetamol 10ml tds	1	0.05	113	6.08
Folic acid 2.5mg daily	3	0.16	116	6.24
Folic acid 2.5mg daily, Albendazole 400mg stat	1	0.05	117	6.29
Folic acid 2.5mg daily, Augmentin 5ml tds, Paracetamol 5ml tds	1	0.05	118	6.35
Folic acid 5mg daily	2	0.11	120	6.46
Gastrolyte daily	2	0.11	122	6.56

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Gastrolyte daily, Amoxicillin 125mg tds, Paracetamol 120mg tds	1	0.05	123	6.62
Gastrolyte daily, Folic acid 2.5mg daily, Paracetamol 5ml tds	1	0.05	124	6.67
Gastrolyte, Augmentin 5ml tds	1	0.05	125	6.72
Gentian Violet solution daily, Amoxicillin 250mg tds	1	0.05	126	6.78
Griseofulvin 250mg daily	1	0.05	127	6.83
Griseofulvin 250mg daily, Whitfield oint bd, Pyridoxine 25mg daily	1	0.05	128	6.89
Hydrocortisone crm bd	1	0.05	129	6.94
Hydrocortisone crm bd, Aqueous crm bd	1	0.05	130	6.99
Hydrocortisone crm bd, Chlorpheniramine 4mg bd	1	0.05	131	7.05
Hydrocortisone crm bd, Erythromycin 125mg qid, Chlorpheniramine 2mg tds	1	0.05	132	7.10
Hydrocortisone crm bd, Chlorpheniramine 2mg tds, Amoxicillin 250mg tds	1	0.05	133	7.15
Hydrocortisone crm bd, Chlorpheniramine 2mg tds, Erythromycin 250mg qid	1	0.05	134	7.21
Ibuprofen 200mg tds, Augmentin 10ml tds, Paracetamol 240mg tds	1	0.05	135	7.26
Ketoconazole 100mg daily, Chlorpheniramine 2mg tds, Hydrocortisone crm bd	1	0.05	136	7.32

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Ketoconazole 100mg daily, Mebendazole 500mg stat, Whitfield oint bd	1	0.05	137	7.37
Loperamide 2mg stat then 1mg tds, Metronidazole 100mg tds, Gastrolyte daily, Folic acid 2.5mg daily	1	0.05	138	7.42
Mebendazole 100mg bd	1	0.05	139	7.48
Metoclopramide 10mg bd, Augmentin 10ml tds	1	0.05	140	7.53
Metoclopramide 5mg tds, Mebendazole 100mg bd	1	0.05	141	7.58
Metronidazole 100mg tds, Mupirocin oint bd	1	0.05	142	7.64
Miconazole oral gel qid	1	0.05	143	7.69
Miconazole oral gel qid, Amoxicillin 250mg tds, Paracetamol 120mg tds	1	0.05	144	7.75
Mist exp stim 7.5ml tds, Amoxicyllin 250mg tds	1	0.05	145	7.80
Mupirocin oint bd	1	0.05	146	7.85
Mupirocin oint bd, Aqueous crm daily	2	0.11	148	7.96
None	1664	89.51	1812	97.47
Nystacid oral drops 1ml qid, Folic acid 2.5mg daily, Paracetamol 180mg tds	1	0.05	1813	97.53
Otosporin ear drops bd	1	0.05	1814	97.58
Paracetamol 120mg qid	1	0.05	1815	97.63

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Paracetamol 120mg tds	3	0.16	1818	97.79
Paracetamol 2.5ml tds, Amoxicillin 125mg tds, Folic acid 2.5mg daily	1	0.05	1819	97.85
Paracetamol 240mg tds	4	0.22	1823	98.06
Paracetamol 240mg tds, Folic acid 2.5mg daily, Nystacid oral drops 1ml qid	1	0.05	1824	98.12
Paracetamol 62.5mg tds	1	0.05	1825	98.17
Paracetamol 62.5mg tds, Nystacid oral solution 1ml qid	1	0.05	1826	98.22
Podophyllin solution daily	1	0.05	1827	98.28
Prednisolone 30mg daily	1	0.05	1828	98.33
Prednisolone 5mg daily, Vitamin Bco 5ml daily, Paracetamol 120mg tds, Methyl Salicilate oint bd, Crepe bandages	1	0.05	1829	98.39
Pyridoxine 12.5mg daily	6	0.32	1835	98.71
Pyridoxine 12.5mg	3	0.16	1838	98.87
Pyridoxine 12.5mg bd	1	0.05	1839	98.92
Pyridoxine 12.5mg daily, Folic acid 2.5mg daily	1	0.05	1840	98.98
Pyridoxine 25mg daily	9	0.48	1849	99.46
Saline nose drops tds	1	0.05	1850	99.52
Tetmosol soap bd, Antazoline eye drops tds, Paracetamol 240mg tds	1	0.05	1851	99.57
Tetmosol soap daily	2	0.11	1853	99.68

Other medication most commonly prescribed to paediatric HIV/AIDS				
Medication	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Vitamin Bco 10ml daily, Folic acid 2.5mg daily	1	0.05	1854	99.73
Vitamin Bco 5ml daily	1	0.05	1855	99.78
Whitfield oint bd	1	0.05	1856	99.84
Whitfield oint bd, Albendazole 200mg stat	1	0.05	1857	99.89
Whitfield oint bd, Folic acid 5mg daily	1	0.05	1858	99.95
Whitfield oint qid	1	0.05	1859	100.00

Appendix 9: List of most commonly recorded complaints of HIV/AIDS patients in the study facility - in the order and combinations that they were recorded

1 List of commonly recorded complaints of adult HIV/AIDS patients

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
None	2469	87.62	2469	87.62
Cough	21	0.75	2490	88.36
Abdominal pain	5	0.18	2495	88.54
Diarrhoea	5	0.18	2500	88.72
Headache	5	0.18	2505	88.89
Vomiting	4	0.14	2509	89.03
Backache	3	0.11	2512	89.14
Dizziness	3	0.11	2515	89.25
Headache, Cough	3	0.11	2518	89.35
Loss of weight	3	0.11	2521	89.46
Oral sores	3	0.11	2524	89.57
Painful feet	3	0.11	2527	89.67
Painful knee	3	0.11	2530	89.78
Painful left leg	3	0.11	2533	89.89
Prominent muscles	3	0.11	2536	89.99
Rash	3	0.11	2539	90.10
Skin rash	3	0.11	2542	90.21
Cough, Night sweat	2	0.07	2544	90.28
Cough, Painful legs	2	0.07	2546	90.35

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Cough, Shortness of breath, Chest pain	2	0.07	2548	90.42
Cough, Vomiting, Diarrhoea	2	0.07	2550	90.49
Diarrhoea, Loss of appetite	2	0.07	2552	90.56
Headache, Dizziness	2	0.07	2554	90.63
Heartburn	2	0.07	2556	90.70
Itching rash all over body	2	0.07	2558	90.77
Nausea	2	0.07	2560	90.84
Nausea, Vomiting	2	0.07	2562	90.92
Painful left elbow	2	0.07	2564	90.99
Painful left shoulder	2	0.07	2566	91.06
Painful legs	2	0.07	2568	91.13
Painful lower limbs	2	0.07	2570	91.20
Painful right hip	2	0.07	2572	91.27
Shortness of breath	2	0.07	2574	91.34
Shortness of breath, Chest pain	2	0.07	2576	91.41
Shortness of breath, Cough	2	0.07	2578	91.48
Vaginal discharge	2	0.07	2580	91.55
None	1	0.04	2581	91.59
Abscess under arm	1	0.04	2582	91.63
Abdominal pain, Backache	1	0.04	2583	91.66
Abdominal pain, Diarrhoea, Loss of appetite	1	0.04	2584	91.70
Abdominal pain, Running nose, Diarrhoea	1	0.04	2585	91.73
Abdominal pain, Vomiting	1	0.04	2586	91.77

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Abdominal pain, Vomiting, Loss of appetite	1	0.04	2587	91.80
Abdominal pains, Rash, Burning urine	1	0.04	2588	91.84
Anal sores	1	0.04	2589	91.87
Back pain, Abdominal pain, Vomiting, Dizziness	1	0.04	2590	91.91
Backache, Abdominal pain, Headache	1	0.04	2591	91.94
Backache, Cough, Constipation	1	0.04	2592	91.98
Backache, Shortness of breath, Cough	1	0.04	2593	92.02
Backpain, Abdominal pain	1	0.04	2594	92.05
Blisters on both lower limbs	1	0.04	2595	92.09
Blocked nose, Cough	1	0.04	2596	92.12
Blocked nostrils	1	0.04	2597	92.16
Body weakness	1	0.04	2598	92.19
Burning urine	1	0.04	2599	92.23
Burning urine, Vaginal rash	1	0.04	2600	92.26
Chest pain	1	0.04	2601	92.30
Chest pain below breast	1	0.04	2602	92.33
Chest pain, Abdominal pain, Diarrhoea	1	0.04	2603	92.37
Chest pain, Cough	1	0.04	2604	92.41
Chest pain, Cramps in both hands, Shortness of breath, Headache	1	0.04	2605	92.44

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Chest pain, Loss of weight, Dizziness	1	0.04	2606	92.48
Chest pain, Loss of weight, Severe headache	1	0.04	2607	92.51
Chest pain, Oral thrush, Cough	1	0.04	2608	92.55
Chest pain, Vomiting, Tiredness	1	0.04	2609	92.58
Chest pains, Abdominal pain, Painful legs	1	0.04	2610	92.62
Chest pains, Loss of weight, Night sweat, Painful legs	1	0.04	2611	92.65
Chest pains, Sore throat	1	0.04	2612	92.69
Child collected medicine stated that mother is not well	1	0.04	2613	92.73
Chronic shoulder pain	1	0.04	2614	92.76
Circumcision done	1	0.04	2615	92.80
Complain about fat in the abdomen	1	0.04	2616	92.83
Confused, Restlessness	1	0.04	2617	92.87
Confused, Violent	1	0.04	2618	92.90
Confusion, Depression	1	0.04	2619	92.94
Confusion, Loss of bladder control	1	0.04	2620	92.97
Confusion, Oral sores	1	0.04	2621	93.01
Convulsions	1	0.04	2622	93.04
Cough, Chest pain	1	0.04	2623	93.08
Cough, Chest pain, Fever	1	0.04	2624	93.12
Cough, Chest pain, Headache	1	0.04	2625	93.15
Cough, Diarrhoea, Loss of appetite	1	0.04	2626	93.19

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Cough, Dizziness, Chest pain	1	0.04	2627	93.22
Cough, Dizziness, Vomiting, Diarrhoea	1	0.04	2628	93.26
Cough, General body pain	1	0.04	2629	93.29
Cough, General body pain, Night sweat, Dizziness	1	0.04	2630	93.33
Cough, Headache, Nasal blockage	1	0.04	2631	93.36
Cough, Kaposi Sarcoma	1	0.04	2632	93.40
Cough, Loss of weight, Loss of appetite	1	0.04	2633	93.44
Cough, Loss of weight, Night sweat	1	0.04	2634	93.47
Cough, Rash	1	0.04	2635	93.51
Cough, Shivering, Headache	1	0.04	2636	93.54
Cough, Shortness of breath	1	0.04	2637	93.58
Cough, Shortness of breath, Chest pains	1	0.04	2638	93.61
Cough, Shortness of breath, General body pain	1	0.04	2639	93.65
Cough, Skin rash	1	0.04	2640	93.68
Cough, Sore throat	1	0.04	2641	93.72
Cough, Sore throat, Headache	1	0.04	2642	93.75
Cough, Vomiting, Diarrhoea, Loss of appetite, Loss of weight	1	0.04	2643	93.79
Cough, Whitish urine, Dizziness	1	0.04	2644	93.83
Cramps in both hands, Diarrhoea, Epigastic pains, Vomiting	1	0.04	2645	93.86

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Cramps in both knees, Dizziness, Diarrhoea, Cough	1	0.04	2646	93.90
Cramps, Chest pain	1	0.04	2647	93.93
Cramps, Loss of appetite, Frequent urination	1	0.04	2648	93.97
Diarrhoea, Cough, General body pain	1	0.04	2649	94.00
Diarrhoea, Cough, Loss of appetite	1	0.04	2650	94.04
Diarrhoea, General body pain and weakness	1	0.04	2651	94.07
Diarrhoea, Oral sores, General body pain	1	0.04	2652	94.11
Diarrhoea, Oral thrush, Abdominal pain	1	0.04	2653	94.14
Diarrhoea, Oral thrush, Loss of weight	1	0.04	2654	94.18
Diarrhoea, Painful lower limbs	1	0.04	2655	94.22
Diarrhoea, Severe headache, Vaginal rash	1	0.04	2656	94.25
Diarrhoea, Shortness of breath	1	0.04	2657	94.29
Diarrhoea, Vomiting, Cough	1	0.04	2658	94.32
Diarrhoea, Vomiting, Painful joints, Cramps, Chest pain	1	0.04	2659	94.36
Diarrhoea, Dizziness	1	0.04	2660	94.39
Difficulty in breathing, Cough	1	0.04	2661	94.43
Difficulty in breathing, Cough, Headache, Dizziness	1	0.04	2662	94.46

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Difficulty in breathing, Dizziness, Cough	1	0.04	2663	94.50
Dizziness, Chest pain	1	0.04	2664	94.54
Dizziness, Fever, Cough	1	0.04	2665	94.57
Dizziness, Headache	1	0.04	2666	94.61
Dizziness, Pain below the breast	1	0.04	2667	94.64
Dizziness, Painful left leg	1	0.04	2668	94.68
Dizziness, Rash	1	0.04	2669	94.71
Dizziness, Skin rash, Sore gums, Painful eyes	1	0.04	2670	94.75
Dizziness, Swelling of lower limbs and cramps	1	0.04	2671	94.78
Dizziness, Vomiting	1	0.04	2672	94.82
Dizziness, Vomiting, Cough, Night sweat, Loss of appetite	1	0.04	2673	94.85
Dry skin, Sores on the skin	1	0.04	2674	94.89
Epigastric discomfort, Nausea	1	0.04	2675	94.93
Epigastric pain	1	0.04	2676	94.96
Epigastric pain, Chest pain	1	0.04	2677	95.00
Epigastric pain, Painful swallowing	1	0.04	2678	95.03
Epigastric pains, Painful left leg	1	0.04	2679	95.07
Failure to gain weight	1	0.04	2680	95.10
Fatigue, Dizziness	1	0.04	2681	95.14
Fever blisters	1	0.04	2682	95.17
Feverish, Cough, Headache, Weakness of lower limbs	1	0.04	2683	95.21

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
General body pain	1	0.04	2684	95.24
General body pain, Blocked nose	1	0.04	2685	95.28
General body pain, Cough	1	0.04	2686	95.32
General body pain, Dizziness	1	0.04	2687	95.35
General body pain, Loss of weight, Loss of appetite, Vomiting	1	0.04	2688	95.39
General body weakness	1	0.04	2689	95.42
General body weakness, Swelling of legs, Cough, Loss of weight	1	0.04	2690	95.46
General joint pain	1	0.04	2691	95.49
Growing breasts- male patient	1	0.04	2692	95.53
Headache, Abdominal pain, Rash, Itching skin	1	0.04	2693	95.56
Headache, Chest pain, Shivering, Vaginal discharge	1	0.04	2694	95.60
Headache, Cough, Epigastric pain, Diarrhoea	1	0.04	2695	95.64
Headache, Drowsiness	1	0.04	2696	95.67
Headache, General body pain	1	0.04	2697	95.71
Headache, General body pain, Dizziness, Cough	1	0.04	2698	95.74
Headache, Painful and swollen arm	1	0.04	2699	95.78
Headache, Painful ear	1	0.04	2700	95.81
Headache, Painful left foot	1	0.04	2701	95.85
Headache, Sores on the tongue, Sore throat	1	0.04	2702	95.88

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Headache, Vomiting, Dizziness	1	0.04	2703	95.92
Itching eyes	1	0.04	2704	95.95
Itching of lower limbs	1	0.04	2705	95.99
Itching rash on both forearms	1	0.04	2706	96.03
Itching rash on the back	1	0.04	2707	96.06
Itching sores all over body	1	0.04	2708	96.10
Itching sores on the scalp and chest	1	0.04	2709	96.13
Left eye painful and red	1	0.04	2710	96.17
Loss of appetite, Abdominal pains, Cough	1	0.04	2711	96.20
Loss of appetite, Chest pain, Loss of weight, Cough, Night sweat	1	0.04	2712	96.24
Loss of appetite, General body weakness, Shortness of breath	1	0.04	2713	96.27
Loss of appetite, Loss of weight, Diarrhoea, Fatigue	1	0.04	2714	96.31
Loss of appetite, Loss of weight, Dizziness	1	0.04	2715	96.34
Loss of appetite, Night sweat, Cough	1	0.04	2716	96.38
Loss of weight, Loss of appetite, Cough, Night sweat	1	0.04	2717	96.42
Loss of weight, Loss of appetite, Cough, Vomiting	1	0.04	2718	96.45
Loss of weight, Nausea	1	0.04	2719	96.49
Lower abdominal pain, Itchy sores	1	0.04	2720	96.52

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Lower limb pain on right side, Headache, Dizziness	1	0.04	2721	96.56
Multiple seizures	1	0.04	2722	96.59
Nausea, Body pains	1	0.04	2723	96.63
Nausea, Stomach pain	1	0.04	2724	96.66
Nausea, Vomiting, Diarrhea	1	0.04	2725	96.70
Nausea, Vomiting, Epigastric pain, Headache, Chest pain	1	0.04	2726	96.74
Neck, Back and abdominal pains	1	0.04	2727	96.77
Numbness of the face, Severe headache	1	0.04	2728	96.81
Oral sores, Vaginal sores	1	0.04	2729	96.84
Oral thrush, Chest pain, General body pain, Cough	1	0.04	2730	96.88
Pain under left breast	1	0.04	2731	96.91
Painful and enlarged breast	1	0.04	2732	96.95
Painful and swollen legs, Night sweat	1	0.04	2733	96.98
Painful and swollen toes	1	0.04	2734	97.02
Painful and tingling sensation in lower limbs	1	0.04	2735	97.05
Painful arm	1	0.04	2736	97.09
Painful ears	1	0.04	2737	97.13
Painful ears, Headache	1	0.04	2738	97.16
Painful elbow	1	0.04	2739	97.20
Painful extremities	1	0.04	2740	97.23

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Painful feet, General body pain	1	0.04	2741	97.27
Painful feet, Painful hand	1	0.04	2742	97.30
Painful hands, Painful ears	1	0.04	2743	97.34
Painful joints and feet	1	0.04	2744	97.37
Painful joints, Painful feet	1	0.04	2745	97.41
Painful left hand	1	0.04	2746	97.44
Painful legs and feet	1	0.04	2747	97.48
Painful legs, Backache	1	0.04	2748	97.52
Painful legs, Painful feet	1	0.04	2749	97.55
Painful legs, Shortness of breath	1	0.04	2750	97.59
Painful lower extremities	1	0.04	2751	97.62
Painful lower extremities, Flu symptoms	1	0.04	2752	97.66
Painful lower extremities, Loss of weight, Loss of appetite	1	0.04	2753	97.69
Painful lower limbs, Cramps	1	0.04	2754	97.73
Painful muscles in lower limbs	1	0.04	2755	97.76
Painful right leg and right shoulder	1	0.04	2756	97.80
Painful right shoulder, Rash under arms	1	0.04	2757	97.84
Painful septic sores on leg (Kaposi Sarcoma)	1	0.04	2758	97.87
Painful shoulder	1	0.04	2759	97.91
Painful shoulder, Headache, Dizziness	1	0.04	2760	97.94
Painful shoulders	1	0.04	2761	97.98

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Painful sores on the face	1	0.04	2762	98.01
Painful sores on the trunk	1	0.04	2763	98.05
Painful watery rash on the lower back	1	0.04	2764	98.08
Perianal warts, Unable to sit	1	0.04	2765	98.12
Pimples on whole body	1	0.04	2766	98.15
Prominent muscles, Painful legs	1	0.04	2767	98.19
Rash on and off	1	0.04	2768	98.23
Rash on both forearms	1	0.04	2769	98.26
Rash on right hand, Nail infection	1	0.04	2770	98.30
Rash under breasts and buttocks	1	0.04	2771	98.33
Rash, Neck stiffness	1	0.04	2772	98.37
Rectal bleeding, Loss of appetite	1	0.04	2773	98.40
Restlessness, Stiffness of the neck	1	0.04	2774	98.44
Running nose, Fever, Cough, Backache, Headache	1	0.04	2775	98.47
Septic skin sores	1	0.04	2776	98.51
Severe abdominal cramps	1	0.04	2777	98.55
Severe headache	1	0.04	2778	98.58
Severe headache, Dizziness	1	0.04	2779	98.62
Severe pain-Cancer of the uterus	1	0.04	2780	98.65
Severe rash on face and whole body-Steven Johnson syndrome	1	0.04	2781	98.69
Shortness of breath, Cough, Chest pain	1	0.04	2782	98.72

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Shortness of breath, Cough, Fatigue	1	0.04	2783	98.76
Shortness of breath, Dizziness, Cough	1	0.04	2784	98.79
Shortness of breath, Dizziness, Cough, Oral thrush	1	0.04	2785	98.83
Shortness of breath, Fever	1	0.04	2786	98.86
Slight headache, Fatigue, Not sleeping well	1	0.04	2787	98.90
Slow growing mass on the hard palate	1	0.04	2788	98.94
Sore throat	1	0.04	2789	98.97
Sores in the mouth	1	0.04	2790	99.01
Sores in the mouth, Rash, Body pains	1	0.04	2791	99.04
Sores in the mouth, Sores on the face	1	0.04	2792	99.08
Sores in the throat	1	0.04	2793	99.11
Sores on left leg	1	0.04	2794	99.15
Sores on the eye lids, Fever, Sores on the body	1	0.04	2795	99.18
Sores on the skin	1	0.04	2796	99.22
Stress	1	0.04	2797	99.25
Sweating, Shortness of breath, Itching spots on the body	1	0.04	2798	99.29
Swelling of the face	1	0.04	2799	99.33
Swelling of veins	1	0.04	2800	99.36

Most commonly recorded complaints of adult HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Swollen and painful finger	1	0.04	2801	99.40
Swollen body, Painful legs, Shortness of breath, Loss of appetite	1	0.04	2802	99.43
Swollen face and rash	1	0.04	2803	99.47
Tiredness, Itching eyes	1	0.04	2804	99.50
Tremors, Growth on the neck	1	0.04	2805	99.54
Unable to walk and speak, Loss of appetite, Oral thrush, General body weakness	1	0.04	2806	99.57
Vaginal bleeding	1	0.04	2807	99.61
Vaginal rash	1	0.04	2808	99.65
Vaginal sores	1	0.04	2809	99.68
Violent, Fighting	1	0.04	2810	99.72
Vomiting, Cough, General body weakness	1	0.04	2811	99.75
Vomiting, Epigastric pain	1	0.04	2812	99.79
Vomiting, General body pain and weakness, Oral thrush	1	0.04	2813	99.82
Vomiting, Oral thrush	1	0.04	2814	99.86
Vomiting, Rash	1	0.04	2815	99.89
Vomiting, Skin rash, Diarrhoea	1	0.04	2816	99.93
Vomiting, Tiredness	1	0.04	2817	99.96
Weight loss, Chest pain, Dry cough	1	0.04	2818	100.00

2 List of commonly recorded complaints of paediatric HIV/AIDS patients

Most commonly recorded complaints of Paediatric HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Abdominal pain, Loss of appetite	1	0.05	1	0.05
Blocked nose	1	0.05	2	0.11
Blocked nose, Cough	2	0.11	4	0.22
Blocked nose, Diarrhoea, Cough	1	0.05	5	0.27
Cough	29	1.56	34	1.83
Cough, Blocked nostrils	1	0.05	35	1.88
Cough, Chest pain	1	0.05	36	1.94
Cough, Diarrhoea	2	0.11	38	2.04
Cough, Fever	3	0.16	41	2.21
Cough, Fever, Vomiting	1	0.05	42	2.26
Cough, Loss of appetite	1	0.05	43	2.31
Cough, Loss of appetite, Diarrhoea	1	0.05	44	2.37
Cough, Loss of appetite, Sore throat, Shortness of breath	1	0.05	45	2.42
Cough, Loss of weight	1	0.05	46	2.47
Cough, Loss of weight, Difficulty in breathing	1	0.05	47	2.53
Cough, Loss of weight, Sore throat	1	0.05	48	2.58
Cough, Oral thrush	1	0.05	49	2.64
Cough, Rash	2	0.11	51	2.74
Cough, Running nose, Fever, Loss of appetite	1	0.05	52	2.80
Cough, Shortness of breath	3	0.16	55	2.96
Cough, Shortness of breath, Running nose	1	0.05	56	3.01

Most commonly recorded complaints of Paediatric HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Cough, Shortness of breath, Sores in the mouth	1	0.05	57	3.07
Cough, Sore throat	1	0.05	58	3.12
Cough, Sores in the mouth	1	0.05	59	3.17
Cough, Sores on the nose, Running nose	1	0.05	60	3.23
Cough, Swollen left foot	1	0.05	61	3.28
Cough, Vomiting, Diarrhoea	1	0.05	62	3.34
Cough, Vomiting, Fever, Loss of appetite	1	0.05	63	3.39
Coughing	2	0.11	65	3.50
Developing breasts	1	0.05	66	3.55
Diarrhoea	4	0.22	70	3.77
Diarrhoea, Cough, Fever	1	0.05	71	3.82
Diarrhoea, Cough, Septic wound on the chest	1	0.05	72	3.87
Diarrhoea, Cough, Vomiting	1	0.05	73	3.93
Diarrhoea, Eczema	1	0.05	74	3.98
Diarrhoea, Oral thrush	1	0.05	75	4.03
Diarrhea, Vomiting	1	0.05	76	4.09
Diarrhoea, Vomiting, Painful feet	1	0.05	77	4.14
Diarrhoea, Vomitting	1	0.05	78	4.20
Diarrhoea, Oral sores	1	0.05	79	4.25
Difficulty in swallowing, Painful throat	1	0.05	80	4.30
Discharging ear	1	0.05	81	4.36

Most commonly recorded complaints of Paediatric HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Discharging ear, Headache	1	0.05	82	4.41
Discharging ear, flu symptoms	1	0.05	83	4.46
Discharging ears	1	0.05	84	4.52
Discharging left ear	1	0.05	85	4.57
Discharging right ear-Chronic Otitis Media	1	0.05	86	4.63
Discharging right ear, Vomiting	1	0.05	87	4.68
Drowsiness	1	0.05	88	4.73
Dry skin, Cough	1	0.05	89	4.79
Facial rash	1	0.05	90	4.84
Fast breathing, Loss of weight, Cough	1	0.05	91	4.90
Fever	4	0.22	95	5.11
Fever, Cough, Night sweat, Foaming from the mouth	1	0.05	96	5.16
Fever, Discharging eyes	1	0.05	97	5.22
Fever, Painful eyes, Abdominal pain, Cough	1	0.05	98	5.27
Feverish, Body weakness, Loss of appetite, Oral thrush	1	0.05	99	5.33
Flu, Cough, Sores on the body	1	0.05	100	5.38
Headache	1	0.05	101	5.43
Headache, Reddish eyes	1	0.05	102	5.49
Headache, Rash	1	0.05	103	5.54
Insomnia, Nightmares	1	0.05	104	5.59
Itching and painful eyes	1	0.05	105	5.65

Most commonly recorded complaints of Paediatric HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Itching eyes	3	0.16	108	5.81
Itching eyes, Chronic cough	1	0.05	109	5.86
Itching rash all over the body, Fever	1	0.05	110	5.92
Itching rash on the face	1	0.05	111	5.97
Itching sores all over the body	1	0.05	112	6.02
Itching sores behind the ears	1	0.05	113	6.08
Itching sores on the thigh	1	0.05	114	6.13
Limping when walking, Painful right leg	1	0.05	115	6.19
Loose stools, Vomiting after cough	1	0.05	116	6.24
Loss of appetite	1	0.05	117	6.29
Loss of appetite, Fever, Shortness of breath, Coughing	1	0.05	118	6.35
Loss of weight, Loss of appetite, Sores in the mouth	1	0.05	119	6.40
Nausea, Oral thrush	1	0.05	120	6.46
Neck stiffness, Vomiting	1	0.05	121	6.51
None	1666	89.62	1787	96.13
Not eating well	2	0.11	1789	96.23
Not gaining weight, Lack of appetite	1	0.05	1790	96.29
Not gaining weight, Signs of lipoatrophy	1	0.05	1791	96.34
Not hearing well	1	0.05	1792	96.40
Numbness, Unable to stand, Vomiting	1	0.05	1793	96.45
Oral Candida	1	0.05	1794	96.50

Most commonly recorded complaints of Paediatric HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Oral thrush	1	0.05	1795	96.56
Oral thrush, Diarrhoea	1	0.05	1796	96.61
Pain when urinating	1	0.05	1797	96.66
Painful ear, Cough	1	0.05	1798	96.72
Painful ears	2	0.11	1800	96.83
Painful eye, Sores on the face	1	0.05	1801	96.88
Painful legs	1	0.05	1802	96.93
Painful legs, Dizziness, Headache	1	0.05	1803	96.99
Painful rash, Painful discharging eyes	1	0.05	1804	97.04
Painful stomach, Reluctant to feed	1	0.05	1805	97.10
Productive cough	1	0.05	1806	97.15
Rash	7	0.38	1813	97.53
Rash all over body	4	0.22	1817	97.74
Rash on back	1	0.05	1818	97.79
Rash on entire body	1	0.05	1819	97.85
Rash on face	1	0.05	1820	97.90
Rash on face and body	1	0.05	1821	97.96
Rash on hands, Loss of appetite	1	0.05	1822	98.01
Rash on the face and back	1	0.05	1823	98.06
Rash on the face, hands and back	1	0.05	1824	98.12
Rash on the head	1	0.05	1825	98.17
Rash on the neck	1	0.05	1826	98.22
Rash, Cough	1	0.05	1827	98.28
Running nose, Cough	1	0.05	1828	98.33

Most commonly recorded complaints of Paediatric HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Septic sores on the face	1	0.05	1829	98.39
Shortness of breath, Cough	2	0.11	1831	98.49
Shortness of breath, Swollen cheeks, Fever	1	0.05	1832	98.55
Shortness of breath, Dry cough, Headache	1	0.05	1833	98.60
Skin infection	1	0.05	1834	98.66
Skin rash	5	0.27	1839	98.92
Skin rash, Genital warts	1	0.05	1840	98.98
Sore throat, Loss of appetite, Cough	1	0.05	1841	99.03
Sore throat, Itching eyes, Running nose	1	0.05	1842	99.09
Sores on both hands	1	0.05	1843	99.14
Sores on face, Not walking	1	0.05	1844	99.19
Sores on the body	1	0.05	1845	99.25
Sores on the face	1	0.05	1846	99.30
Sores on the face, Discharging eyes	1	0.05	1847	99.35
Sores on the head	2	0.11	1849	99.46
Sores on the head, Cough	1	0.05	1850	99.52
Sores on the head, Painful ear	1	0.05	1851	99.57
Sores on the skin	2	0.11	1853	99.68
Swollen Penis, Poor appetite, Cough	1	0.05	1854	99.73
Vomiting	1	0.05	1855	99.78
Vomiting when coughing	1	0.05	1856	99.84
Vomiting, Difficulty in swallowing	1	0.05	1857	99.89

Most commonly recorded complaints of Paediatric HIV/AIDS patients				
Complaint	**Number of consultations (n)**	**Percentage**	**Cumulative number**	**Cumulative percentage**
Vomiting, General body weakness	1	0.05	1858	99.95
Vomiting, Oral sores, Fever	1	0.05	1859	100.00