Analysis on access to antiretroviral therapy for patients with different income and educational level, and the effect of treatment on quality of life after two to three months of therapy

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Declaration

I declare that this thesis that I now submit for assessment on the programme of study leading to the degree Master of Science in Pharmacy Administration and Policy Regulation has not been submitted for the purpose of a degree at this or any other higher education institution. It is entirely my own work and has not been taken from the work of others, save the extent that such work has been cited and acknowledged within the text of my work.

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ABSTRACT

BACKGROUND: Access to antiretroviral therapy (ART) for HIV positive patients has brought hope and a chance to a healthier longer life with improved quality of life (QoL). In this study we explored the difference in health related quality of life (HRQoL) between participants eligible for ART and those not yet eligible for ART as per the 2015 South African HIV treatment guidelines. We also considered the impact of ART access on HRQoL and the effect of employment status and education level. The study was conducted at one tertiary hospital and two primary health care facilities in Johannesburg, South Africa.

AIM: To determine how access to ART for HIV-positive patients with higher CD4 cell counts affected HRQoL and the role of socioeconomic status. The objectives of the study were to determine if there was a significant difference in HRQoL between the two groups of patients, eligible for ART and those not yet eligible for ART at a CD4 cell count cut off of 500cells/mm$^3$ and to examine HRQoL at initiation of ART and again two to three months post ART initiation.

METHOD: A cross-sectional study compared baseline measurements of HIV-positive patients eligible and not eligible for ART, while the cohort eligible for ART were followed up after two to three months on ART. HRQoL was measured using the EQ-5D questionnaire (which determined the index score and VAS score, as objective and subjective measures for HRQoL, respectively), and, socioeconomic and clinical data were collected using an adapted version of the South African household survey questionnaire.

RESULTS: A total of 105 participants were enrolled in the study. The baseline group had a median age of 36 (IQR 30-44) years, about 70% were female, 89.62% had an education level of
Grade 12 or higher, about 67% were either employed or self-employed and 50% had a CD4 count of 500 cells/mm$^3$ and higher. The baseline group was further divided into those 46 participants not eligible for ART and those 60 who were eligible and thus initiated on ART. Participants initiating on ART were significantly older than those not eligible for ART with median ages of 38 (IQR 32-46) and 34 (IQR 27-43) years, respectively (p=0.0084). The group not yet eligible for ART comprised of mostly women (91.30%) versus the eligible group that comprised of only about half of women (53.33%) (p< 0.001). Both groups had comparable levels of education and income. As expected the group not yet eligible for ART had a significantly higher CD4 cell count compared to the ART eligible group with median of 697.50 (IQR 589-900) and 213.50 (IQR 80-387.50) cells/mm$^3$ respectively, (p< 0.001).

The HRQoL for the entire baseline group was most affected by pain and discomfort, followed by depression and anxiety, amounting to 40.57% and 23.58% of participants, respectively. The only significant difference between the ART eligible and non-ART eligible groups were that the ART group initially experienced more problems with usual activities (18.33%) than the non-ART group (2.00%), (p=0.037). However, the VAS score indicated that at baseline ART group had a significantly higher median of 90 (IQR 76.50-99) while non-ART group scored median 66.50 (IQR 60-80); (p < 0.001).

At two to three months follow up of the group that started ART, there was one patient that was lost to follow up. The total number of ART group changed from 60 to 59. The HRQoL for ART group at two to three month follow up improved significantly except for usual activities. Mobility improved from 86.67% to 98.31% (p=0.011), pain/discomfort increased from 60% to 83% (p=0.005), depression/anxiety rose from 78% to 84% (p = 0.008). Median VAS score increased from 90 to 98 (p < 0.001).
In the univariate analysis males were 9% CI (0.86-0.97) (p=0.004) less likely to experience significant problems with mobility. With higher education thus above grade twelve the percentage change in the incident rate of not experiencing problems with mobility is an increase of 75% (CI 1.02-1.13) (p=0.005) for every unit increase in education. The ART naïve group was 11% (CI 1.01-1.20) (p=0.025) less likely to experience problems with mobility and 21% (CI 1.06-1.38) (p=0.004) less likely to experience problems with pain/discomfort.

The multivariate analysis did not find a difference in the HRQoL outcomes in mobility and usual activities. There was nevertheless an 11% (CI 0.76-0.93) (p=0.001) less likelihood that the ART naïve group would experience problems with anxiety/depression as compared to the group that was eligible for ART.

CONCLUSION/RECOMMENDATIONS: Access to ART does bring about improvement in HRQoL after 2-3 months of ART as indicated by the index score and the VAS score. Higher education level (above grade 12) and employment were associated with better HRQoL. Further studies should be done to look at the impact of ART on HRQoL for patients with higher CD4 counts over an extended period than in this study.
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LIST OF ABBREVIATIONS

AIDS- Acquired Immunodeficiency syndrome

ART- Antiretroviral Therapy

CEO- Chief Executive Officer

CI- Confidence Interval

CD4- Cluster of differentiation 4

DHIS- District Health Information System

DOH- Department of Health

EQ-5D- EuroQol Health Questionnaire HIV/AIDS

EQ-5D-5L- EuroQol Health Questionnaire HIV/AIDS 5 level

EQ-VAS- EuroQol Visual Analogue Scale

HAART- Highly Active Antiretroviral Treatment

HAT-QoL- HIV/AIDS Targeted Quality of life

HIV- Human Immunodeficiency Virus

HRQoL- Health Related Quality of Life

IQR- Interquartile range

KES- Kenyan Shilling
LTF- Lost to Follow-up

MOS-HIV - Medical Outcomes Study HIV

MQoL - HIV Multidimensional Quality of Life HIV

OR - Odds ratio

PMTCT - Prevention of Mother to Child Transmission

QoL - Quality of life

R - South African Rands

SA - South Africa

SD - Standard Deviation

SF-36 - Short Form 36

START - Strategic Timing of Antiretroviral Therapy

UNAIDS - United Nations Programme on HIV/Acquired Immune Deficiency Syndrome

UTT - Universal Test and Treat

WHO - World Health Organisation

WHOQOL-HIV-Brief - World Health Organization QoL Instrument for HIV infected patient
South Africa has the world’s biggest Human Immunodeficiency Virus (HIV) epidemic with an estimated 7.03 million people living with HIV in 2016 (Statistics South Africa, 2016). In 2015 there were about 3.2 million people on antiretroviral treatment (ART) in South Africa (Kahn, 2016). Eligibility criteria for ART in an HIV-positive individual are determined through measuring CD4 cell count and/or determining World Health Organisation (WHO) stage. According to (World Health Organisation, 2007), the HIV stages were developed for resource poor settings where laboratory services may not be available as well as to assist in the scale up of ART initiation. The classification of these stages are based on clinical symptoms, they are stages 1 to 4 and are defined by specific clinical conditions or symptoms.

ART was initially rolled out in the South African public sector in 2004 with eligibility criteria to initiate ART at CD4 cell counts of less than or equal to 200 cells/mm³ and/or WHO stage 4 regardless of CD4 count (National Department of Health South Africa, 2004). By 2005, 85000 South Africans had been initiated on ART (Simelela and Venter, 2014). By 2011, ART coverage in South Africa was 75% of individuals eligible for ART (UNAIDS, 2014). This was accomplished through many interventions including the commitment of government to provide ART to 80% of eligible HIV positive people including foreign nationals (Simelela and Venter, 2014).

In 2013 the eligibility criteria to initiate ART changed to CD4 counts of less than or equal to 350 cells/mm³ and/or patients with WHO stage 3 and 4 regardless of CD4 count. The guidelines
also made provision for patient with tuberculosis co-infection regardless of CD4 cell count and pregnant women regardless of CD4 count until they deliver after which ART will be stopped (option B) (WHO, 2014). The new criteria decreased ART coverage to 55% of eligible adults (Simelela and Venter, 2014). However, HIV related mortality decreased from 320 000 per annum in 2010 to 140 000 per annum in 2014 (Kahn, 2016. The HIV prevalence however remained high at 21.5% in women and 18.3% in males between the ages of 15 to 49 years. (Statistics South Africa, 2016).

In January 2015 the eligibility criteria for ART initiation changed again to a CD4 count of less than or equal to 500cells/mm³ and/or WHO stage 3 or higher regardless of CD4 count, including tuberculosis co-infection regardless of CD4 cell count, patients with active hepatitis B co-infection and lifelong ART for pregnant women. This change reduced coverage further to 42% in 2015 (UNAIDS, 2015). This can be attributed to an even higher number of patients eligible for ART within resource restricted health care facilities.

Access to ART for HIV positive patients has brought hope and a chance to a healthier and longer life with improved quality of life (QoL). Moller (2007) suggests that with the introduction of ART, the prospects for South Africans to live a long and happy life have become a reality. With sentiments like these, it is therefore important to measure HRQoL in HIV infected patients especially in the era of ART (Louwagie et al., 2007).

Health related quality of life (HRQoL) is a multidimensional concept that includes global health perspective, symptom status, functional status, biological and physical variables, individual and environmental characteristics and general health perceptions as suggested by Wilson and Cleary (1995). However, the QoL of the individual is intertwined with factors permeating their families and society such as gender equality, education level and other socio-economic variables.
Socioeconomic status is often measured as combination of education, income and occupation, therefore socioeconomic status often determines access to ART. (American Psychological Association, 2016). In South Africa “rates of new infections among young women aged 15-24 were more than four times greater than that of men in the same age range. Poverty, the low status of women and gender-based violence have been cited as reasons for the disparity in HIV prevalence between men and women in South Africa”. (UNAIDS, 2014).

Education has long been identified as having a key role to play in reducing HIV-related risk and vulnerability, and mitigating the impact of the epidemic on affected individuals and communities (Aggleton et al., 2011). A study done in Malawi in 2009 where young girls were given money to stay in school not only reduced drop-out rates but also protected them from contracting HIV (UNAIDS, 2010).

The impact of HIV and AIDS on employment and hence income can be devastating. The impact of absenteeism and death on the economy is still evident even though the magnitude is not very clear currently due to lack of information disclosure by companies and confidentiality issues (Vos, 2005). The huge bearing of HIV on social aspects however cannot be ignored as it has brought about death, child-headed households and missed enrolment into schools hence missed opportunities to education (Vos, 2005).

Nannungi, Wagner and Ghosh-Dastidar (2013) demonstrated that loss of work and income after HIV diagnosis was common, however after initiating treatment, patients were able to work again and earn an income. ‘Work performance improved and absenteeism decreased, with the most dramatic changes occurring in the first three months of treatment and then leveling off.’ (Beard et al., 2009).
1.1 Problem statement

With the change in HIV treatment guidelines in 2015 where patients were initiated on ART treatment with higher CD4 counts (350-500 cell/mm³ and >500 cell/mm³), had better health conditions and were not as sick as when the last studies on QoL were done. (Lifson et al., 2016). There are few studies that have assessed the effect of higher CD4 counts on HRQoL in South Africa. These patients are physically healthy and therefore one would expect that they would be employed, be productive and involved in the labor force. It is therefore important to measure HRQoL of these patients and actually examine how ART affects their HRQoL, and compare this with patients that have not yet started ART treatment. One of the studies that looked at the initiation of ART at a higher CD4 count was the Strategic Timing of Antiretroviral Therapy (START) trial, this study demonstrated the importance of starting ART early (Lifson et al., 2016).

In September 2016 South Africa adopted universal test and treat (UTT) which means eligibility for ART of any and all HIV-positive people. With the wide scale up of ART and South Africa adopting the universal test and treat approach it is important to track how the impact of ART translates into improved QoL and well-being for these patients.

1.2 Research questions

Is there a difference in QoL between patients eligible for ART versus patients not yet eligible for ART if the CD4 count cut off is 500cells/mm³?

Does access to ART improve quality of life two to three months post therapy initiation at CD4 counts higher than 350cells/mm³?

Does access to ART for patients with higher CD4 counts of 500cells/mm³ and their socio-economic status affect QoL among people living with HIV?
1.3 The research hypotheses are:

1.3.1 Research hypothesis 1

Null hypothesis (H\textsubscript{01}): There is no difference in QoL between patients eligible for ART versus those not yet eligible for ART.

Alternative hypothesis (H\textsubscript{11}): There is a difference in QoL between patients eligible for ART versus those not yet eligible for ART.

1.3.2 Research hypothesis 2

Null hypothesis (H\textsubscript{02}): Access to ART does not improve QoL two to three months post ART initiation.

Alternative hypothesis (H\textsubscript{12}): Access to ART improves QoL two to three months post ART initiation.

1.3.3 Research hypothesis 3

Null hypothesis (H\textsubscript{03}): Access to ART for patients with CD4 counts higher than 350 cells/mm\textsuperscript{3} does not lead to improved QoL.

Alternative hypothesis (H\textsubscript{13}): Access to ART for patients with CD4 counts higher than 350 cells/mm\textsuperscript{3} does lead to improved QoL.
1.4 Primary aim and objectives

The aim of the study was thus to determine how access to treatment for patients with higher CD4 counts influences their HRQoL and the influence of socioeconomic status such as employment status, income and education level.

The objectives of the study were:

- To determine if there was a significant difference in HRQoL between the two groups of patients, eligible for ART and those not yet eligible.
- To examine QoL at initiation of therapy and again two to three months post initiation of ART.
- To investigate the role of socio-economic status on QoL.
CHAPTER 2

LITERATURE REVIEW

There are different instruments that measure quality of life. These include generic and specific instruments (Skevington and O’Connel, 2003). The generic instruments are patient-focused developed to be suitable across all diseases, medical interventions and also across a large population area (Coons et al., 2000). Specific instruments look at concerns of a patient’s particular disorder, (Skevington and O’Connel, 2003) and they are designed to be relevant to certain interventions or subpopulations (Coons et al., 2000). The reliability and validity of two instruments above is of significant importance to ensure that indeed treatment outcomes and hence QoL are appropriately measured because according to Skevington and O’Connel (2003) “conclusions about how QoL is affected by HIV remain equivocal, in part due to problems with reliable and valid measurement”. A significant number of studies (Louwagie et al. 2007; Nglazi et al. 2014; Stangl et al. 2007; Abera et al. 2010) has shown an improvement in HRQoL after the initiation of antiretroviral treatment (ART) and that education and income level have a positive effect on HRQoL (Table 2.1).

The EuroQol health questionnaire (EQ-5D) was developed by EuroQol Group which consisted of a multidisciplinary research team from Europe, North America, Africa, Asia, Austria and New Zealand. It was designed to be self-administered and short enough to be used in conjunction with other measures; it takes a few minutes to complete as stated by EuroQol Group (2009). It is a generic measure. The tool has two sections, namely the EQ-5D from which the EQ-5D-5L index
score is calculated and the visual analogue scale (VAS) score (EQ-VAS). The EQ-5D section is divided into five domains which include mobility, self-care, usual activities, pain or discomfort and anxiety or depression. Each domain has five levels which are: no problem, slight problem, moderate problem, severe problem and unable to perform. The value sets derived from the EQ-5D can be used to deduce the overall health score for each patient, which is referred to as the index score (a full health score is equal to 1). The index score can be determined using the EQ-5D-5L crosswalk index value calculator version 2, which has value sets that are representative sample of the general population this is found on the EuroQol website (EuroQol Group, 2009), this is an objective measure. The second section is EQ-VAS which is a record of the patient’s self-rated health status on a scale of 0 to 100, this is a subjective measure.

The following three studies by Jelsma et al. (2005), Louwagie et al. (2007) and Nglazi et al. (2014) conducted in South Africa used the EQ-5D tool to indicate that access to ART does bring about improved QoL. In a cohort study conducted in Cape Town, South Africa by Jelsma et al. (2005), the eligibility criteria for ART was CD4 level of <200 cell/mm³. They demonstrated a significant improvement in HRQoL across scores recorded at baseline, one, 6 and 12 months on ART in 117 participants. It also proved that patients with HIV in resource poor countries can have improved HRQoL due to access to ART. Improvement was evident in all domains of the EQ-5D (p<0.01) (the study did not calculate each patient’s index score and therefore was not used in this study) and EQ-VAS scores (p<0.01). However, they did not indicate how WHO stage 3 and stage 4 affected the HRQoL of the study participants.

A cross-sectional study by Louwagie et al. (2007) measured HRQoL in HIV-positive patients in the Free State province of South Africa. The eligibility criteria for ART was CD4 <200 cell/mm³. It compared the HRQoL of 268 patients that have been initiated on ART for two months to 103
patients that were ART naïve. Patients on ART had significantly higher VAS scores and EQ-5D index scores compared to ART naïve patients. Additionally the study also looked at socioeconomic status such as income, employment status and gender and how these impacted on HRQoL. The results indicated that unemployed patients in both groups had lower VAS scores and EQ-5D index scores (p = 0.018). Income did not show any positive effect on HRQoL and this was explained by the fact that most participants were receiving social grants. Women had higher VAS scored compared to men (p = 0.021) indicating higher perceived HRQoL and this was explained by the fact that women seek health care earlier before they develop advanced disease. The study did not look at clinical predictors such as a CD4 count and viral load or WHO stage. Unlike the study by Jelsma et al. (2005) that only used the VAS scores, the results from EQ-5D domains were also used to gather the overall QoL of participants.

A cross sectional study by Nglazi et al. (2014) examined HRQoL in patients with HIV attending public sector antiretroviral services in Cape Town. It compared the HRQoL of 468 patients initiated on ART to 435 patients who were ART naïve. The ART eligibility was CD4 count ≤350 cell/mm³. The key findings in this study were that the treatment group had a significantly better HRQoL than the ART naïve group, which concurred with the findings of Louwagie and colleagues (2007). Similarly, in a later study by Louwagie et al. (2007), Nglazi and colleagues (2014) also observed that HRQoL was in fact positively affected by availability of income in the form of employment and this was significant (p= 0.003). They concluded that there was an association between low CD4 counts in ART naïve patients and low VAS score citing poor QoL. The study by Nglazi et al., (2014) had a good sample size of 903 participants and hence the results of the study could be generalized to the population in similar setting of the study population and it demonstrated the positive impact of higher CD4 count on HRQoL.
The next five studies by Stangl et al. (2007), Mwesigire et al. (2015), Rueda et al. (2011), Harding et al. (2014) and Stangl et al. (2012) used the Medical Outcomes Study (MOS- HIV) tool to evaluate HRQoL. This tool has been previously validated in sub-Saharan African populations by Harding et al. (2014) and it is an objective measure calculated by combining the Physical Health Score (PHS) and Mental Health Score (MHS). It has a 35-item QoL scale that addresses 10 health dimensions: overall health, physical function, role function, social function, cognitive function, pain, mental health, fatigue, health distress, and QoL (Stangl et al., 2007).

A cohort study conducted in Uganda by Stangl et al. (2007) measured HRQoL across scores recorded at baseline, and every three months until 12 months on ART of 710 female and 237 male participants. The ART eligibility criteria was CD4 less than 200 cell/mm³. Stangl et al. (2007) examined trends and predictors which could be classified into three categories: clinical (CD4 count, viral load, WHO stage, presence of symptoms); psychosocial (social support, presence of depressive symptoms) and sociodemographic (age, employment, financial dependency, education, gender). Patients that were financially dependent on others, unemployed, had CD4 counts of less than 250 cell/mm³ and high viral loads reported poor QoL at baseline. Once ART was initiated and CD4 cell count increased there was an improvement in QoL, supporting the theory that access to ART as well as improvements in CD4 cell count positively influence QoL. Financial dependence on others (p = 0.001) and primary education as compared to post primary education (p = 0.019) negatively affected QoL at ART initiation but financial dependence alone had a negative effect even at 12 months follow up (p = 0.001). There were two limitations to the study: lack of a control group to compare with, and it considered only patients with CD4 counts less than 250 cells/mm³.
Another prospective cohort study conducted in Uganda by Mwesigire et al. (2015) measured HRQoL across scores recorded at baseline, three and six months of two groups of participants. One group of 640 patients was initiated on ART at baseline while the other group of 634 patients remained ART naïve. Mwesigire et al. (2015) looked at the relationship between CD4 count and QoL and the influence of change in HIV guidelines in 2013, WHO recommending initiation of ART at CD4 cell counts of less than 350cell/mm³. Most patients were initiated at higher CD4 counts and they were usually healthier. The authors could not however establish a relationship between improved CD4 count and improved QoL on patients taking ART versus ART naïve patients. Therefore unlike other studies like Nglazi et al. (2014), this study did not find any relationship between change in CD4 cell count among patients on ART and QoL. Mwesigire and colleagues (2015) associated this finding with the fact that patients initiating on ART in the study had significantly higher CD4 counts compared to other studies done before due to change in ART initiation guidelines. Therefore, higher CD4 count meant positive QoL. However, education level and income were found to be related to QoL. The authors discovered that low education thus primary education and below as well as income below $60 per month were negatively associated with QoL. The large sample size of 1274 was a great strength of the study. This was the first study to look at higher CD4 counts and QoL in sub-Saharan Africa.

A cross sectional study conducted in Toronto, Canada by Rueda et al. (2011) measured HRQoL 361 HIV-positive participants. Rueda et al. (2011) examined the relationship between employment status and HRQoL. The eligibility criteria for ART was CD4 count less than 200cells/mm³. The major finding was that employment is strongly associated with a good HRQOL (p<0.001). The study did not collect substantial information on income and therefore could not demonstrate that employment certainly has far more impact on QoL than the actual income because it has been
proven that employed people reported higher QoL relative to unemployed people (Blalock et al., 2002).

A cross-sectional study conducted in East Africa by Harding et al. (2014) looked at QoL and well-being among 1337 HIV-positive outpatients initiating on ART with WHO guidelines recommending ART to be commenced at CD4 less 200 cell/mm³. They observed the relationship between more education (diploma and above) \( (p=0.003) \), CD4 count above 200 cell/mm³ \( (p<0.001) \) as well as wealth \( (p<0.001) \) and improved QOL. In this study CD4 cell count was collected from clinic records, one important limitation that is very common in clinical care was lack of consistent recording of clinical data such as CD4 count, this affected the overall results of the study.

A prospective cohort study conducted in rural Uganda by Stangl et al. (2012) measured HRQoL across scores recorded at baseline, and every three months until 12 months on ART of 947 participants. Eligibility criteria for ART initiation was CD4 cell count less 200 cells/mm³. Like previous studies they discovered a correlation between improved HRQoL and post primary education \( (p < 0.001) \) as well as income from farming, wages and trade \( (p < 0.001) \). Participants with no education or primary education and were dependent on others as source of income scored low on physical and mental health summary indicating poor HRQoL. Furthermore participants with low CD4 counts \( (less \ than \ 50 \ cells/mm³) \) had lower scores as well. The same was also identified with patients with viral loads higher or equal to 5 log10 copies/ml.

Another tool used for measuring HRQoL is a generic measure called Short Form-36 Health Survey (SF-36) which has been translated into many languages and is therefore widely used. It is a patient rated instrument that includes: physical function (PF), social function (SF), role physical (RP), role emotional (RE), mental health (MH), vitality (VT), bodily pain (BP) and general health (GH). Two scores can be generated, these are mental-health component summary score (MHS) and physical-
health component summary score (PHS) as elaborated by Abera et al. (2010).

A cross-sectional study conducted in central and Southern Ethiopia by Abera et al. (2010) looked at QoL of 422 participants on ART for at least three years. The eligibility criteria used for ART initiation was CD4 count less than 200 cells/mm³. The key findings were: patients with CD4 counts above 200 cells/mm³ (p<0.001), on ART longer than 12 months (p<0.005), who attained a secondary school education and were employed, were associated with a better QoL. The primary limitation of the study was that there was no control group or baseline data before ART initiation to compare to or prove that ART was indeed responsible for improved QoL.

A cross-sectional study conducted in Malawi by Fan et al. (2011) compared the QoL of 267 HIV-infected patients on ART and 598 non-HIV infected patients. The eligibility criteria used for ART initiation was CD4 counts less than 200 cells/mm³. Besides SF-36 QoL, they also collected data on needs assessments (nutrition, religion, counseling exercise etc.) and socioeconomic status. The majority of HIV-positive patients in this study (98%) completed secondary school and were employed (87.4%). HIV-positive patients with CD4 cell counts less than 200 cells/mm³ (p=0.0148), and with WHO stages 3 and 4 (p=0.0006) demonstrated lower scores on QoL, which highlighted the relationship between clinical indicators and QoL. This study also found a positive relationship between QoL and employed participants compared to unemployed participants (p<0.0001). Moreover most (72.7%) of the participants were women which was indicative of increased access to ART to women than men.

Mûnene and Ekman. (2014) evaluated the extent to which HRQoL in people living with HIV is associated with duration of ART in Kenya in a cross-sectional study of 421 participants on ART
for at least one month. The eligibility criteria for ART were CD4 count less than 350 cells/mm³. The finding was that patients on ART for longer duration reported lower HRQoL due to treatment fatigue, adverse drug reactions and reduced engagement with healthcare workers who seem to give more attention to newly diagnosed patients. They discovered that higher education (college and above) \( (p \leq 0.05) \) and paid employment (income above 10,000 KES (Kenyan shilling)) \( (p \leq 0.05) \) were associated with better HRQoL. There was no association between baseline WHO stage and HRQoL \( (p \leq 0.05) \).

World Health Organization QoL Instrument for HIV infected patients (WHOQOL-HIV-Brief) was developed by WHO to measure QoL specifically in HIV infected patients. It is available for low income countries and was validated for cross-cultural usage. It has 31 items and 6 domain scores and these are used to represent a person’s subjective perception of their own QoL in these domains: physical, psychological, level of independence, social relationship, physical environment and spirituality (Friend-du Preez and Peltzer, 2010). The following six studies by Deribew et al. (2013), Friend-du-Preez and Peltzer (2010), Peltzer (2012), Tesfay et al. (2015), Ayodele et al. (2014) and Igumbor et al. (2013) used this tool to assess QoL.

A prospective cohort study in Ethiopia by Deribew et al. (2013) evaluated changes in QoL as compared at baseline and 6 months in 465 participants on ART without TB and 124 participants on ART and on TB treatment in all the 6 domains related to QoL. The eligibility criteria for ART were CD4 count less than 350 cells/mm³. There was a significant improvement in HRQoL \( (p=0.000) \) after 6 months on ART and/or TB therapy. No CD4 counts were recorded for this study due to missing data on clinical records.

A cross-sectional study in public hospitals in Kwazulu-Natal, South Africa by Friend-du-Preez and Peltzer (2010) looked at HIV symptoms and HRQoL prior to initiation of ART in 618
participants. Participants who received disability grants (27%) reported higher QoL than those not receiving any form of income (p<0.001). They reasoned that patients with higher education (grade 12 and above) had better QoL (p<0.001) but the authors did not explain if this was linked to income. The majority of participants in this study were unemployed (60.3%), receiving financial assistance in the form of government grants (27%) and those that did not have income. Income influenced their perceived QoL negatively (p<0.001).

A prospective cohort study in Kwazulu-Natal, South Africa by Peltzer (2012) looked at changes in HRQoL in 735 participants prior to ART initiation, 519 participants after 6 months of ART, 557 participants after 12 months of ART and 499 participants after 20 months on ART. The eligibility criteria for ART were CD4 count less than 200cells/mm³. In this study Peltzer discovered that QoL improved in patients on ART. For those that had income in the form of wages HRQoL was affected positively (p = 0.000). Employed participants also reported significant improved HRQoL (p = 0.001) compared to the unemployed participants. Participants with grade 12 and above level of education reported better HRQoL compared to education level of grade 11 and below (p=0.04). The association of improved QoL and clinical outcomes such as CD4 cell counts of more than or equal to 350cells/mm³ mirrored results from other studies conducted in South Africa such as a study by Nglazi et al. (2014). This was one of the longest studies which followed patients prior to and after ART initiation and gives a better perspective on some of the significant effects on QoL over a longer period of time.

Tesfay et al. (2015) did a comparative cross-sectional study on gender differences in HRQoL in five different health institutions in Mekelle Town, Northern Ethiopia with 253 male participants and 253 female participants on ART for more than three months. The eligibility criteria for ART was CD4 count less than 200cells/mm³. The findings indicated that women scored lower than

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males on all domains ($p = 0.037$). Being illiterate ($p < 0.005$) and earning a monthly income less than $83.75 (p < 0.001) were closely related to poor QoL in both genders.

A cross-sectional study in Nigeria by Ayodele et al. (2014) looked at HRQoL of 491 participants on ART. Participants with CD4 counts above 350 cells/mm$^3$ had higher scores in all QoL domains ($p = 0.001$). They did not find any gender differences in all domains of QoL, and they ascertained that participants with no education or primary education only reported better QoL in all domains as compared to secondary and tertiary education ($p=0.002$). The authors thought this could be brought about the fact that educated people know the consequences of the disease and how it affects their lives and hence the negative impact on QoL.

A comparative cross sectional study in South Africa by Igumbor et al. (2013) compared the level of CD4 count, viral load and HRQoL between 311 ART naïve participants and 331 participants on ART for 12 months. The eligibility criteria for ART initiation was CD4 count less than 200 cells/mm$^3$. Participants on ART for 12 months had a better QoL compared to treatment naïve patients ($p = 0.000$). Participants on ART had higher CD4 counts (>500 cells/mm$^3$) than treatment naïve patients (less than 200 cells/mm$^3$) and the QoL score was higher with rise in CD4 cell count.

The following studies used various tools to measure QoL. A cohort study in Johannesburg, South Africa by Rosen et al. (2010) looked at symptoms, general health as well as normal activity and employment using an instrument designed for the study. A cohort of 855 patients initiated on ART (616 have been on ART for less than six months), and 210 pre- ART was interviewed and followed up for three years. At baseline the cohort had a total of 1065 participants, 449 of whom were not yet on ART and 616 were on ART for less than 6 months. By month 12, 607 participants had been followed up, 234 were lost to follow up, 75 were transferred out and 53 died.
The guidelines during the time of study were access to ART for CD4 less than 200 cells/mm³. Interviews were conducted at the time participants presented to the clinic either for medical follow up or on medication collection. The results indicated that symptoms (fatigue, pain, nausea and skin problems) improved drastically after ART initiation (p=0.000). According to the study, ART does in fact bring about improved QoL and the improvement in all outcomes was sustained over 3 years. For some outcomes the increase was seen in the second and third year. Lost to follow up was very high (42%).

A cross-sectional descriptive survey in Lebanon was conducted by Abboud et al. (2010) on 41 participants on ART for an unspecified period to determine the impact of HIV on QoL using the multidimensional quality of life HIV (MQoL-HIV) tool. The eligibility criteria for ART initiation was CD4 count less than 200 cells/mm³. An interesting finding was that participants who had education level up to primary school had significantly higher HRQoL compared to those with university qualifications (p=0.001). These findings were similar to that of Ayodele et al. (2014) and both authors came to the conclusion that educated people know the consequences of the disease hence it affected their HRQoL negatively. The small sample size of 41 patients limits the study to be generalized to the overall Lebanese people living with HIV. The instrument used to measure QoL was never validated in the study population before.

Abasiubong et al. (2010) assessed QoL in people living with HIV in Niger Delta region, Nigeria in a cohort study of 309 participants using HIV/AIDS-Targeted Quality of life (HAT-QoL) questionnaire. Data was collected at baseline only, it was not stated whether patients were on ART or not and for what period of time. The authors established that females (61.8%) displayed lower QoL compared to males (54%) (p <0.01). Access to ART is still a challenge since guidelines still limit treatment initiation to CD4 counts of less than or equal to 200 cells/mm³.
Sixty percent of males and 70% of females had financial constraints due to the lack of employment and subsequent income. This therefore contributed to poor QoL.

The following four studies are literature reviews of QoL:

A recent literature review of 303 studies by Skevington and O’Connel (2003) looked at instruments used to measure QoL in HIV. The inclusion criteria were studies that used generic instruments of QoL as well as HIV-specific instruments. Instruments that were not self-report measures were excluded. The authors agreed that socio-economic impact is critical in the care of people living with HIV therefore social support such as social grants and feeding schemes are crucial as part of their clinical care. Therefore QoL instruments should encompass social and environmental issues (stigma and access to care) in order to be relevant. Choosing the right instrument to measure QoL is also crucial as this will depend on the study population. Some guidelines in choosing the right instruments include ensuring validity and reliability, on the intended use of the instrument.

A review of 8 cohort studies was undertaken by Jin et al. (2014) to analyze changes in QoL of people living with HIV. The inclusion criteria were: it must be a cohort study, patients should be initiated on ART at baseline and followed up more than twelve weeks. The studies they reviewed confirmed that QoL of patients initiated on ART did improve especially at the beginning of treatment. Most studies did not show any relationship between QoL and CD4 cell count, and time since the patient was diagnosed. Patients that had CD4 counts of less than 200 cell/mm³ had no improved QoL despite ART initiation. However, the fact that studies use different instruments to measure QoL cannot be ignored and it brings about disparity in the results. This is because QoL is a subjective experience that is affected by many factors. The majority of study locations in this literature review were in developing countries making it very relevant in this review.
A review by Oguntibeju (2012), examined the effect and benefits of ART on people living with HIV based on studies done in developed and developing countries. The author ascertained that income was related positively to QoL. The studies also showed the relationship between a higher level of education and better QoL (Oguntibeju, 2012). This is in contrast with finding by Abboud et al. (2010) who established that university level of education brought about lower HRQoL compared to elementary education, while Ayodele et al. (2014) concluded that no education translated to better HRQoL. It was apparent in the studies that patients with CD4 cell counts of above 300 cells/mm$^3$ had a greater QoL.

Robberstad and Olsen (2010) focused on the HRQoL of people living with HIV in sub-Saharan Africa in a literature review that focused on 29 articles. The review also looked specifically on studies that used the EQ-5D questionnaires which were used in 9 out of the 29 articles. The review indicated the EQ-5D is indeed a suitable instrument to measure HRQoL in Africa. Even though three of the studies were from South Africa, it is not enough and it is indicative of the significant lack of data or research in South Africa on effectiveness of the ART program despite it being deemed successful. From these publications it was clear that patients on ART had improved QoL compared to patients not yet initiated on ART as they reported amongst others, increased CD4 count, less symptoms, ability to earn a living and better viral load suppression (Igumbor et al. 2013; Nglazi et al. 2014). Most studies above indicated a relationship between access to ART and improved QoL, but there is still not enough research to indicate relationship between access to ART and QoL especially for patients with higher CD4 counts.

Table 2.1 (page 29) Comparison of sixteen studies” on HIV-positive patients either on antiretroviral treatment (ART) or not, comparing tools used to measure HRQoL, study design, number of
HRQoL measurements and intervals between measurements, sample size and groups, and, the primary conclusions in terms of influence on HRQoL.

Table 2.1 Comparison of 16 studies

<table>
<thead>
<tr>
<th>Author</th>
<th>QoL measure</th>
<th>Study design</th>
<th>Number of QoL measurement and intervals</th>
<th>Location</th>
<th>Samp le size</th>
<th>Main conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jelsma et al. 2005</td>
<td>EQ-5D and VAS</td>
<td>Cohort study</td>
<td>Four measurement s at baseline, 1, 6 and 12 months</td>
<td>Cape Town, South Africa</td>
<td>117 patients on ART</td>
<td>Improved HRQoL due to access to ART. Improvement was evident at the first month post ART initiation.</td>
</tr>
<tr>
<td>Louwagie et al. 2007</td>
<td>EQ-5D and VAS</td>
<td>Cross-sectional study</td>
<td>Baseline only</td>
<td>Free State Province, South Africa</td>
<td>268 patients on ART and 103 ART naïve patients</td>
<td>Improvements in HRQoL after initiation on ART as compared to the control group.</td>
</tr>
<tr>
<td>Nglazi et al. 2014</td>
<td>EQ-5D and VAS</td>
<td>Cross-sectional study</td>
<td>Baseline only</td>
<td>Cape Town, South Africa</td>
<td>435 patients on ART and 468 ART Naïve patients</td>
<td>HRQoL improved with ART use.</td>
</tr>
<tr>
<td>Abera et al. 2010</td>
<td>Short Form 36 (SF-36)</td>
<td>Cross-sectional study</td>
<td>Baseline only</td>
<td>Central and southern Ethiopia, Ethiopia</td>
<td>422 patients on ART for at least three months.</td>
<td>Better HRQoL associated with high CD4 counts (above 200cells/mm$^3$), on ART for longer than 12 months, attained a secondary school education and employment.</td>
</tr>
<tr>
<td>Friend-du</td>
<td>WHOQ</td>
<td>Cross-</td>
<td>Baseline only</td>
<td>KwaZulu-</td>
<td>618</td>
<td>More symptoms</td>
</tr>
<tr>
<td>Reference</td>
<td>Study Type</td>
<td>Sectional Prospective Cohort</td>
<td>Baseline Only</td>
<td>Country</td>
<td>Patients on ART</td>
<td>Outcomes</td>
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<tr>
<td>Preez and Peltzer 2010</td>
<td>OL-HIV section study</td>
<td>Natal, South Africa</td>
<td>initiating on ART</td>
<td>低收入相关，反之亦然。高教育水平与更好的HRQoL相关。</td>
<td></td>
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<tr>
<td>Peltzer 2012</td>
<td>WHOQOL-HIV BREF Prospective cohort study</td>
<td>KwaZulu-Natal, South Africa</td>
<td>735 patients initiating on ART</td>
<td>质量生活在开始ART的患者中改善，以及那些有收入或收到社会救济金和有就业的。</td>
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<tr>
<td>Münene and Ekman 2014</td>
<td>SF-36 Cross-sectional study</td>
<td>Kenya</td>
<td>392 patients on ART</td>
<td>高教育和就业与更好的HRQoL相关。 baseline WHO临床阶段与HRQoL之间没有关联。</td>
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<tr>
<td>Tesfay et al. 2015</td>
<td>WHOQOL-HIV BRIEF Comparative cross-sectional study</td>
<td>Northern Ethiopia</td>
<td>253 males and 253 females patients on ART</td>
<td>Women scored lower than men. Low educational status, low monthly income and stigma were related to poor HRQoL. There was no difference in the perceived poor quality of life in both male and female participants when it came to educational status and income level.</td>
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<tr>
<td>Igumbor et al. 2013</td>
<td>WHOQOL-HIV Comparative cross-sectional study</td>
<td>South Africa</td>
<td>311 ART naïve patients and 331 on ART for 12 months.</td>
<td>Patients on treatment for 12 months had better quality of life compared to treatment naïve patients.</td>
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<tr>
<td>Stangl et al. 2012</td>
<td>MOS-HIV Prospective cohort study</td>
<td>Tororo and Busia, Uganda</td>
<td>947 adults initiating on ART</td>
<td>Participants with no education, no income and low CD4 counts had a poor HRQoL.</td>
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<tr>
<td>Study</td>
<td>Design</td>
<td>Methodology</td>
<td>Measurements</td>
<td>Country</td>
<td>Patients</td>
<td>Findings</td>
</tr>
<tr>
<td>------------------------</td>
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<tr>
<td>Stangl et al. 2007</td>
<td>Cohort</td>
<td>MOS-HIV Cohort study</td>
<td>Five</td>
<td>Uganda</td>
<td>710 HIV infected women and 237 HIV infected men on ART. Financial dependence, unemployment, CD4 counts of less than 50 cells/mm³ and high viral loads &gt; 5 log10 copies/ml were associated with poor HRQoL at baseline. Once ART was initiated and CD4 cell count increased there was improvement in QoL most gains were achieved by the third month of ART therapy.</td>
<td></td>
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<tr>
<td>Deribew et al. 2013</td>
<td>Prospective cohort</td>
<td>WHOQOL HIV-Brief cohort study</td>
<td>Two</td>
<td>Ethiopia</td>
<td>465 on ART and 124 on ART and anti-TB treatment. Improvement in quality of life was better in patients with HIV and TB co-infection. There was however no statistically significant relationship between quality of life and employment or income.</td>
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<tr>
<td>Mwesigire et al. 2015</td>
<td>Prospective cohort</td>
<td>MOS-HIV and Global Person Generate d Index (GPGI) cohort study</td>
<td>Two</td>
<td>Uganda</td>
<td>640 on ART and 643 ART naive. No relationship between CD4 cell count and quality of life. Low education was negatively associated with HRQoL.</td>
<td></td>
</tr>
<tr>
<td>Abboud et al. 2010</td>
<td>Cross-sectional descriptive</td>
<td>MQoL-HIV Cross-sectional descriptive study</td>
<td>Baseline only</td>
<td>Lebanon</td>
<td>41 on ART. Education level up to elementary had significantly higher HRQoL compared to those with university qualifications.</td>
<td></td>
</tr>
<tr>
<td>Ayodele et al. 2014</td>
<td>Cross-sectional</td>
<td>WHOQOL-BRIEF Cross-sectional study</td>
<td>Baseline only</td>
<td>Nigeria</td>
<td>491 on ART. No gender differences in all domains of quality of life, no education or primary</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Tool</td>
<td>Design</td>
<td>Setting</td>
<td>Sample Size</td>
<td>Findings</td>
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<tr>
<td>Rueda et al 2011</td>
<td>MOS-HIV</td>
<td>Cross sectional</td>
<td>Baseline only</td>
<td>Toronto, Canada 361 on ART</td>
<td>Employments was strongly associated with better QoL.</td>
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</tr>
</tbody>
</table>
CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

This study was descriptive and quantitative in design. The study design included both a cross sectional component which described the study population and divided the population into those participants eligible for ART and those not eligible for ART. A prospective cohort design followed the subset of participants eligible for ART and follow-up measurements were done on this group after two to three months on ART to compare changes. Two structured questionnaires were developed from validated data collections tools.

3.2 RESEARCH SETTING

The setting was an urban hospital and two surrounding clinics in Johannesburg. The study population included HIV-positive patients attending hospital A, primary health care clinic B and C in Johannesburg. Hospital A is in Gauteng Province, it is a large, urban public hospital with 12000 patients on ART as of June 2015 at the time of data collection. Hospital A initiate on average 60 patients on ART every month. The majority of patients who test HIV-positive at hospital A but are not yet eligible for initiation on ART because their CD4 counts are above 500cells/mm$^3$ are down referred to clinics B and C. In addition, these two clinics test on average 50 patients per month for HIV and out of these an average of 10 patients test positive every month, according to data from the District Health Information System (DHIS).
This hospital was selected due to convenience of access and because hospital A has one of the largest clinics that offer ART services in Gauteng Province. The two clinics were selected because the study population would be similar to hospital A in terms of demographics.

3.3 **RESEARCH POPULATION AND SAMPLE**

Sample size was dependent on the resources, availability/ willingness of participants to be part of the study and a limited time framework.

3.3.1 **Research Population**

The study population comprised of the 12000 patients from the age of 18 years and older currently attending either hospital A, clinic B and/or C. The sample size was aimed at 60 patients that were initiated on ART on a monthly basis at hospital A and 60 patients not yet eligible for ART at clinics B and C.

3.3.2 **Research sample**

Convenience sampling was used to recruit patients into the study due to time constraints. This sampling method was dependent on participants’ choice to participate in the study or not. A convenience sample of 120 patients was planned to be recruited into the study, of which 60 participants was to be eligible to initiate on ART and 60 not yet eligible for ART. Patients that were excluded from the study were anyone HIV-negative, under the age of 18, pregnant and/or already on ART. Patients that were included in the study were HIV-positive ART naïve patients, or patients considered for initiating ART, who consented to be part of the study and adults above 18 years of age.

Participants at hospital A were recruited from the initiation room, this is a room where new patients
that are due to start treatment see a nurse who ensures patients have received counselling and are ready to start treatment. Informed consent was obtained. The baseline questionnaires were administered by the investigator to those that gave written informed consent. Follow up questionnaires were then administered two to three months after initiation of therapy.

Participants at clinics B and C were first identified through their clinical records and the results book, because there were no electronic clinical records of patients or booking/appointment systems. Patients who met the inclusion criteria were then phoned to determine their willingness to participate in the study. Once they agreed to be part of the study the date of their next clinic visit was noted. During their clinic visit they were recruited into the study and written informed consent was undertaken, together with the administration of the two questionnaires. This group of patients was not followed up due to time constraints.

3.4 DATA COLLECTION

3.4.1 Data collection instrument and characteristics

In this study two structured questionnaires were used to collect data directly from participants and from participants’ medical records. Additional information such as baseline CD4 count and WHO stage were obtained from patients’ medical records. Structured interviews were conducted in order to ensure that patients who cannot read or write were not excluded, as well as to standardize data collection to reduce interviewer error.

The two structured questionnaires included a socio-economic questionnaire (Appendix 4) and a health related quality of life questionnaire (Appendix 3). The socio-economic questionnaire was extracted from questions of the General Household Survey 2013 conducted by Statistics South Africa (Statistic South Africa, 2014). This questionnaire was designed to collect demographic data (age and sex), socio-economic data (highest level of education, income and employment status) and
clinical data (CD4 count and WHO stage) (Table 3.1).

The health related quality of life questionnaire that was used to collect the data included the EuroQol health questionnaires. The tool has two sections, namely the EQ-5D from which the EQ-5D-5L index score was calculated and the visual analogue scale (VAS) score (EQ-VAS). The EQ-5D section is divided into five domains which include mobility, self-care, usual activities, pain or discomfort and anxiety or depression. Each domain has five levels which are: no problem, slight problem, moderate problem, severe problem and unable to perform. The value sets derived from the five domains of the EQ-5D can be used to deduce the overall health score for each patient, which is referred to as the index score (a full health score is equal to 1). The index score can be determined using the EQ-5D-5L crosswalk index value calculator version 2, which has value sets that are representative sample of the general population this is found on the EuroQol website (EuroQol Group, 2009). The second section is EQ-VAS which is a record of the patient’s self-rated health status on a scale of 0 to 100. The participant does a selection on how they perceive their health on that particular day on the scale of 0 to 100, where 0 means the worst health and 100 means the best health one can imagine.

The EQ-5D questionnaire was selected as it has already been authenticated in HIV/AIDS patients in South Africa by Jelsma et al. (2005). Hence the reliability and validity of this tool has been proven in South Africa (Jelsma et al., 2004). It was designed to be self-administered and short enough to be used in conjunction with other measures. It took about a minute to complete. It has been translated in many of the South African official languages including Sotho, Xhosa and Zulu (Jelsma et al., 2004).
Table 3.1 Summary of variables included in data collection tools.

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Independent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of life indicators</td>
<td>Socio-demographic characteristics</td>
</tr>
<tr>
<td>Mobility, self-care, usual activities, pain/discomfort,</td>
<td>Age, gender, education status,</td>
</tr>
<tr>
<td>depression/anxiety, index score, VAS score</td>
<td>income and employment status</td>
</tr>
<tr>
<td></td>
<td>CD4 count, ART status and WHO stage</td>
</tr>
</tbody>
</table>

3.5 ETHICAL CONSIDERATIONS

Permission to conduct this study was granted from the University of the Western Cape Senate Research Ethics committee (ref 15/7/237), as well as institutional approval from the hospital CEO and Gauteng Province Department of Health district office for permission to conduct the study at two primary health care facilities.

The principles of ethical research during data collection were respected at all times ensuring patients’ rights, dignity and confidentiality. The most important aspect of informed consent was to inform participants on why the study was being conducted, how it will impact on them as study participants and the importance of their consent (see Appendix 2) to being part of the study. This required cautious groundwork involving explanation and consultation as well as ensuring the participants understood everything before any data collection commenced. Every participant gave their written consent before they were enrolled in the study. If the participants requested that information and the consent form to be in their language, it was provided as such.
Participants were informed of their right to refuse to be part of the study, and could withdraw anytime. Patient information leaflets (Appendix 1) explaining the purpose of the study and how their data will be used were provided.

Anonymity was maintained by assigning each study participant with a unique identifier (hospital number was used for follow-up purpose) on the consent form that was linked to the set of questionnaires. The consent forms were kept locked away in a different location from the questionnaires. The information and findings from this study were be used for academic purposes only. Handling of data was restricted to the research team as the CEO only allowed access to the people included in the research permission form. The statistician only had access to anonymous data. Participants were also requested to give consent for the research team to access their medical records, as well as anonymous data to be accessed by the statistician.

Information that could identify individual patients was not used or disclosed for purposes other than healthcare. Storage, handling and sharing of data were most critical and therefore, a lockable cabinet was used to store hard copy data and the data stored on the computer was password protected. Data collected will be destroyed once research reports has been completed and examined.

People living with HIV are considered vulnerable and therefore, the participants in this study were not coerced into the study. If they chose not to participate in the study they still received the same level of care. The hospital CEO assessed the risks versus the benefits the study posed to the patients before the study was approved.

Participants were not put under any unnecessary risk during the study. The risks and benefits of participating in the study were clearly explained in the patient information leaflet (see Appendix

http://etd.uwc.ac.za
1). Over-burdening participants with long questionnaires was avoided and questionnaires were designed such that they do not take longer than half an hour to complete.

3.6 DATA ANALYSIS

Data from the questionnaires were captured onto an Excel spreadsheet. The socio-economic data were categorized as follows: highest level of education completed (grade 1-7, Grade 8-11, Grade 12, >12), employment status (employed, self-employed or not employed), and income level (<R500, R550-R2000, R2500-R5000, >R5000).

Clinical characteristics analysed included: WHO stage (stage 1, 2, 3, 4), CD4 count (cell/mm³) (≤200, 201-350, 351-500, >500). Each domain of the HRQoL questionnaire was captured according to the five different levels in the questionnaire. From the scores of the aforementioned five domains, the index score of each patient was determined using EQ-5D-5L crosswalk index value calculator version 2 found on the EuroQol website. The VAS score was captured. The data were double checked for errors before the spreadsheet was imported into STATA.

Statistical analysis was done using STATA version 14. Descriptive statistics was used to summarise baseline characteristics. Central tendency of the continuous variables were analyzed using mean and standard deviation if their distribution was normal and using the median and interquartile range if their distribution was not normally distributed (Figure 1). Categorical variables were described using frequencies and percentages using tabulations. The baseline characteristics of all the study participants in terms of demographics, socio-economics, clinical indicators and HRQoL will be presented using the aforementioned descriptive statistics.
The baseline data were separated by ART eligibility status of participants to infer any differences between the group eligible and not eligible to start ART. The paired t-test will be used for normally distributed variables, and non-parametric tests (Mann-Whitney test or Kruskal-Wallis) for non-normally distributed variables to test for association between exposures and outcomes. For categorical variables the Chi-squared ($\chi^2$) test was used provided the conditions for using this test was met (e.g. number of observations per cell is more than 10), if not the Fischer’s exact test was used. The level of significance was set at $P<0.05$. The HRQoL indicators will be further tabulated and dichotomised into baseline and two to three months follow up for those starting ART.

Poison regression analysis with robust standard errors will be used to estimate the relative risk and the 95% confidence interval of an unfavorable outcome (in this case the problem sub-category) while controlling for possible confounders. A univariate analysis to test association between the outcome and each variable (socio-demographic/clinical variables) individually was done. Then from this, significant association by checking the $p$ value was determined. At this stage there was more leniency so the cut-off is set at $p <0.200$. All factors with a $p$ value equal or less than 0.200 were considered for the multivariate analysis. Some factors were not significant in the univariate analysis (i.e. ART status) but were forced in the multivariate analysis because it is known from previous studies and literature review done that they influenced the outcome. Therefore, factors known to be of importance were included irrespective of significance in the univariate analysis.

The HRQoL outcomes under self-care in the ‘problem’ category none of the groups reported any problems therefore this was not included in the regression analysis. WHO staging was also left out because only 23% of the patients had their WHO documented in the file.
CHAPTER 4

RESULTS AND DISCUSSION

4.1 RESULTS

A total of 106 participants were recruited and enrolled in the study. Forty-six participants were recruited from the two clinics and were not eligible for ART, and, 60 participants were recruited from the hospital site and eligible to be started on ART. Of the 60 participants who started ART, one participant was lost to follow-up at the two to three month follow-up period.

Figure 1. The distribution of continuous variables; age, CD4 cell count, income (income 1 is baseline income and income 2 is 2-3 months income), index score (index score 1 and 2 are baseline and 2-3 months index scores respectively) and VAS score (VAS score 1 and 2 are baseline and 2-3 months follow up scores respectively). Only age was normally distributed, while others were either skewed to the right or to the left.
4.1.1 Participant characteristics

The sociodemographic and clinical characteristics of the 106 participants enrolled at baseline are presented in Table 4.1. There were 103 black participants, 2 white and 1 coloured. The baseline group had a median age of 36 IQR (30-44) years and about 70% were female. Almost half of the participants had an education level of Grade 12 (41.57%) and higher (8.49%). About 67% of participants were either employed or self-employed. Half of the participants had a CD4 count of more than 500cells/mm$^3$. In terms of income, the main source of income was salary (56.60%) the median income was R1500 (IQR R0-R3800). Only 15 participants had recorded WHO stage in their clinic records and of these 60% were stage 1. The WHO stage was thus not further analysed or reported on.

The baseline group was further divided into those 46 participants not eligible for ART and those 60 who were eligible for ART. Participants eligible for ART were significantly older than those not eligible for ART with a median of 38 (IQR 32-46) years and median of 34 (IQR 27-43) years, respectively (p=0.008). The group not yet eligible for ART comprised of mostly women (91.30%) versus the ART eligible group that comprised only about half of women (53.33%) (p< 0.001). Both groups had comparable levels of education, employment status and income, however income increased post ART initiation (p=0.013) (see appendix 5 table 4.5). As expected the group not yet eligible for ART had a significantly higher CD4 count compared to the ART group with median of 697.50 (IQR 589-900) and 213.50 (IQR 80-387.50), respectively, (p < 0.001) (Table 4.1).
Table 4.1 Demographic, socio-economic and clinical characteristics of the study population

Demographic, socio-economic and clinical characteristics of the 106 participants in the study population. This population was divided into the group of 46 participants not yet eligible for ART (ART naïve) and 60 participants eligible to start ART (ART).

<table>
<thead>
<tr>
<th>Total (n= 106)</th>
<th>ART- naïve (n= 46)</th>
<th>ART (n= 60)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yrs., median (IQR)</td>
<td>36 (30-44)</td>
<td>34 (27-43)</td>
<td>38 (32-46)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>74 (69.81)</td>
<td>42 (91.30)</td>
<td>32 (53.33)</td>
</tr>
<tr>
<td>Males</td>
<td>32 (30.19)</td>
<td>4 (8.70)</td>
<td>28 (46.67)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>2 (1.89)</td>
<td>0 (0.00)</td>
<td>2 (3.33)</td>
</tr>
<tr>
<td>Grade 1-7</td>
<td>18 (16.98)</td>
<td>13 (28.26)</td>
<td>5 (8.33)</td>
</tr>
<tr>
<td>Grade 8-11</td>
<td>33 (31.13)</td>
<td>10 (21.74)</td>
<td>23 (38.33)</td>
</tr>
<tr>
<td>Grade 12</td>
<td>44 (41.51)</td>
<td>18 (39.13)</td>
<td>26 (86.67)</td>
</tr>
<tr>
<td>&gt;Grade 12</td>
<td>9 (8.49)</td>
<td>5 (10.87)</td>
<td>4 (6.67)</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>64 (60.38)</td>
<td>25 (54.35)</td>
<td>39 (65.00)</td>
</tr>
<tr>
<td>Self employed</td>
<td>7 (6.60)</td>
<td>4 (8.70)</td>
<td>3(5.00)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>35 (33.02)</td>
<td>17 (36.96)</td>
<td>18 (30.00)</td>
</tr>
<tr>
<td>Income, median (IQR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤R500</td>
<td>1500 (0-3800)</td>
<td>1650 (0-4500)</td>
<td>2218 (0-2218)</td>
</tr>
<tr>
<td>R500-R2000</td>
<td>18 (25.35)</td>
<td>6 (20.70)</td>
<td>13 (30.95)</td>
</tr>
<tr>
<td>R2000-R5000</td>
<td>23 (32.39)</td>
<td>12 (41.38)</td>
<td>11 (26.19)</td>
</tr>
<tr>
<td>&gt;R5000</td>
<td>6 (8.45)</td>
<td>5 (17.24)</td>
<td>1 (2.38)</td>
</tr>
<tr>
<td>Did not want to disclose</td>
<td>20 (28.17)</td>
<td>4 (13.79)</td>
<td>16 (38.10)</td>
</tr>
<tr>
<td>CD4 count, cell/mm³ median (IQR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤200</td>
<td>494.50 (155-680)</td>
<td>697.50 (589-900)</td>
<td>213.50 (80-387.50)</td>
</tr>
<tr>
<td>&gt;201 - 350</td>
<td>29 (27.36)</td>
<td>0 (0.00)</td>
<td>29 (48.33)</td>
</tr>
<tr>
<td>&gt;351 - 500</td>
<td>12 (11.32)</td>
<td>0 (0.00)</td>
<td>12 (20.00)</td>
</tr>
<tr>
<td>&gt;500</td>
<td>12 (11.32)</td>
<td>0 (0.00)</td>
<td>12 (20.00)</td>
</tr>
<tr>
<td>&gt;500</td>
<td>53 (50.00)</td>
<td>46 (100.00)</td>
<td>7 (11.67)</td>
</tr>
</tbody>
</table>
4.1.2 Comparison of health related quality of life outcome by ART status at baseline and two to three months post ART initiation

Table 4.2 summarises the HRQoL measurements of both the cross-sectional and the cohort results of all the participant groups. The HRQoL for the entire baseline group was most affected by pain and discomfort, followed by depression and anxiety, amounting to 40.57% and 23.58% of participants, respectively. The only significant difference between the ART and non-ART groups were that the ART group initially experienced more problems with usual activities (18.33%) than the non-ART group (2.00%), (p = 0.037). However, the VAS score indicated that at baseline ART group had a significantly higher median of 90 (IQR 76.50-99) while non-ART group scored median 66.50 (IQR 60-80); (p < 0.001). A sub-analysis within the ART and ART naïve groups to see if there were any significant differences in the VAS between genders for the entire group (ART & ART naïve, and within each ART status group) was done. The results for each analysis indicated that there was no statistically significant difference in the baseline VAS score mean for males and females for all study participants (p = 0.315). There was also no difference in the baseline VAS score median for males and females among the ART participants (p = 0.487), and no difference in the ART naïve participants (p = 0.678) (see appendix 5 Table 4.4).

At two to three months follow up of the group that started ART, there was one patient that was lost to follow up. The total number of ART group changed from 60 to 59. The HRQoL for ART group at two to three month follow up improved significantly except for usual activities. Mobility improved from 86.67% to 98.31% (p = 0.011), pain/discomfort increased from 60% to 83% (p = 0.005), depression/anxiety rose from 78% to 84% (p = 0.008). Median VAS score increased from 90 to 98 (p < 0.001).
Table 4.2 Health-related quality of life (EuroQol) of ART-naïve and ART groups at study baseline and ART baseline vs ART 2-3 months after study enrolment

Analysis using Pearson’s chi-square ($\chi^2$), Fischer’s exact test for number of observations per cell of less than 5, as well as t-test for continuous variables were undertaken.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>2-3 months follow-up</th>
<th>P value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>ART-naïve (study baseline)</td>
<td>ART (study baseline)</td>
<td>ART (study baseline)</td>
</tr>
<tr>
<td>n=106</td>
<td>n=46</td>
<td>n=60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N (%)</td>
<td>N%</td>
<td>N%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mobility</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problems</td>
<td>92 (86.79)</td>
<td>40 (86.96)</td>
<td>52 (86.67)</td>
<td></td>
</tr>
<tr>
<td>Problems</td>
<td>14 (13.21)</td>
<td>6 (13.04)</td>
<td>8 (13.33)</td>
<td></td>
</tr>
<tr>
<td><strong>Self-Care</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problem</td>
<td>103 (97.17)</td>
<td>46 (100)</td>
<td>57 (95.00)</td>
<td></td>
</tr>
<tr>
<td>Problems</td>
<td>3 (2.83)</td>
<td>0 (0.00)</td>
<td>3 (5.00)</td>
<td></td>
</tr>
<tr>
<td><strong>Usual Activities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problems</td>
<td>93 (87.74)</td>
<td>44 (95.65)</td>
<td>49 (81.67)</td>
<td></td>
</tr>
<tr>
<td>Problems</td>
<td>13 (12.26)</td>
<td>2 (2.00)</td>
<td>11 (18.33)</td>
<td></td>
</tr>
<tr>
<td><strong>Pain/Discomfort</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problems</td>
<td>63 (59.43)</td>
<td>27 (58.70)</td>
<td>36 (60.00)</td>
<td></td>
</tr>
<tr>
<td>Problems</td>
<td>43 (40.57)</td>
<td>19 (41.30)</td>
<td>24 (40.00)</td>
<td></td>
</tr>
<tr>
<td><strong>Depression/Anxiety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problems</td>
<td>81 (76.42)</td>
<td>34 (73.91)</td>
<td>47 (78.33)</td>
<td></td>
</tr>
<tr>
<td>Problems</td>
<td>25 (23.58)</td>
<td>12 (26.09)</td>
<td>13 (21.67)</td>
<td></td>
</tr>
<tr>
<td><strong>Index Score (IQR)</strong></td>
<td>0.88 (0.81-0.90)</td>
<td>0.86 (0.81-0.90)</td>
<td>0.90 (.81-90)</td>
<td></td>
</tr>
<tr>
<td><strong>VAS score, median (IQR)</strong></td>
<td>80 (65-93)</td>
<td>66.50 (60-80)</td>
<td>90 (76.50-99.00)</td>
<td></td>
</tr>
</tbody>
</table>
4.1.3 Comparison of health related quality of life outcomes with sociodemographic and clinical outcomes

Table 4.3 shows the baseline group’s univariate and multivariate analyses of certain variables such as age, gender, education level, employment status, ART status, CD4 count, index scores and VAS scores as associated with the five domains in the HRQoL questionnaire. The univariate analysis shows that males were 9% (CI 0.86-0.97) \( (p=0.004) \) less likely to experience significant problems with mobility than females. With higher education thus above grade twelve the percentage change in the incident rate of not experiencing problems with mobility is an increase of 75% (CI 1.02-1.13) \( (p=0.005) \) for every unit increase in education. This means that patients with higher education have less problems with mobility. Self-employed participants were 9% (CI 0.89-1.00) \( (p=0.034) \) less likely to experience problems with usual activities. The participants not yet eligible for ART (ART naïve group) was 11% (CI 1.01-1.20) \( (p=0.025) \) less likely to experience problems with mobility and 21% (CI 1.06-1.38) \( (p=0.004) \) less likely to experience problems with pain/discomfort than the group of participants eligible for ART (ART group). Participants with CD4 counts above 500 cell/mm³ were 11% (CI 1.03-1.20) \( (p=0.006) \) less likely to experience problems with mobility than participants with lower CD4 counts.

The multivariate analysis did not find a difference in the HRQoL outcomes in mobility and usual activities. There was nevertheless an 11% (CI 0.76-0.93) \( (p=0.001) \) less likelihood that ART naïve group would experience problems with anxiety/depression than the group eligible for ART.
Table 4.3 univariate and Multivariate analyses showing factors associated with the five Health related Quality of Life (EuroQol) domains

The multivariate analysis indicate that ART naïve group is less likely to experience problems with pain/discomfort and Anxiety/depression

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mobility</th>
<th>Usual activities</th>
<th>Pain/discomfort</th>
<th>Anxiety/depression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IRR (95% CI)</td>
<td>p-value</td>
<td>aIRR (95% CI)</td>
<td>p-value</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>1.00 (0.99-1.00)</td>
<td>0.668</td>
<td>0.99 (0.99-1.00)</td>
<td>0.159</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.00 (1.00-1.00)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>0.91 (0.86-0.97)</td>
<td>0.004</td>
<td>0.98 (0.93-1.03)</td>
<td>0.356</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>1 (1-1)</td>
<td>0.988</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;Grade 12</td>
<td>1.75 (1.02-1.129)</td>
<td>0.005</td>
<td>1.05 (0.95-1.17)</td>
<td>0.338</td>
</tr>
<tr>
<td>≤Grade 12</td>
<td>1 (1-1)</td>
<td>0.988</td>
<td>1.03 (0.86-1.23)</td>
<td>0.771</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>1 (1-1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self employed</td>
<td>0.96 (0.91-1.00)</td>
<td>0.071</td>
<td>0.98 (0.89-1.08)</td>
<td>0.649</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1.07 (0.96-1.19)</td>
<td>0.241</td>
<td>1.08 (0.98-1.18)</td>
<td>0.122</td>
</tr>
<tr>
<td><strong>ART status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ART</td>
<td>1 (1-1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ART-naive</td>
<td>1.11 (1.01-1.22)</td>
<td>0.025</td>
<td>1.08 (0.96-1.22)</td>
<td>0.183</td>
</tr>
<tr>
<td><strong>CD4 count</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤200</td>
<td>1 (1-1)</td>
<td>0.999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;201 - 350</td>
<td>1 (1-1)</td>
<td>0.999</td>
<td>1.07 (0.97-1.17)</td>
<td>0.169</td>
</tr>
<tr>
<td>&gt;351 - 500</td>
<td>1.09 (0.93-1.26)</td>
<td>0.276</td>
<td>1.14 (0.99-1.32)</td>
<td>0.07</td>
</tr>
<tr>
<td>&gt;500</td>
<td>1.11 (1.03-1.20)</td>
<td>0.006</td>
<td>1.13 (0.95-1.35)</td>
<td>0.18</td>
</tr>
</tbody>
</table>

IRR - Univariate Incident Rate Ratio
aIRR- Multivariate Incident Rate Ratio
4.2 DISCUSSION

The cross-sectional study looked at HRQoL between the two groups of patients, those that were eligible for ART and those not yet eligible for ART. The group not yet eligible for ART comprised of mostly women (91.30%) versus the ART group that comprised only about half of women (53.33%) P<0.001. This could be similar to the finding of the study conducted by Louwagie et al. (2007) that most women seek health care services early while their CD4 cell counts are still high and therefore will be in the pre ART services at health care facilities before they can initiate ART. Men usually wait until they are sick to seek medical attention and hence their CD4 cell count would be low.

In terms of HRQoL, the main findings were as follows; firstly, the ART eligible group had significantly more problems in the domain of usual activities as compared to the group not yet eligible (p = 0.037), yet the overall index scores (that take into account all five domains) showed no significant difference between the two groups, and, secondly, the VAS scores were significantly higher in the ART eligible group (p < 0.001). The VAS score is an indication of how a participant perceives his or her overall health on that particular day and the value of this measurement may be limited by the absence of information about any acute conditions experienced by participants on the day of data collection. The WHO stage would assist with providing an indication of symptoms the patient maybe experiencing that could potentially affect their perceived health. These data were missing in the majority of clinical stationary. Looking further into the difference between the groups, the fact that the group not yet eligible for ART was significantly younger than the ART eligible group (p = 0.0084) may have influenced the younger group to have higher expectations of their health. An analysis within the ART group to see if there were any significant differences in the VAS score between genders was conducted.
There was no difference in the baseline VAS score mean for males and females among the ART participants (p=0.487) and thus gender was eliminated as the cause of this difference. Ayodele et al. (2014) also found no gender difference in all domains of HRQoL in their study, on the other hand Tesfay et al. (2015) and Abasiubong et al. (2010) both found that female gender experienced lower HRQoL as compared to men. Lastly, it is interesting to note that although the CD4 counts of the group not yet eligible for ART were significantly higher than the ART eligible group, it still did not translate to a perception of better health as per the VAS score.

The HRQoL outcomes improved significantly upon access to ART treatment, this was evident in the two to three months follow up data. The ART group at two to three months compared to their baseline measurements had a significantly higher index score (p = 0.0001) and VAS score (p < 0.001). Index score of 1 is the value for full health therefore, our ART patients were very close to 1 at 0.90. Regarding the VAS score, 100% is the best imaginable health and ART patients scored 98%. The results could be generalized to the study population because the index score is based on the values of the general population as opposed to the VAS score which is based on the patients ‘self-perception of their health, but because the sampling technique used was not random and the sample size was not representative of the study population caution should be exercised when making generalisations.

Similar results were reported by Stangl et al. (2007), who determined that once ART was initiated and CD4 cell count increased there was improvement in QoL, they further indicated that most gains were achieved by the third month of ART therapy. In addition, Jelsma et al. (2005) found that patients with HIV in resource poor countries can have improved quality of life due to access to antiretroviral (ARV) treatment. Improvement was evident in all domains of the EQ- 5D, which was already evident in the first month post ART initiation. Abera et al. (2010)
established that patients with high CD4 counts (above 200 cells/mm³), on treatment longer than 12 months were associated with better HRQoL. Igumbor et al. (2013) concluded that patients on treatment for 12 months had better QoL compared to treatment naïve patients.

The following studies conducted by Louwagie et al. (2007), Nglazi et al. (2014) and Peltzer (2012) found similar results: Louwagie et al. (2007) showed improvements in QoL after initiation on ART as compared to the control group, improvements were seen in all five domains of the EQ-5D, even though the results are similar the studies are not directly comparable due to different sample size. Nglazi et al. (2014) found that HRQoL was improved with ART use and that ART patients had higher VAS scores compared to ART naïve group. Peltzer (2012) determined that QoL improved in patients on ART and besides a good study sample of 735 participants the follow up was longer at baseline, 3 months, 6 months and 12 months.

Employed and self-employed participants were less likely to report problems in the univariate and multivariate analysis compared to unemployed participants signifying better HRQoL. Further analysis into income (see appendix 5 table 4.5) indicated that post ART therapy the median income changed from R2218.30 to R2464.87 (p=0.013). The participants with higher education above grade 12 were less likely to report problems in the univariate and multivariate analysis compared to participants with education below grade 12 indicating better HRQoL. This was reported in other studies by Friend-du Preez and Peltzer (2010), Peltzer (2012), Mûnene and Ekman (2014) and Tesfay et al. (2015) they indicated that employment and higher education were associated with better HRQoL. Deribew et al. (2013) did not however find any relationship between HRQoL and employment or income.
Notwithstanding that the ART naïve group in this study was not followed up, it should not skew the results drastically because there was no intervention done on this group and for that reason one would expect not to see any change in this group’s outcomes.

The strengths of the study were the use of the index score in combination with the VAS score to determine the HRQoL. There was only one patient lost to follow up. There was limited bias when administering questionnaires because they were not self-administered rather they were administered by someone who could translate the questionnaire to participants who could not understand English.

4.2.1 Limitations of the study

There were several limitations to the study. Firstly, sample size was not representative of the study population and only managed to recruit 46 ART naïve patients instead of 60, therefore care should be taken when generalizing the results to the study population. External validity of data will also be compromised as the sample size is not an accurate representation of the population. If random sampling was used this issue would be avoided. Secondly, the follow up period was too short and some patients were followed up at two months and others at three months, even though change in HRQoL was significant clinically, statistically it can still be questionable. Third, participants not yet eligible for ART at baseline were not followed up because their data were only collected towards the end of the data collection period. The reason being permission to collect data for these patients took too long and in order to meet the deadlines follow up could not be done. This is expected to be another limitation of the study as it will skew the data. Fourth, Only 19 patients out of 60 of the ART group had CD4 counts in the range >350-500 cell/mm³ and >500 cell/mm³. This is an indication that despite changes in the South African HIV treatment guidelines patients still starts treatment at very low CD4 counts. As a result, we cannot come to a conclusion of the effect of ART
on QoL of patients with higher CD4 counts. Fifth, other studies like Harding et al. (2014), Deribew et al. (2013) and Mûnene et al. (2014) indicated the issue of missing clinical data such as WHO stage in patients ‘clinical records this was also a substantial problem in this study. Only 15 out of 106 participants had their WHO stage recorded in their medical records. Therefore, effect of WHO stage on HRQoL could not be analysed in this study hence the inability to further interrogate the VAS score due to lack of acute symptom data. Sixth, the study site was initially hospital A only, but during data collection it was discovered that patients not yet eligible for treatment with high CD4 counts were referred out to near-by primary health care clinics. Two clinics close to hospital A were selected. These amendments had to be authorized by the ethics committee as well as different levels within the health district. The approval took two months, which then influenced the follow up of some patients to two months instead of three months in order to meet the thesis submission deadline.
CHAPTER 5

CONCLUSIONS AND/ RECOMMENDATIONS

5.1 CONCLUSIONS

The purpose of this study was to investigate the health related quality of life of HIV-positive patients either eligible or not yet eligible for ART at a CD4 count cut off of 500 cells/mm$^3$. It also measured the HRQoL of the group that were initiated on ART two to three month post ART initiation. Finally, the influence of education level, employment status and income were also associated with HRQoL in these groups.

There were conflicting findings for HRQoL between participants eligible for ART and the group not yet eligible for ART. The index score (i.e. the objective measure for HRQoL) did not indicate any significant difference between the two groups. However according to the VAS score (i.e. subjective HRQoL measure) there was a significant difference, showing the ART group having a significantly better HRQoL than the group not yet eligible for ART. Consequently, we will fail to reject or accept research hypothesis 1, because there was no conclusive difference between the two groups.

It was found that access to ART treatment does bring about improvement in HRQoL, as measured by the EQ-5D questionnaire’s index score and the VAS score Improvements in HRQoL were significant two to three months post ART initiation. Therefore, we reject the null hypothesis $H_0$ 2 because access to ART did show significant improvement in HRQoL two to three months post ART initiation.
Higher education level and employment as well as income were associated with better HRQoL. However conclusions on the effect of ART on HRQoL among patients with high CD4 counts could not be reached. Therefore, we did not reject or accept research hypothesis three (3).

5.2 RECOMMENDATIONS

Further studies should be done to look at the impact of ART on HRQoL for patients with higher CD4 counts over an extended period than this study, especially with the implementation of universal test and treat in South Africa. More needs to be done to ensure that patients test early and hence access to ART treatment earlier. There is a need to ensure that primary health care facilities develop appointment and booking systems for patients which was a huge challenge faced during data collection. The documentation of WHO stage in the clinical stationary should be strengthened as well.
REFERENCES


April [Online]. Available at: http://www.biomedcentral.com/1471-2458/14/343.


59-65.

WHO (2007) *WHO HIV guidelines*. Available at:


Appendices

Appendix 1: Patient information leaflet

Dr Mea van Huyssteen
Pharmacy building, First floor Room F6, School of Pharmacy, University of the Western Cape, Robert Sobukwe Road, Bellville, 7535
Tel: 021 9592864
Ms. Mpato Mokobori
Tel: 011 2768850
Cell: 0736193324

Patient Information Leaflet

Protocol Title:

Analysis on Access to Antiretroviral therapy for patients with different income and educational level, and the effect of treatment on quality of life after three months of therapy.

Principal Investigator’s Name: Mpato Mokobori

Principal Investigator’s Title: District Pharmacist

Telephone No. of Principal Investigator: 0112768850

You are being invited to take part in a clinical research study carried out at Themba Lethu Clinic. Before you decide whether or not you wish to take part, you should read the information provided below carefully and if you wish to discuss it with your family, friends or GP. Take time to ask questions – do not feel rushed or under any obligation to make a hasty judgement. You should clearly understand the risks and benefits of participating in this study so that you can make a decision that is right for you – this process is known as Informed Consent.

You are not obliged to take part in this study and if you decide not to participate it will have no effect on your future care.

You may change your mind at any time (before the start of the study or even after you have commenced the study) for whatever reason without having to justify your decision and without any negative impact on the care you will receive from the medical staff.
WHY IS THIS STUDY BEING DONE?

This study is being done because we want to learn how access to antiretroviral therapy will affect the quality of life and how soon after initiation of therapy within three months is the impact seen.

WHO IS ORGANISING AND FUNDING THIS STUDY?

This study is purely for research purpose and not routine care, it is conducted as part of a Master’s program and there will be academic qualification as well as career advancement for the researcher.

HOW WILL IT BE CARRIED OUT?

A study to look at the effect of treatment on quality of life will be undertaken at Themba Lethu clinic in Johannesburg South Africa. This will commence in November 2015 to June 2016. The study will be undertaken to look at estimating whether there are significant differences between two different groups of patients. Sample one will be participants that are being initiated on anti-retroviral treatment and sample two will be participants that have not yet been initiated on treatment.

Participants will be asked a number of questions on two different occasions when they attend the clinic. You as the participants will be expected to be in the study for a period of three to four months. There will be a total of 120 patients in the study. The sort of questions that will be asked include: what is your level of education? What is your monthly income? Then there will be questions of quality of life such as mobility, self-care, usual activities, pain/discomfort and anxiety/Depression. These questionnaires will not take more than half an hour. So about one hour of your time will be required including time for informed consent.

Some of the questionnaires may be sensitive and can offend or upset you. It has been indicated in the questionnaire why these questions are critical in the study and each patient needs to understand why they are being asked. You can choose not to answer these questions.

WHAT WILL HAPPEN TO ME IF I AGREE TO TAKE PART?

You need to know what the study is about and that there will be no pain at all except a little inconvenience due to the questionnaires and informed consent that will be undertaken. There will be no additional care with study. All the questionnaires will be administered during normal clinic visits therefore there are no additional visits involved. There will be no compensation given for participation.

BENEFITS:

There is no direct benefit for your participation but there could be benefit for the overall clinical management of patients in future.
RISKS:

Some of the questionnaires may be sensitive and can offend or upset you. It has been indicated in the questionnaire why these questions are critical in the study and each patient needs to understand why they are being asked. You can choose not to answer these questions.

You will also be inconvenienced as you will spend more time in the clinic for informed consent and questionnaires but the questionnaires have been designed such that they do not take longer than half an hour.

Potential breach of patient confidentiality is a risk. Efforts will be made to keep personal information confidential. There will be no disclosure of your information to any third party unless it is made unidentifiable.

WHAT IF SOMETHING GOES WRONG AS A RESULT OF MY PARTICIPATION IN THIS STUDY?

This is a very low risk study and therefore no untoward effects are expected. The safety of participants will always be the first priority.

WILL THERE BE ANY ADDITIONAL COSTS INVOLVED?

There will be no additional cost involved as recruitment and follow up will be during your routine clinic visit and therefore not out of pocket expenses will be expected.

CONFIDENTIALITY ISSUES

Efforts will be made to keep personal information confidential. Your confidentiality will be maintained throughout the study. There will be no disclosure of your information to any third party unless it is unidentifiable. Your information will be accessed by me as the researcher and the statistician.

Organizations that may inspect and/or copy your research records for quality assurance and data analysis include groups such as the Research Ethics Committee.

If results are published, may lead to cohort identification but not individual identification.

Your information that has been collected will be stored in a locked cupboard and information collected on the Personal Computer will be password protected. The information and findings for this study will be used for academic purposes only. Data will be retained for not longer than the time needed for publication, it will be retained at our research site and it will be anonymous data only that will be stored. These data will be destroyed once the thesis has been completed and if publication is to be done then it will be destroyed once published.

Access to your medical records will be sought from the hospital CEO and this records will be treated with confidentiality. You will also give informed consent for the research team to have

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access to your medical records. The data will be deleted from my computer and the research site where it will be stored.

**IF YOU REQUIRE FURTHER INFORMATION**

If you have any further questions about the study, or if you wish to withdraw from the study you may do so without justifying your decision and your future treatment will not be affected.

For additional information now or any future time please contact:

**Name:** Mpato Mokobori

**Address:** Themba Lethu Clinic – Helen Joseph Hospital, Perth Road, Westdene.

**Phone No:** 0112768850

Alternatively you can contact:
Dr Mea van Huyssteen
Pharmacy building, First floor Room F6, School of Pharmacy, University of the Western Cape, Robert Sobukwe Road, Bellville, 7535
Tel: 021 9592864

The committees giving ethical approval for this study is the UWC Faculty Board Research and Ethics Committee and the UWC Senate Research Committee. If you have any problems or questions about this study you can also contact the Ethics Committee directly at telephone number 021 9593170.
Appendix 2: Consent form

Dr Mea van Huyssteen
Pharmacy building, First floor Room F6, School of Pharmacy, University of the Western Cape, Robert Sobukwe Road, Belville, 7535
Tel: 021 9592864
Ms. Mpato Mokobori
Tel: 011 2768850
Cell: 0736193324

CONSENT FORM

Protocol Title:

Analysis on Access to Antiretroviral therapy for patients with different income and educational level, and the effect of treatment on quality of life after three months of therapy.

Please tick the appropriate answer.

I confirm that I have read and understood the Patient Information Leaflet dated _24/04/2015_ attached, and that I have had ample opportunity to ask questions all of which have been satisfactorily answered. □Yes □No

I understand that my participation in this study is entirely voluntary and that I may withdraw at any time, without giving reason, and without this decision affecting my future treatment or medical care. □Yes □No

I understand that my records may be viewed by individuals with delegated authority from ___Hospital CEO DR. Bila_. □Yes □No

I understand that my identity will remain confidential at all times. □Yes □No

I am aware of the potential risks of this research study. □Yes □No

I have been given a copy of the Patient Information Leaflet and this Consent form for my records. □Yes □No

FUTURE USE OF ANONYMOUS DATA:

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I agree that I will not restrict the use to which the results of this study may be put. I give my approval that unidentifiable data concerning my person may be stored or electronically processed for the purpose of scientific research and may be used in related or other studies in the future. (This would be subject to approval by an independent body, which safeguards the welfare and rights of people in biomedical research studies)

☐ Yes  ☐ No

Participant____________________
Signature and dated____________________
Name in block capitals____________________

To be completed by the Investigator or his nominee.

I the undersigned, have taken the time to fully explain to the above patient the nature and purpose of this study in a manner that he/she could understand. I have explained the risks involved, the experimental nature of the treatment, as well as the possible benefits and have invited him/her to ask questions on any aspect of the study that concerned them.

Signature:____________________
Name in Block Capitals:____________________
Qualification:____________________
Date:____________________

Unique identifier

3 copies to be made: 1 for patient, 1 for PI and 1 for hospital records.
Appendix 3: EQ-5D-5L Quality of life questionnaire

Dr Mea van Huyssteen
Pharmacy building, First floor Room F6, School of Pharmacy, University of the Western Cape, Robert Sobukwe Road, Bellville, 7535
Tel: 021 9592864
Ms. Mpato Mokobori
Tel: 011 2768850
Cell: 0736193324

Unique ID

Name of interviewer

Date of interview

Time interview started

Time interview stopped

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Under each heading, please tick the ONE box that best describes your health TODAY.

MOBILITY
I have no problems in walking about
I have slight problems in walking about
I have moderate problems in walking about
I have severe problems in walking about
I am unable to walk about

SELF-CARE
I have no problems washing or dressing myself
I have slight problems washing or dressing myself
I have moderate problems washing or dressing myself
I have severe problems washing or dressing myself
I am unable to wash or dress myself

USUAL ACTIVITIES (E.g. work, study, housework, family or Leisure activities)
I have no problems doing my usual activities
I have slight problems doing my usual activities
I have moderate problems doing my usual activities
I have severe problems doing my usual activities
I am unable to do my usual activities

PAIN / DISCOMFORT
I have no pain or discomfort
I have slight pain or discomfort
I have moderate pain or discomfort
I have severe pain or discomfort
I have extreme pain or discomfort

ANXIETY / DEPRESSION
I am not anxious or depressed
I am slightly anxious or depressed
I am moderately anxious or depressed
I am severely anxious or depressed
I am extremely anxious or depressed
- We would like to know how good or bad your health is TODAY.

- This scale is numbered from 0 to 100.

- 100 means the best health you can imagine.
  0 means the worst health you can imagine.

- Mark an X on the scale to indicate how your health is TODAY.

- Now, please write the number you marked on the scale in the box below.

YOUR HEALTH TODAY =

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Appendix 4: Socio-demographic questionnaire

Dr Mea van Huyssteen
Pharmacy building, First floor Room F6, School of
Pharmacy, University of the Western Cape, Robert
Sobukwe Road, Bellville, 7535
Tel: 021 9592864
Ms. Mpato Mokobori
Tel: 011 2768850
Cell: 0736193324

SOCIO-DERMOGRAPHIC QUESTIONNAIRE

<table>
<thead>
<tr>
<th>Name of the interviewer:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Date of interview:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Time interview started:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Time interview finished:</th>
</tr>
</thead>
</table>
1. Unique ID .................................

2. Hospital number .........................

3. Race ........................................

4. Gender ....................................... 

5. Date of Birth ............................... 

6. Baseline CD4 count ....................... 

7. WHO staging ............................... 

8. Cell phone number ...........................

9. What is the highest level of education that you have successfully completed?

Diplomas or certificates must be of six months
Plus study duration full-time (or equivalent) to be included
98 = No schooling
00 = Grade R/0
01 = Grade 1/ Sub A/Class 1
02 = Grade 2/ Sub B/Class 2
03 = Grade 3/Standard 1/ ABET 1 (Kha Ri Gude, Sanli)
04 = Grade 4/ Standard 2
05 = Grade 5/ Standard 3/ ABET 2
06 = Grade 6/Standard 4
07 = Grade 7/Standard 5/ ABET 3
08 = Grade 8/Standard 6/ Form 1
09 = Grade 9/Standard 7/ Form 2/ ABET 4
10 = Grade 10/ Standard 8/ Form 3
11 = Grade 11/ Standard 9/ Form 4
12 = Grade 12/Standard 10/ Form 5/Matric (No Exemption)
13 = Grade 12/Standard 10/ Form 5/Matric (Exemption *)
14 = NTC 1/ N1/NC (V) Level 2
15 = NTC 2/ N2/ NC (V) Level 3
16 = NTC 3/ N3/ NC (V)/ Level 4
17 = N4/ NTC 4
18 = N5/ NTC 5
19 = N6/ NTC 6
20 = Certificate with less than Grade 12/ Std 10
21 = Diploma with less than Grade 12/ Std 10
22 = Certificate with Grade 12/ Std 10
23 = Diploma with Grade 12/ Std 10
24 = Higher Diploma (Technicon/University of Technology)
25 = Post Higher Diploma (Technicon/University of Technology Masters, Doctoral)
26 = Bachelor's Degree
27 = Bachelor's Degree and post-graduate diploma
28 = Honor's Degree
29 = Higher degree (Masters, Doctorate)
30 = other (specify in the box below)
10. Do you or anyone in your household receive a Social grant, pension or social relief Assistance from the Government?

1 = Yes 
2 = No 
3 = Do not know

11. During the last calendar week (Sunday to Saturday) Did you work for a wage, salary, commission or any payment in kind (including paid domestic work), even if it was for only one hour? Examples: a regular job, contract, casual or piece work for pay, work in exchange for food or housing, paid domestic work.

1 = Yes 
2 = No 
3 = Do not know

12. During the last calendar week (Sunday to Saturday) Did you run or do any kind of business, big or small, for yourself or with one or more partners, even if it was for only one hour? Examples: Commercial farming, selling things, making things for sale, construction, repairing things, guarding cars, brewing beer, collecting wood or water for sale, hairdressing, creche businesses, taxi or other transport business, having a legal or medical practice, performing in public, having a public phone shop, etc.

1 = Yes 
2 = No 
3 = Do not know

13. What is your total salary/pay at your main job? Including overtime, allowances and bonus, before any tax or deductions. Give amount in whole figures, without any text or decimals. If "NONE", "REFUSE" or "DO NOT KNOW write 999 999 999 ........................

14. Ask only if an amount is given in Q11 Is this ....

1 = Per week 
2 = Per month 
3 = Annually

15. What means of transport is usually used by you to get to your place of employment? If more than one mode is used, indicate the one that covers the longest distance. 
1 = Office is at home 
2 = Walking 
3 = Bicycle/motorcycle 
4 = Minibus taxi/ sedan taxi/bakkie taxi 
5 = Bus 
6 = Train

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7 = Lift club by a group of people sharing a private vehicle
8 = Own car/other private vehicle/company vehicle
9 = Other (specify in the block)

16. How many minutes does it take you to get to your place of employment? Specify for one direction only, using all the usual means of transport

1 = Less than 15 minutes
2 = 15 - 30 minutes
3 = 31 - 60 minutes
4 = 61 - 90 minutes
5 = More than 90 minutes
6 = Do not know

17. During the last four calendar weeks, were you looking for any kind of job or trying to start any type of business?

1 = Yes
2 = No
3 = Do not know

18. What was the main reason for not trying to find work or starting a business during the past four calendar weeks?

01 = Awaiting the season for work
02 = Waiting to be recalled to former job
03 = Health reasons
04 = Pregnancy
05 = Disabled or Unable to work (Handicapped)
06 = Housewife/Homemaker (Family Considerations/child care)
07 = Undergoing training to help find work
08 = No jobs available in the area
09 = Lack of money to pay for transport to look For work
10 = Unable to find work requiring his/her skills
11 = Lost hope of finding any kind of work
12 = No transport available
13 = Scholar or student
14 = Retired
15 = Too old/young to work
16 = did not want to work
17 = Other

19. Did you own a mobile telephone in working Order during some or all of the past 12 months?

1 = Yes
2 = No

20. Is this facility the nearest of its kind (clinic/hospital/health center

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Etc.) To your dwelling?

1 = Yes
2 = No

21. Answer if “No” in 18
If not the nearest, why is the household normally not using the nearest facility?

01 = Facilities not clean
02 = Long waiting time
03 = Opening times not convenient
04 = Too expensive
05 = Drugs that were needed, not available
06 = Staff rude or uncaring or turned patient away
07 = Incorrect diagnosis
08 = Not on medical aid scheme list of facilities
09 = Prefer to use a State/Provincial health institution
10 = Prefer to use a private health institution
11 = other (specify)

22. What are the sources of income for this household?
Read all the options

1 = Salaries/wages/commission
2 = Income from a business
3 = Remittances (money received from people living elsewhere)
4 = Pensions
5 = Grants (include old age grant here)
6 = Sales of farming products and services
7 = other income sources e.g. rental income, interest
8 = No income

23. Which one of the above income sources is the main source of Income?
Write the option number below. If only one source of Income write the code of that one source.

24. If the household receives an income from remittances, please Specify approximately how much they receive per month? If no Income received from remittances write 0.

25. If the household receives an income from pensions (do Not include income from old age grants), please specify Approximately how much they receive per month? If no income Received from pensions write 0.
### Table 4.1 Demographic, socio-economic and clinical characteristics of the study population

Demographic, socio-economic and clinical characteristics of the 106 participants in the study population. This population was divided into the group of 46 participants not yet eligible for ART (ART naïve) and 60 participants eligible to start ART (ART).

<table>
<thead>
<tr>
<th></th>
<th>Total (n= 106)</th>
<th>ART naïve (n= 46)</th>
<th>ART (n= 60)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yrs., median (IQR)</td>
<td>36 (30-44)</td>
<td>34 (27-43)</td>
<td>38 (32-46)</td>
<td>0.0084</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>74 (69.81)</td>
<td>42 (91.30)</td>
<td>32 (53.33)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Males</td>
<td>32 (30.19)</td>
<td>4 (8.70)</td>
<td>28 (46.67)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td>0.492</td>
</tr>
<tr>
<td>No education</td>
<td>2 (1.89)</td>
<td>0 (0.00)</td>
<td>2 (3.33)</td>
<td></td>
</tr>
<tr>
<td>Grade 1-7</td>
<td>18 (16.98)</td>
<td>13 (28.26)</td>
<td>5 (8.33)</td>
<td></td>
</tr>
<tr>
<td>Grade 8-11</td>
<td>33 (31.13)</td>
<td>10 (21.74)</td>
<td>23 (38.33)</td>
<td></td>
</tr>
<tr>
<td>Grade 12</td>
<td>44 (41.51)</td>
<td>18 (39.13)</td>
<td>26 (43.33)</td>
<td></td>
</tr>
<tr>
<td>&gt;Grade 12</td>
<td>9 (8.49)</td>
<td>5 (10.87)</td>
<td>4 (6.67)</td>
<td></td>
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<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
<td>0.207</td>
</tr>
<tr>
<td>Employed</td>
<td>64 (60.38)</td>
<td>25 (54.35)</td>
<td>39 (65.00)</td>
<td></td>
</tr>
<tr>
<td>Self employed</td>
<td>7 (6.60)</td>
<td>4 (8.70)</td>
<td>3 (5.00)</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>35 (33.02)</td>
<td>17 (36.96)</td>
<td>18 (30.00)</td>
<td></td>
</tr>
<tr>
<td>Income, median (IQR)</td>
<td>1500 (0-3800)</td>
<td>1650 (0-4500)</td>
<td>2218 (0-2218)</td>
<td></td>
</tr>
<tr>
<td>≤R500</td>
<td>4 (5.63)</td>
<td>2 (6.90)</td>
<td>1 (2.38)</td>
<td>0.896</td>
</tr>
<tr>
<td>R550-R2000</td>
<td>18 (25.35)</td>
<td>6 (20.70)</td>
<td>13 (30.95)</td>
<td></td>
</tr>
<tr>
<td>R2500-R5000</td>
<td>23 (32.39)</td>
<td>12 (41.38)</td>
<td>11 (26.19)</td>
<td></td>
</tr>
<tr>
<td>&gt;R5000</td>
<td>6 (8.45)</td>
<td>5 (17.24)</td>
<td>1 (2.38)</td>
<td></td>
</tr>
<tr>
<td>Did not want to disclose</td>
<td>20 (28.17)</td>
<td>4 (13.79)</td>
<td>16 (38.10)</td>
<td></td>
</tr>
<tr>
<td>CD4 count, cell/mm³ median (IQR)</td>
<td>494.50 (155-680)</td>
<td>697.50 (589-900)</td>
<td>213.50 (80-387.50)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>≤200</td>
<td>29 (27.36)</td>
<td>0 (0.00)</td>
<td>29 (48.33)</td>
<td></td>
</tr>
<tr>
<td>&gt;201 - 350</td>
<td>12 (11.32)</td>
<td>0 (0.00)</td>
<td>12 (20.00)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&gt;351 - 500</td>
<td>12 (11.32)</td>
<td>0 (0.00)</td>
<td>12 (20.00)</td>
<td></td>
</tr>
<tr>
<td>&gt;500</td>
<td>53 (50.00)</td>
<td>46 (100.00)</td>
<td>7 (11.67)</td>
<td></td>
</tr>
</tbody>
</table>

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Table 4.2 Health-related quality of life (EuroQol) of ART-naïve and ART groups at study baseline and ART baseline vs ART 2-3 months after study enrolment

Analysis using Pearson's chi-square ($\chi^2$), Fischer's exact test for number of observations per cell of less than 5, as well as t-test for continuous variables were undertaken.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>2-3 months follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>ART-naïve (study baseline)</td>
</tr>
<tr>
<td></td>
<td>n=106</td>
<td>n=46</td>
</tr>
<tr>
<td>Mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problems</td>
<td>92 (86.79)</td>
<td>40 (86.96)</td>
</tr>
<tr>
<td>Problems</td>
<td>14 (13.21)</td>
<td>6 (13.04)</td>
</tr>
<tr>
<td>Self Care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problem</td>
<td>103 (97.17)</td>
<td>46 (100)</td>
</tr>
<tr>
<td>Problems</td>
<td>3 (2.83)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Usual Activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problems</td>
<td>93 (87.74)</td>
<td>44 (95.65)</td>
</tr>
<tr>
<td>Problems</td>
<td>13 (12.26)</td>
<td>2 (2.00)</td>
</tr>
<tr>
<td>Pain/Discomfort</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problems</td>
<td>63 (59.43)</td>
<td>27 (58.70)</td>
</tr>
<tr>
<td>Problems</td>
<td>43 (40.57)</td>
<td>19 (41.30)</td>
</tr>
<tr>
<td>Depression/Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No problems</td>
<td>81 (76.42)</td>
<td>34 (73.91)</td>
</tr>
<tr>
<td>Index Score (IQR)</td>
<td>0.88 (0.81-0.90)</td>
<td>0.86 (0.81-0.90)</td>
</tr>
<tr>
<td>VAS score, median (IQR)</td>
<td>80 (65-93)</td>
<td>66.50 (60-80)</td>
</tr>
</tbody>
</table>
Table 4.3: Univariate and Multivariate analyses showing factors associated with the five Health related Quality of Life (EuroQoL) domains

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mobility IRR (95% CI)</th>
<th>p-value</th>
<th>Usual Activities IRR (95% CI)</th>
<th>p-value</th>
<th>Pain/discomfort IRR (95% CI)</th>
<th>p-value</th>
<th>Anxiety/depression IRR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.00 (0.99-1.00)</td>
<td>0.668</td>
<td>1.00 (1.00-1.00)</td>
<td>0.763</td>
<td>1.01 (1.00-1.01)</td>
<td>0.064</td>
<td>1.00 (1.00-1.01)</td>
<td>0.29</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.00 (1.00-1.00)</td>
<td>0.988</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>0.91 (0.86-0.97)</td>
<td>0.004</td>
<td>0.98 (0.93-1.03)</td>
<td>0.356</td>
<td>0.625 (0.93-1.15)</td>
<td>0.592</td>
<td>0.88 (0.76-1.10)</td>
<td>0.062</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>1 (1-1)</td>
<td>0.338</td>
<td>0.94 (0.78-1.13)</td>
<td>0.511</td>
<td>0.104 (0.83-1.32)</td>
<td>0.716</td>
<td>1.01 (0.91-1.11)</td>
<td>0.88</td>
</tr>
<tr>
<td>&gt; Grade 12</td>
<td>1.75 (1.02-1.129)</td>
<td>0.005</td>
<td>1.05 (0.95-1.17)</td>
<td>0.338</td>
<td>0.92 (0.78-1.09)</td>
<td>0.301</td>
<td>1.04 (0.83-1.32)</td>
<td>0.716</td>
</tr>
<tr>
<td>≤ Grade 12</td>
<td>1 (1-1)</td>
<td>0.988</td>
<td>1.03 (0.86-1.23)</td>
<td>0.771</td>
<td>0.150 (0.93-1.12)</td>
<td>0.625</td>
<td>0.88 (0.76-1.10)</td>
<td>0.062</td>
</tr>
<tr>
<td>Employment</td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Employed</td>
<td>1 (1-1)</td>
<td>0.649</td>
<td>0.94 (0.89-1.00)</td>
<td>0.034</td>
<td>0.91 (0.86-1.05)</td>
<td>0.301</td>
<td>1.02 (0.77-1.34)</td>
<td>0.911</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1.07 (0.96-1.19)</td>
<td>0.241</td>
<td>1.08 (0.98-1.18)</td>
<td>0.122</td>
<td>0.97 (0.90-1.05)</td>
<td>0.432</td>
<td>0.99 (0.91-1.08)</td>
<td>0.767</td>
</tr>
<tr>
<td>ART status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ART naive</td>
<td>1.11 (1.01-1.22)</td>
<td>0.025</td>
<td>1.08 (0.96-1.22)</td>
<td>0.183</td>
<td>0.99 (0.92-1.07)</td>
<td>0.866</td>
<td>1.21 (1.06-1.38)</td>
<td>0.004</td>
</tr>
<tr>
<td>ART</td>
<td>1 (1-1)</td>
<td>0.999</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD4 count</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 200</td>
<td>1 (1-1)</td>
<td>0.999</td>
<td>1.07 (0.97-1.17)</td>
<td>0.169</td>
<td>0.91 (0.82-1.00)</td>
<td>0.056</td>
<td>0.91 (0.81-1.02)</td>
<td>0.101</td>
</tr>
<tr>
<td>&gt; 201 - 350</td>
<td>1 (1-1)</td>
<td>0.999</td>
<td>1.07 (0.97-1.17)</td>
<td>0.169</td>
<td>0.91 (0.82-1.00)</td>
<td>0.056</td>
<td>0.91 (0.81-1.02)</td>
<td>0.101</td>
</tr>
<tr>
<td>&gt; 351 - 500</td>
<td>1.09 (0.93-1.26)</td>
<td>0.276</td>
<td>1.14 (0.99-1.32)</td>
<td>0.07</td>
<td>0.91 (0.82-1.00)</td>
<td>0.056</td>
<td>0.91 (0.79-1.05)</td>
<td>0.188</td>
</tr>
<tr>
<td>&gt; 500</td>
<td>1.11 (1.03-1.20)</td>
<td>0.006</td>
<td>1.13 (0.95-1.35)</td>
<td>0.18</td>
<td>0.94 (0.84-1.05)</td>
<td>0.285</td>
<td>0.94 (0.79-1.11)</td>
<td>0.438</td>
</tr>
</tbody>
</table>

Univariate analysis indicated no difference in HRQoL in all domains of HRQoL.

The multivariate analysis indicate that ART naive group is less likely to experience problems with pain/discomfort and Anxiety/depression

IRR - Univariate Incident Rate Ratio
aIRR- Multivariate Incident Rate Ratio
Table 4.4 A sub-analysis of the ART and ART naïve groups on the difference between male and female VAS responses

The results for each analysis indicates that there is no statistically significant difference in the baseline VAS score mean for males and females for all study patients (p=0.3145). There is also no difference in the baseline VAS score mean for males and females among the ART patients (p=0.4867).

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>ART-naïve (study baseline)</th>
<th>ART (study baseline)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>P value</td>
<td>P value</td>
</tr>
<tr>
<td>n=106</td>
<td>n=46</td>
<td>n=60</td>
<td></td>
</tr>
<tr>
<td>N (%)</td>
<td>N%</td>
<td>N%</td>
<td></td>
</tr>
<tr>
<td>VAS score, median (IQR)</td>
<td>80 (65-93)</td>
<td>66.50 (60-80)</td>
<td>90(76.50-99.00) &lt;0.001</td>
</tr>
<tr>
<td>Males</td>
<td>32 (30.19)</td>
<td>0.315</td>
<td>4 (8.70)</td>
</tr>
<tr>
<td>Females</td>
<td>74 (69.81)</td>
<td>42 (91.30)</td>
<td>32 (53.33)</td>
</tr>
</tbody>
</table>

Table 4.5 Income of ART group at baseline and 2 to 3 months post initiation.

The analysis looks at the income of ART group at baseline then 2-3 months post ART initiation, there was a significant change income 2-3 months post ART initiation.

<table>
<thead>
<tr>
<th></th>
<th>ART (study baseline)</th>
<th>ART (2-3 months post ART initiation)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income median (IQR)</td>
<td>2218.32 (1727.88-2709.39)</td>
<td>2464.87 (1983.05-2946.70)</td>
<td>0.013</td>
</tr>
</tbody>
</table>

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