

A Retrospective Evaluation of the Effectiveness of the Mobile HIV / AIDS Treatment Teams
in the Amajuba District Kwa- Zulu Natal.

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ABSTRACT

HIV / AIDS is one of the leading causes of death in South Africa. Highly active antiretroviral treatment (HAART) has been shown to reduce the morbidity and mortality due to HIV / AIDS. Amajuba District in Kwa-Zulu Natal has embarked on an ambitious program to reach out to communities by providing treatment for HIV positive patients via mobile HIV/AIDS treatment teams.

Aim: This study aimed to evaluate the effectiveness of the Mobile HIV/AIDS Treatment Teams in initiating and treating patients with HAART at fixed primary health care clinics Amajuba District.

Methodology: An observational analytical retrospective cohort analysis of adults at Osizweni Clinic 2, Naas Farm Clinic, Mndozo Clinic and Nellie's Farm Clinic enrolled onto Antiretroviral Treatment via the mobile treatment teams between March 2010 and April 2011 was conducted. The inclusion criteria of patients in this study included ART naïve patients and those who have remained in care for at least twelve months. Data was extracted from patient clinical records. Epi Info was used to analyze the data. Descriptive statistics was used to determine the outcomes of treatment Pre ART and Post ART, including weight, CD 4 cell counts and virological suppression.

Results: Of the 842 participants that were initiated onto HAART via the mobile HIV/AIDS treatment teams, 64.7% were women, the median age was 35.5 years (IQR: 27.50 – 33.50), the median weight was 58.2kg (IQR: 50.9 – 66.6) and the majority of the participants were in the age group of 20-39 years (65.08%). At baseline the median CD4 cell count was 137 μ l³/ml (IQR: 75-188), the majority of participants (77.14%) had a WHO staging of III or IV and 99 percent of participants were initiated onto the correct HAART regimen. At follow up intervals of 6 months and 12 months, the median weight for the cohort increased to 60.9kg (IQR: 54-71) and 63.7 kg (IQR: 55.85-72.58) respectively. The median CD4 cell count increased from 137 μ l/mm³ at baseline (n = 784) to 262 μ l/mm³ (n= 444) at 6 months and 383 μ l/mm³ (n = 269) at 12 months. Virological suppression was at 94% (n= 298) at 12 months. Overall retention in care at 12 months was 63% (n=842). There were 145 (17.2%) deaths, 72 (8.5%) lost to follow up, 76 (9%) transfers, and 20 participants (2.4%) discontinued treatment.

Conclusion: This study has concluded that HAART can be successfully scaled up and provided effectively at rural primary health care clinics via mobile HIV/AIDS treatment teams with good outcomes to treatment despite barriers to access and scarcity of human resources. Missing test results are of concern. All stakeholders in the value chain for the provision of laboratory results to clinics need to develop a comprehensive plan to address this challenge.

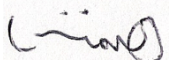


DECLARATION

I declare that *A Retrospective Evaluation of the Effectiveness of the Mobile HIV / AIDS Treatment Teams in the Amajuba District Kwa- Zulu Natal* is my own work, that it has not been submitted for any degree or examination in any other University, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Abdus-Samad Cassim

August 2013

Signed: 



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LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral Therapy
ARV	Antiretroviral
CD4	Cluster of Differentiation four
DHIS	District Health Information System
HAART	Highly Active Antiretroviral Treatment
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
IQR	Interquartile Range
MSF	Medecins Sans Frontieres
PHC	Primary Health Care
PLWHA	People Living with HIV / AIDS
RNA	Ribonucleic Acid
SSA	Sub-Saharan Africa
TB	Tuberculosis
WHO	World Health Organization

DEFINITION OF TERMS

Cohort analysis – An analysis of clinical data to monitor and determine outcomes for a group of people over a specific period of time.

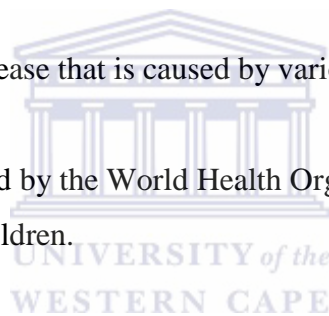
Cohort study – A cohort study is an analytical study in which individuals with different exposures to a suspected factor are identified and then observed for the occurrence of certain health effects over some period, commonly years rather than weeks or months.

Retention in care – Continuous engagement in medical care at the primary health care clinic.

Task shifting – A process of delegation whereby tasks are moved, where appropriate, to less specialized health workers (doctors to nurses)

Tuberculosis – An infectious disease that is caused by various strains of *mycobacteria*

WHO stage – A system published by the World Health Organization to classify the stages of HIV progression in adults and children.



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CHAPTER 1

1.1 Introduction

South Africa accounted for 17% of the global burden of Human Immunodeficiency Virus (HIV) in 2007 (Department of Health, 2007). The country has an HIV prevalence rate of approximately 10.6% and there are an estimated 5.38 million people living with HIV in South Africa (Statistics South Africa, 2011). In 2009, it was determined that Acquired Immune Deficiency Syndrome (AIDS) caused approximately 270000 deaths in South Africa (WHO, 2009). In 2003, HIV had been ranked as one of the major causes of death in the country (Bradshaw, Groenewald, Laubscher, Nannan, Nojilana, Norman, Pieterse, Schneider, Bourne, Timæus, Dorrington & Johnson, 2003).

Antiretroviral therapy (ART) has been shown to effectively reduce mortality and improve the quality of life of people living with HIV and AIDS (Posse, Meheus, Van Asten, Van der Ven & Baltussen, 2008). Though South Africa has the world's largest public sector ART program, it has been estimated that in 2009 50% of the people eligible for ART were without treatment (Statistics South Africa, 2011). Senegal, Rwanda, Botswana and Namibia are the only countries in Sub-Saharan Africa that have achieved the World Health Organization (WHO) "3 by 5" goal of treating at least half of the persons who are living with HIV/AIDS and need treatment (Kaloustian, Sidle, Selke, Vedanthan, Kemboi, Boit, Viola, Jebet, Carroll, Tierney & Kimaiyo, 2009).

A systematic search of literature conducted by Bartlett, Hornberger, Shewade, Bhorand Rajagopalan, (2009) indicated that barriers associated with the scale up of ART in resource poor setting can be linked to: costs of ART, poverty, infrastructure, stigma, health care system deficiencies, traditions and gender inequalities. The lack of appropriately skilled and trained health care providers and inadequate infrastructure are the major challenges faced by lower income countries in rolling out ART programs (Kaloustian *et al.*, 2009).

1.2 Background

Amajuba District is characterized with HIV prevalence. In 2010, the antenatal HIV prevalence was 39.5%, which was one of the highest in South Africa (Department of Health, 2010). The district has been challenged with chronic lack of human resources at all primary health care (PHC) clinics, and treatment, care and management of HIV infected patients was limited to three local hospitals (Radebe, Personal communication, 2011).

Historically, even though a patient may have tested positive for HIV at the PHC clinic, they had to travel vast distances to the local hospital for highly active antiretroviral treatment (HAART) initiation. According to the South African national treatment guidelines in 2007, only doctors could initiate a patient onto HAART (Department of Health, 2007).

Furthermore, a health facility had to be accredited by the National Department of Health before that facility could provide HAART to patients. The accreditation of a facility depended on the availability of permanent medical staff (e.g. doctors and pharmacists) at that facility. The accreditation process was extremely stringent and hence primary health care clinics were primarily excluded from the provision of HAART. Departmental statistics indicated that there were only 7234 people of a population of 193 494 living with HIV/AIDS in Amajuba that were on HAART in 2008. To meet the enormous treatment gap and to overcome the barriers to HAART at the PHC clinics, a mobile HIV/AIDS treatment team comprising of a doctor, pharmacist and nutritionist was established. This team would visit PHC clinics on a regular basis and would allow for patients to be initiated onto HAART at the PHC clinic without the need for accreditation whilst at the same time be in compliance with the National HIV/AIDS treatment guidelines.

The mobile HIV/AIDS treatment teams visit fixed PHC clinics on a weekly basis to initiate clients onto HAART. At PHC clinics there is a personal computer (PC) and an electronic health management information system (HMIS) where longitudinal data is been captured routinely for each client visit on a monthly basis by qualified data capturers. Client follow up visits are also captured manually in registers as per Department of Health requirements. Booking dates for clients that are to be initiated on HAART are written manually in diaries and are available. Clients that do not honor the appointment dates for HAART initiation are followed up by telephonic communication or tracing with community care givers.

1.3 Problem statement

All PHC clinics in Amajuba District are serviced by mobile HIV/AIDS treatment teams once a week since 2010. According to the Amajuba District Health Information System (DHIS), 4000 patients have been enrolled and received ARVs as a result of this model of care over the past 36 months. The District Office of Health submits quarterly reports via the DHIS to its head office. The reporting requirements do not encompass the outcomes of patients who are initiated on HAART at PHC facilities. Though it is known how many clients have been initiated onto HAART via the mobile HIV/AIDS treatment teams at the PHC clinics, there is a need to assess the effectiveness of the mobile team's activities on whether they are meeting their objectives of patient outcomes on HAART.

1.4 Description of study setting

Amajuba District is located in the North-Western part of KwaZulu-Natal. The district is 6911.8 square kilometers in size and is 7.32% of the total geographical size of the province of KwaZulu-Natal. There are three local municipalities aligned as sub districts in Amajuba District. (Newcastle, Emadlangeni and Dannhauser). It has been established that although Amajuba District is regarded as more developed than the surrounding districts of Umzinyathi and Zulu Land, its rural areas are marked by widespread poverty. Income levels in Amajuba District are generally low and the unemployment rate is 39.1% (Statistics South Africa, 2011). In terms of health service provision, Amajuba District has two regional hospitals and one district hospital. There are 25 fixed clinics and 5 mobile clinics that serve an estimated population of 499839 (Statistics South Africa, 2011).

1.5 Aims and Objectives

This study aimed to assess the effectiveness of the Mobile HIV Treatment Teams in initiating patients onto HAART in Amajuba District from March 2010 to April 2011.

The objectives of the study were:

- 1) To determine the number of patients initiated on HAART from the Mobile HIV Treatment Teams.
- 2) To determine the number of patients that were followed up by the Mobile HIV Treatment Teams as stipulated by the South African National Department of Health guidelines.
- 3) To assess the clinical outcomes of patients who have been initiated onto HAART from the Mobile HIV Treatment Teams.
- 4) To assess patient retention (patients initiated onto HAART who are lost to follow up).



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

One of the earliest cases of HIV/AIDS was detected in American hospitals in the early 1980's. By 1985, HIV/AIDS had spread alarmingly and the disease was reported in all regions of the world (WHO, 2006). WHO (2008) reported that it was estimated that by the end of 2007, 33.2 million people were living with HIV and the disease has caused tremendous loss of life and suffering to people residing in developing countries (Rajaraman , Russell & Heymann, 2006).

Numerous studies have shown that the provision of HAART can prolong the life of those infected with HIV (Gilks, Crowley, Ekpini, Gove, Perriens, Souteyrand, Sutherland, Vitoria, Guerma & De Cock, 2006). It has been reported that HAART can reduce morbidity, mortality and improve the quality of life of people living with HIV/AIDS (PLWHA) (Vittinghoff, Scheer, O'Malley, Colfax, Holmberg & Buchbinder, 1999).

Although the advent of HAART has improved the outlook of survival with PLWHA, WHO has reported that only 31% of clinically eligible HIV infected people received ART in 2008 (WHO, 2008). The reasons for the above were the scarcity of human resources, costly prices of ARVs and fragmented procurement systems. These contributing factors in resource poor settings have made the roll out of life saving ART challenging (Gilks *et al.*, 2006).

The South African National ART program was launched in 2004. Since then, there have been numerous studies that have shown that the roll out of ART in South Africa is successful and effective (Bouille, Bock, Osler, Cohen, Channing, Hilderbrand, Mothibi, Zweigenthal, Slingers, Cloete & Abdullah, 2008).

Evidence has shown that patients in South Africa have responded to ART in a manner that is equivalent to those in high resource settings (Mutevedzi, Lessells, Heller, Bärnighausen, Cooke & Newell, 2010) and the effectiveness of ART and its outcomes at PHC clinic level in

resource poor settings have been shown to be superior compared to hospitals (Fatti, Grimwood & Bock , 2010).

The effectiveness of ART can be determined by monitoring a patient either virologically, immunologically, or clinically (Colebunders, Moses, Laurence, Shihab, Semitala, Lutwama, Bakeera-Kitaka, Lynen, Spacek, Reynolds, Quinn, Viner & Mayanja-Kizza, 2006).

Immunological monitoring can be measured by the CD4 lymphocyte cell count, whilst virological monitoring is measured by the HIV Ribonucleic Acid (RNA) viral load in response to ART (Nash, Katyal, Brinkhof, Keiser, May, Hughes, Dabis, Wood, Sprinz, Schechter & Egger, 2008).

In terms of analyzing the effectiveness of an ART program, it is unethical to estimate HAART effectiveness using randomized placebo-controlled trials (Fairall, Bachmann, Louwagie, Van Vuuren, Chikobvu, Steyn, Staniland, Timmerman, Msimanga, Seebregts, Boule, Nhiwatiwa, Bateman, Zwarenstein & Chapman, 2008). Researchers instead, tend to follow the patient monitoring guidelines for HIV and ART as published by WHO (WHO, 2006). These guidelines aim to provide consensus as to how patients should be monitored whilst on ART at the clinic level. The WHO guidelines encourage a cohort analysis of the patient data that has been recorded over a period of time when patients have reached a certain stage in the cycle of receiving ART (WHO, 2006). It is to note that this cohort analysis is not the same as a cohort study. The cohort analysis of patient data allows for the comparison of all patients starting ART in the same period. The key outcomes in this analysis would be to determine: a) how long patients survive on treatment, b) how long patients remain on first line ART, c) the return of patient to functional status of working and, d) improvement of CD 4 cell count over time (WHO, 2006). When analyzing cohort data as described by WHO recommendations, there are certain other parameters of importance that would need to be investigated in order to draw meaningful conclusions to the outcomes HAART.

2.2 Parameters of importance in cohort analysis

2.2.1 Gender

It is known that women have a greater biological vulnerability to HIV infection compared to men and with this are numerous socio cultural economic factors that make women more susceptible to HIV infection (Pettifor, Measham, Rees & Padian, 2004). In Sub-Saharan Africa it has been determined that more females have accessed antiretroviral treatment than men. Increased access to health care services available to women e.g. antenatal programs and family planning services could be reasons for a higher percentage of uptake to HAART (Muula, Ngulube, Siziya, Makupe, Umar, Prozesky, Wiysonge & Mataya, 2007).

Men on the other hand access HAART at a later stage during their HIV infection. Possible factors of men accessing HAART at a later stage could be due to unwillingness to accept HIV status and the stigma that is associated with HIV infection (Muula *et al.*, 2007).

2.2.2 WHO staging

A WHO staging of III or IV is indicative of advanced HIV disease and significant immune suppression. There is a risk of high mortality in the first 6 months upon initiation of HAART when patients have advanced immune suppression (Lawn, Harries, Anglaret, Myer & Wood, 2008). A cross sectional study in Uganda indicated that 40% of participants initiated onto ART had WHO staging of IV. The investigators determined that the factors associated with late initiation of ART were: male sex, unemployment and low education levels (Kigozi *et al.*, 2009).

2.2.3 ART Regimen

The Department of Health published the second version of South African National Clinical Guidelines for the Management of HIV /AIDS in Adults and Adolescents in 2010. These new guidelines saw the inclusion of a safer antiretroviral medicine (Tenofovir) and the discontinuation of Stavudine as a first line ART agent. This study was affected by the introduction of the 2010 guidelines. Prior to July 2010, participants were initiated on the old 2007 guidelines with a standardized first line regimen consisting of two nucleoside reverse

transcriptase inhibitors (Stavudine and Lamivudine) and one non-nucleoside reverse transcriptase inhibitor (Nevirapine or Efavirenz). When the 2010 guidelines were approved and circulated in August 2010, the remaining participants in the study were initiated on new first line ART regimen containing Tenofovir.

2.2.4 Tuberculosis (TB) status

TB is the leading cause of death in HIV-infected persons in South Africa (Lawn, Bekker, Middelkoop, Myer & Wood, 2006). WHO estimated South Africa's overall annual tuberculosis incidence rate to be 940 per 100 000 population in 2006 (Hausler, Sinanovic, Kumaranayake, Naidoo, Schoeman, Karpakis & Faussett, 2006). In 2009 there were 482000 people living with tuberculosis in South Africa and tuberculosis deaths accounted for 105 000 (AbdoolKarim, S., Churchyard, AbdoolKarim, Q.& Lawn, 2009). It would be important to determine the TB status of participants in the study seeing that concomitant TB with HIV infection is associated with higher mortality.

2.2.5 Pregnancy Status

It is known that HIV/AIDS has caused significant maternal and perinatal mortality and morbidity in Sub-Saharan Africa. (van der Spuy, 2009). The provision of HAART during pregnancy is vital for positive maternal outcomes (Abrams, Myer, Rosenfield & Sadr, 2007). HAART initiated during pregnancy has also been also shown to improve the survival of the infant (WHO, 2007). Following up on the outcomes of pregnancy for women who were initiated onto HAART are important seeing that this is a departmental priority.

2.2.6 Body weight

A very common complication of HIV infection is wasting. HIV associated wasting has been associated morbidity and mortality (Wanke, Silva, Forrester, Speigelman & Gorbach, 2000). When individuals are treated with HAART, weight loss that is associated with HIV is less than compared to those individuals who are untreated. It is thought that the suppression of viral replication could be the reason for the improvement of patients' weight and body mass index (Saghayam, Kumarasamy, Cecelia, Solomon, Mayer & Wanke, 2007). Studies have shown that incidence of HIV associated weight loss has decreased with the advent of

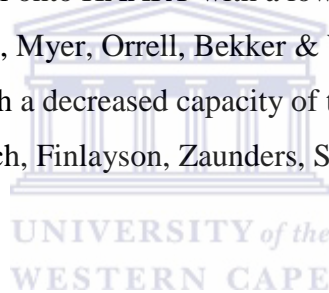
HAART (Dworkin and Williamson, 2003). Lia, Spiegelman, Drain, Mwiru, Mugusi, Chalamilla and Fawzi (2012) reported in a study conducted in Tanzania that there was an association between the socio demographic characteristic of participants in their study and weight change at three months. Their study further went on to identify that middle aged patients were less likely to have weight loss after HAART initiation compared to younger patients (Lia *et al.*, 2012).

2.2.7 CD 4 cell count

The 2010 South African National Clinical Guidelines for the Management of HIV /AIDS in Adults and Adolescents indicated that adult individuals are eligible for HAART if they have a CD4 cell count that is less than 200 $\mu\text{l}/\text{mm}^3$ or if the individual is WHO stage IV (Department of Health , 2010). These guidelines therefore only allowed for individuals to access HAART when they already had significant immune suppression. It has been shown in studies that individuals who enroll onto HAART with a low CD4 cell count have a high risk of morbidity and mortality (Lawn, Myer, Orrell, Bekker & Wood, 2005). Advanced immune suppression is also associated with a decreased capacity of the CD4 cell count to functionally respond to ART (Kaufmann, Bloch, Finlayson, Zaunders, Smith & Cooper, 2002).

2.2.8 Viral load

Viral load testing is an important measure to determine the efficacy of HAART (Nash, Katyal, Brinkhof, Keiser, May, Hughes, Dabis, Wood, Sprinz, Schechter & Egger, 2008). However the WHO public approach to ART in resource poor settings does not regard viral load monitoring in resource poor settings as essential due to complexity of conducting the test and the costs associated with it. (Gilks, Crowley, Ekpini, Gove, Perriens, Souteyrand, Sutherland, Vitoria, Guerma & De Cock, 2006). The WHO 2010 guidelines for the treatment of HIV infection regard any viral load (ribonucleic acid) above 5000 copies per ml as indication of virological failure and a viral load of less than 1000 copies per ml as evidence for viral load suppression (WHO, 2010).



2.2.9 Status at follow up intervals

In a systematic review to determine patient retention in ART programs in Sub-Saharan Africa conducted by Rosen, Fox and Gill (2007) it was found that loss to follow up and death accounted for 56% and 40% attrition respectively. The investigators concluded that each patient retained in care on ART can be “regarded as a life saved and a source of tremendous benefit to patients’ families and communities” (Rosen *et al.*, 2007).

2.3 Survival Analysis – Effectiveness of HAART in resource poor settings

This study aimed to determine the effectiveness of the provision of ART via mobile HIV/AIDS treatment teams. To my knowledge, there have been very few studies published clearly describing the provision of HAART via mobile HIV/AIDS treatment teams in resource poor settings. Dube, Nozaki, Hayakawa, Kakimoto, Yamadad, and Simpungwee (2010) describe a model whereby a mobile team consisting of a doctor, pharmacist, nurse and laboratory staff visited selected rural sites in Zambia to provide ART services. The authors of the study indicate that mobile HIV/AIDS treatment services improved the accessibility to HAART by reducing the long distances required by patients to travel for health services in Zambia (Dube *et al.*, 2010). In terms of effectiveness, the six month retention rate of the cohort was similar to that of other African countries. Dube *et al.*, (2010) do acknowledge that their study had limitations. They note that the study comparison to clients that enrolled at the hospital could have had different social demographic factors compared to those that accessed HAART via the mobile HIV/AIDS treatment teams. The authors conclude that it is possible to provide HAART in resource poor settings utilizing a model of mobile treatment teams with good patient outcomes (Dube *et al.*, 2010). The authors recommend that further research is required in order to determine the long term outcomes of the patients in the cohort including improvement of clinical outcomes.

The studies described below relate to the provision of HAART in resource poor settings but not necessarily via mobile HIV/AIDS treatment teams. The attempt here is to compare the mobile HIV/AIDS treatment teams’ activities to those ARV programs in resource poor settings to determine the outcomes to HAART and draw conclusions there upon.

Bedelu, Ford, Hilderbrand and Reuter (2007) describe a decentralized model of ART care in Lusikisiki South Africa. Lusikisiki is a densely populated sub district in the Eastern Cape with a severe lack of appropriately trained and skilled medical staff. Medecins Sans Frontieres (MSF) developed a model that included the provision of HAART via task shifting (physician provides mobile ART support) in a resource poor setting. This model allowed for the rapid provision of HAART at PHC clinics with positive clinical outcomes (Bedelu *et al.*, 2007). In this cohort it was noted that the mobile service provided by the physician allowed for faster enrollment of clients onto HAART due to improved accessibility and greater proximity of services at the clinic level. In 2006, 2200 individuals were receiving ART in Lusikisiki. The study showed comparable positive patient outcomes to the surrounding hospitals in terms of patient improvement and retention on ART (Bedelu *et al.*, 2007). The model highlighted that *only* the physician provided mobile services. This service was in a supervisory capacity and that other allied health care workers were stationed at the PHC clinics permanently.

In a study conducted in Cambodia, Ferradini, Laureillard, Prak, Ngeth, Fernandez, Pinoges, Puertas, Taburet, Ly, Rouzioux, Balkan, Quillet and Delfraissy (2007) followed up individuals that were initiated onto HAART at primary health sites. The outcomes of their study showed that of the 416 patients initiated on HAART, 59.2% were men and the median age was 33.6 years. At baseline 48.9% patients were WHO stage IV and the median CD4 cell count was $11\mu\text{l}^3/\text{ml}$. At follow up 84.1% of patients were still on HAART, 12.7% had died and 1.7% were lost to follow-up. A limitation of this study was the small number of patients in the cohort and the short duration of time for follow up. The authors note that HAART could be successfully rolled out in resource poor settings with positive outcomes.

Fatti *et al.*, (2010) describe a retrospective cohort study where comparisons were made between individuals that were initiated onto HAART at PHC facilities in resource poor settings and hospitals. Their findings indicated that from 29203 adults initiated onto HAART at PHC facilities, retention in care at 24 months follow up was 80.8%. The limitations of this study were that it was a retrospective study that utilized data that is captured routinely at the facilities. Such data could have contained errors. Missing test results were another limitation. Only 60% of viral load test results were available for interpretation. The missing test results could have been a bias toward the estimates, but the authors conclude that ART outcomes were superior at PHC facilities compared to patients at hospitals (Fatti *et al.*, 2010).

MSF conducted an effectiveness assessment of the provision of HAART in the Chiradzulu district in Malawi. The findings of this study indicated that 64% of the eligible individuals for HAART were female. The median age of the cohort was 34.9 years (IQR 29.9–41.0). At baseline 27% of the individuals were staged as WHO stage IV. At follow up (median 8.3 months, IQR 5.5–13.1), 967 (74%) were still on HAART, 243 (19%) had died, 91 (7%) were lost to follow-up, and seven (0.5%) discontinued treatment (Ferradini, Jeannin, Pinoges, Izopet, Odhiambo, Mankhambo, Karungi, Szumilin, Balandine, Fedida, Carrieri, Spire, Ford, Tassie, Guerin & Brasher, 2006). The authors concluding note was that HAART can be simplified and rolled out rapidly with good outcomes in rural resource poor settings.

An observational cohort study of ART in Khayelitsha South Africa investigated findings of a 7 year community based ART program in Khayelitsha. The results of this study showed that 9.8% of patients were lost to follow-up for at least 6 months and 32.8% had died when followed up. The authors demonstrated that ART can be rolled out in a resource poor setting with good clinical outcomes (Boule, Van Cutsem, Hilderbrand, Cragg, Abrahams, Mathee, Ford, Knight, Osler, Myers, Goemaere, Coetzee & Maartens, 2010).

A study conducted by Mutevedzi *et al.* (2010) at 16 primary health care clinics in Kwa Zulu Natal showed that 5719 adults were initiated on ART over a 4 year period. The overall patient retention in care within this cohort at 12 months was 84.0% (95% confidence interval, CI: 82.6–85.3) and mortality was highest in the first 3 months after ART initiation. The median baseline CD4 cell count was 116 $\mu\text{l}^3/\text{ml}$ (IQR: 53–173). In this cohort 10.9% of patients had died (95% CI: 9.8–12.0) and 3.7% were lost to follow-up (95% CI: 3.0–4.4). The study had limitations in that the authors discovered a high percentage of unsuppressed viral load results. They note that further research would need to be conducted to determine the cause of the above.

Wandeler, Keiser, Pfeiffer, Pestilli, Fritz, Labhardt, Mbofana, Mudyiradima and Emmel (2012) describe a study conducted in six rural ART program in Southern Africa. Patients over the age of 16 years old were initiated onto HAART in Lesotho, Zimbabwe and Mozambique. The cohort consisted of 7,725 patients. At follow up, 9.6% of patients had died and 18.1% were lost to follow up. The risk factors for lost to follow up were documented as young age

and male gender, whilst advanced WHO stage and low baseline CD4 counts were associated with death.

In Zambia, the Zambian ministry of Health scaled up the treatment of HIV/AIDS at primary care sites in resource poor settings. An open cohort evaluation of 18 primary care facilities in 2004 / 2005 demonstrated that 16198 adults were initiated onto HAART (Stringer, Zulu & Levy, 2006). Among those that were initiated, 61% were women. For those patients that had documented WHO staging, 73% were staged WHO III or IV. The mean baseline CD4 cell count was $143\mu\text{l}^3/\text{ml}$. The reported deaths were identified to have occurred within 90 days of starting HAART. The authors conclude it is possible to scale up HAART rapidly in resource poor settings and obtain good clinical outcomes, but it is was important to initiate clients early on HAART due to mortality associated with advanced immune suppression (Stringer *et al.*, 2006).

A meta-analysis exploring the effectiveness of HAART in resource -poor settings demonstrated that ART is effective for HIV-infected individuals in resource poor settings (Ivers, Kendrick & Doucette, 2005). This study found that the provision of ART resulted in an HIV RNA viral load suppression in 60%–70% of individuals at times established during the study. The above individuals had viral suppressions similar to that observed in developed countries.

2.4 Summary

In summary it has been shown that there numerous challenges associated with the scale up of ART in resource poor settings. However, overcoming the barriers to access ART in these settings is possible with therapeutic outcomes to HAART comparable to developed countries.

CHAPTER 3

METHODOLOGY

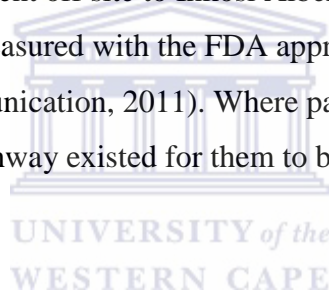
3.1 Study Design

In terms of analyzing the effectiveness of an ART program it is unethical to estimate HAART effectiveness using randomized placebo-controlled trials (Fairall, Bachmann, Louwagie, Van Vuuren, Chikobvu, Steyn, Staniland, Timmerman, Msimanga, Seebregts, Boulle, Nhiwatiwa, Bateman, Zwarenstein & Chapman, 2008). Researchers instead, tend to follow the patient monitoring guidelines for HIV and ART as published by WHO (WHO, 2006). The proposed study draws on data from an observational and analytical retrospective, cohort analysis. Studies by Mutevedzi *et al.* (2010), Boulle *et al.* (2008), Fatti *et al.* (2010) and Bedelu *et al.* (2007) also utilized a cohort analysis of data for determining the effectiveness of ART program in various settings. These study designs were in accordance with WHO monitoring guidelines. This is the study design that was utilized to conduct this study.

3.2 Population and Sampling

PHC clinics in Amajuba District enrolled patients into HIV care once they tested positive for HIV. Upon testing positive for HIV, the patient was then assessed for HAART eligibility by a professional nurse at the clinic. This process involved: documenting the patient's demographic information, obtaining a thorough medical history (including WHO staging), screening for TB and drawing blood for CD4 cell count. The blood drawn for CD 4 cell count was sent off site to Madadeni Hospital for evaluation. CD4 cell count was determined utilizing flowcytometry (Mashego, Personal communication, 2011). According to the 2010 South African National HIV treatment guidelines, a patient is eligible for HAART: If the CD cell count is $\leq 200 \mu\text{l}^3/\text{ml}$, or if the CD4 cell count is $\leq 350 \mu\text{l}^3/\text{ml}$ in patients with TB or and pregnant women, or WHO stage IV irrespective of CD4 cell count, or multidrug or extreme drug resistant TB. Once the patient was eligible for HAART, the patient then commenced patient literacy classes and attended intensive pre HAART counselling. The professional nurse then gave the client a booking date to be seen by the mobile HIV/AIDS treatment teams. The patient was initiated onto HAART by the mobile HIV/AIDS treatment teams and received clinical services from a doctor, a pharmacist and a nutritionist. Doctors were primarily responsible for initiating the participants onto HAART and assisting with

complicated cases. Pharmacists were responsible for dispensing ARVs on the day of HAART initiation and were also responsible for ensuring the availability of ARVs at the clinic for subsequent months. Nutritionists were responsible for providing advice relating to good dietary practice and assessment for malnutrition. The frequency of visits by the mobile treatment HIV/AIDS treatment teams visits to the clinics was according to a schedule that was established within the district. Doctors also consulted and advised professional nurses telephonically if there were complicated cases. After HAART initiation the patient was given an appointment to visit the PHC clinic every month. Each appointment visit entailed a clinical assessment of the patient and a refill of the patient's ARVs. At intervals determined by the National treatment guidelines, blood drawn for CD4 lymphocyte count was sent off site to Madadeni Hospital for evaluation. Plasma HIV RNA measurement was not determined at baseline due to cost cutting measures introduced by the KZN Department of Health. Instead, it was determined every 6 months from the HAART initiation date. All bloods for plasma RNA determination was sent off site to Inkosi Albert Luthuli Central Hospital. Plasma HIV RNA levels were measured with the FDA approved Abbott Real Time HIV-1 assay (Mashego, Personal communication, 2011). Where patients presented to the clinic being extremely ill, a referral pathway existed for them to be transferred to a higher level of care for treatment.



The study population for this study included all eligible patients that were initiated on HAART via the mobile HIV/AIDS treatment teams at four PHC clinics in Amajuba District. The sample consisted of the records of all patients initiated onto HAART between March 2010 and April 2011. Only four PHC clinics were included in the study seeing that other clinics in the District had cohorts of patients who were less than a year on HAART.

The following patients were included in the study:

- All HIV adult ART naïve patients who were initiated onto HAART at Osizweni Clinic 2 , Naas Farm Clinic, Mndozo Clinic and Nellie's Farm Clinic.
- Patients must have been initiated onto HAART between March 2010 and April 2011 and must be taking HAART for at least twelve months.

Study exclusion criteria:

- All patients where treatment was switched or substituted between March 2010 and April 2011. (Therapeutic substitution or changes in an ARV regimen can impact on the CD4 cell count and viral load).
- Prior ARV therapy (patients who were transferred into the facility, already having being initiated onto HAART at another facility).
- Pediatric patients were not included in this study since they are not initiated onto HAART at the PHC clinics.

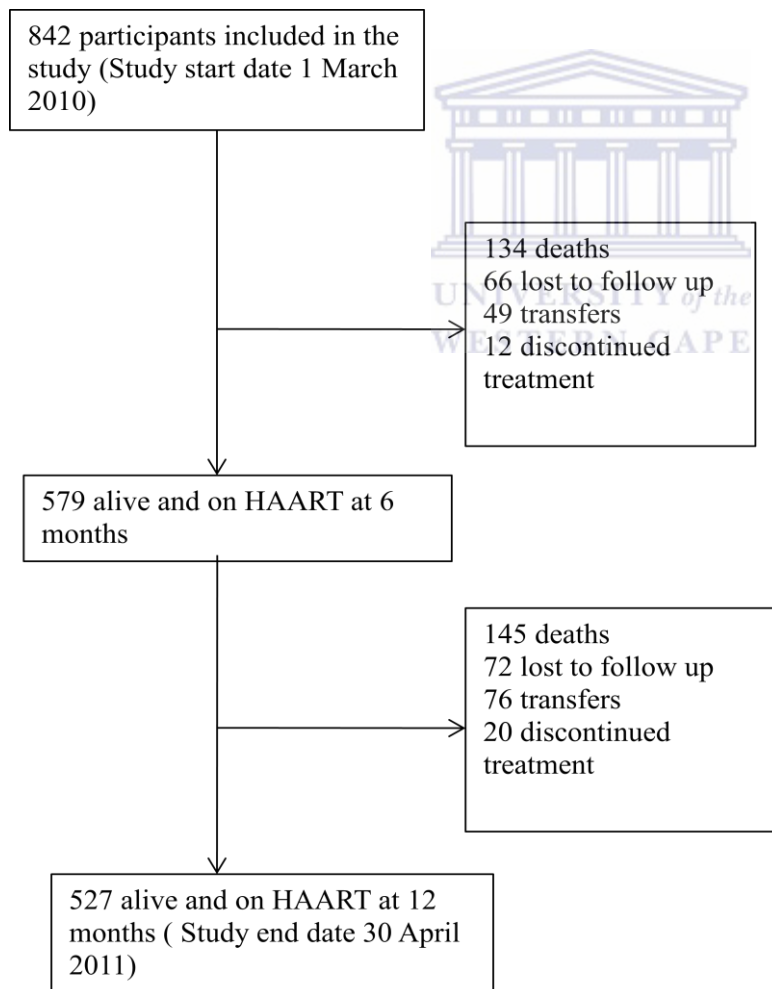


Figure 1: Study Profile

3.3 Data Collection

Doctors who were part of the mobile HIV/AIDS treatment teams initiated participants onto HAART at the PHC clinic. Patient clinical records were written manually by the doctors and nurses on a paper based clerking form that is standardized across the entire province of KZN. These clinical records were accurately kept, maintained and filed at all PHC clinics that were involved in the study. The clinical information contained within the clerking form was then captured by a trained data capturer onto an electronic health management information system (HMIS). The data from was then down loaded to a central data base on a weekly basis where data was scrutinized using data quality controls.

For the purposes of the study, records of all patients initiated onto HAART between March 2010 and April 2011 were extracted from the patient clerking form onto a data collection sheet and was then captured onto a Microsoft Excel Spread Sheet (Microsoft Corporation, Virginia, USA). Data was verified by reviewing the patient's information on the clerking form in comparison to the extracted data on the Microsoft Excel Spreadsheet. Each entry was checked for completion of entry, inconsistencies and correctness. Variables extracted included:

- Initiating clinic
- Age (years)
- Gender
- HAART Initiation Date
- Pregnancy status
- Base line body weight (Kilograms)
- Body weight at 6 months (Kilograms)
- Body weight at 12 months (Kilograms)
- TB status at HAART Commencement Date
- WHO Staging at Baseline
- WHO Staging at six months
- WHO Staging at twelve months
- HAART Regimen
- Baseline CD 4 cell count ($\mu\text{l}^3/\text{ml}$)
- CD 4 cell count ($\mu\text{l}^3/\text{ml}$) at six months

- CD 4 cell count ($\mu\text{l}^3/\text{ml}$) at twelve months
- Virological load at 6 months
- Virological load at 12 months
- Patient Outcomes at 6 and 12 months (Alive , Died , Lost to Follow up , Transferred to another facility)

3.4 Analysis

Epi Info (CDC, 2002) was used to analyze the data. The following formed part of the analysis: measures of central tendency (mean, median), measure of dispersion (range, standard deviation) for all variables of interest including: Age, CD4 cell counts, viral load suppression and weight. Loss to follow up was defined as a participant having missed two consecutive clinic visits (60 days).

3.5 Validity

A standardized data collection tool was used for data extraction. This provided consistency in data collection and minimized errors. Data capture workers at the study sites were trained to collect data for extraction and data was be cross checked in Microsoft Excel by inspecting each row. Data was scrutinized for errors such as placement of variables in incorrect fields, inconsistencies (e.g. heights, weights and blood results that have extreme values) and fields that did not have any entry. Where there were errors, all findings were compared to the patient file for confirmation. Microsoft Excel does have capabilities to sort data and filter out any extreme outliers. According to Broeck, Cunningham and Herbst (2005), Microsoft Excel can be used as a data cleansing tool. This function was used to further strengthen the data validation process.

There were challenges relating to the completeness (missing variables of interest) of routine data. In order to strengthen the reporting of missing test results and improve the systems that were utilize to retrieve laboratory results, the author of this study engaged with the National Health Laboratory Service (NHLS) to obtain access for professional nurses to blood results from a web based portal on the KZN Department of Health server. This intervention improved the access to blood results that were categorized as missing or misplaced. The

Department of Health KZN has also made strides in improving the availability of blood results by installing a satellite based short message service (SMS) that is based at the PHC clinic. Results from the laboratory are sent via SMS to the clinic, where a dedicated printer automatically prints the blood result. This result is then filed for the specific patient. A nongovernmental organization called Kheth'Impilo has been supporting the District office of Health with improving the quality of data and improving the availability of blood results at PHC clinics in Amajuba. Their interventions include: Hiring of nurse quality mentors whose key objectives were to probe missing test results and assist with data quality improvement. These nurse quality mentors have been advising and training professional nurses on how to manage blood results via suitable filing systems as many results have been misplaced at site level.

The key findings relating to the missing blood results at the PHC clinics were attributed to challenges relating to the printing of laboratory results at Madadeni Hospital and delivery of results to incorrect facilities.

3.6 Reliability

In terms of reliability of the data, random numbers were generated by Microsoft Excel. These numbers were assigned to represent a 10% sample of the data records from the captured data contained in the Microsoft Excel spreadsheet described above. This sample was then compared to the patient's clinical clerking chart for variables of interest. All variables of interest had a high level of agreement. There were challenges relating to the completeness (missing variables) of routine data. This could affect the statistical analysis. The response to HAART is variable in individuals and many patterns in immunological and clinical responses to treatment have been noted (Perrin & Telenti, 1998). The above could confound the results of the study. The inclusion of patients in this study will be such that there is no selection bias given the sample size and the inclusion criteria for the study.

3.7 Generalizability

The generalizability of the results of this study is limited to study population. This is due to the response to ART in individuals will vary based on the immunological profile of the individual prior HAART commencement (advanced immune suppression is a predictor to

immunological failure even in the presence of HAART), adherence to treatment and resistance to first line HAART regimens. The results of the study does have relevance to other districts for scale up models for the treatment of HIV. In settings where clients are adequately counselled prior HAART initiation and there is fast tracking of clients with for HAART commencement, similar results may be attained as to the study result.

3.8 Ethical considerations

Ethics approval was obtained from the University of the Western Cape Higher Degrees Ethics Committee (Appendix D). Permission was sought from the Department of Health District Office (Appendix B) and Department of Health KZN Provincial Office (Appendix C) to conduct the study. Data capturers were trained on patient confidentiality. All patient clinical records were kept locked in a filing cabinet. The key to this cabinet was kept with the operational manager of the clinic. Only data capturers were allowed to handle the clinical records. Data from clinical records for capturing purposes was encoded in a manner such that no individual could be identified. Personal computers for data capturing had passwords that restricted access to information to only authorized personnel. All personal commuturs were kept in a lockable room with access only allowed to data capturers.

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CHAPTER 4

4. RESULTS

4.1 Demographic characteristics of participants

The study sample included 842 treatment naïve adult patients enrolled onto HAART during period March 2010 (study start date) to April 2011 at four primary health care clinics (Nellie's Farm , Osizweni Clinic 2, Naas Farm and Mndozo Clinic) in Amajuba District.

Table.1: Demographic characteristics of respondents

Characteristic	Frequency	P value
Gender		0.00000
Male	297 (35.3%)	
Female	545 (64.7%)	
Age (in years)		
14-19	25(2.97%)	
20-29	258(30.64%)	
30-39	295 (35.04%)	
40-49	161 (19.12%)	
>49	103 (12.23%)	

More women (64.7%) than men (35.3%) participated in the study. Majority of the participants belonged to the age group of 20-39 years (65.08%). The median age for females was 32.5 years (IQR: 26-40.5) was lower than median age for males (36.5 years, IQR: 30.5 – 46) (P=0.00000).

4.2 Baseline clinical characteristics

Table. 2: Baseline Clinical Characteristics

Variable	TOTAL	Male	Female	P value
WHO Clinical Stage				0.025
Stage 1	79 (9.51%)	23 (2.77%)	56 (6.74%)	
Stage 2	111 (13.36%)	33 (3.97%)	78 (9.39%)	
Stage 3	589 (70.88%)	215 (25.87%)	374 (45.01%)	
Stage 4	52 (6.26%)	24 (2.89%)	28 (3.37%)	
Diagnosed with TB	124 (14.73%)	59 (19.9%)	65 (11.9%)	0.001
Confirmed pregnant	85 (15.6%)	-		
HAART regimen*				
1a (d4t,3tc,efv)	252 (29.93%)	118 (14.01%)	134 (15.91%)	
1b (d4t,3tc,nvp)	135 (16.03%)	16 (1.90%)	119 (14.13%)	
1c (tdf,3tc,nvp)	119 (14.13%)	7 (0.83%)	112 (13.30%)	
1e (tdf,3tc,efv)	334 (39.67%)	155 (18.41%)	179 (21.26%)	
2a (Azt,3tc,Allv)	1 (0.12%)	1(0.12%)	0	
2b azt,3tc,efv	1 (0.12%)	0	1 (0.12%)	
CD 4 cell count (in $\mu\text{l}^3/\text{ml}$)	(n=784)			0.00924
<50	123 (15.69%)	57 (7.27%)	66 (8.42%)	
50-199	504 (64.29%)	176 (22.45%)	328 (41.84%)	
200-350	155 (19.77%)	46 (5.87%)	109 (13.90%)	
350 \geq	2 (0.25%)	0	2(0.25%)	

*Abbreviations: D4T = Stavudine , 3TC = Lamivudine, EFV = Efavirenz, NVP = Nevirapine ,TDF =Tenofovir , AZT = Zidovudine , ALLV = Lopinavir / Ritonovir.

The median baseline CD4 cell count was 137 $\mu\text{l}^3/\text{ml}$ (IQR: 75-188). The mean base line CD cell count for females (143 $\mu\text{l}^3/\text{ml}$) was higher than that for males (123 $\mu\text{l}^3/\text{ml}$) ($p = 0.009$). Majority of the participants (80%) had baseline CD 4 cell counts that were less than 200 $\mu\text{l}^3/\text{ml}$.

4.3 Follow up Parameters

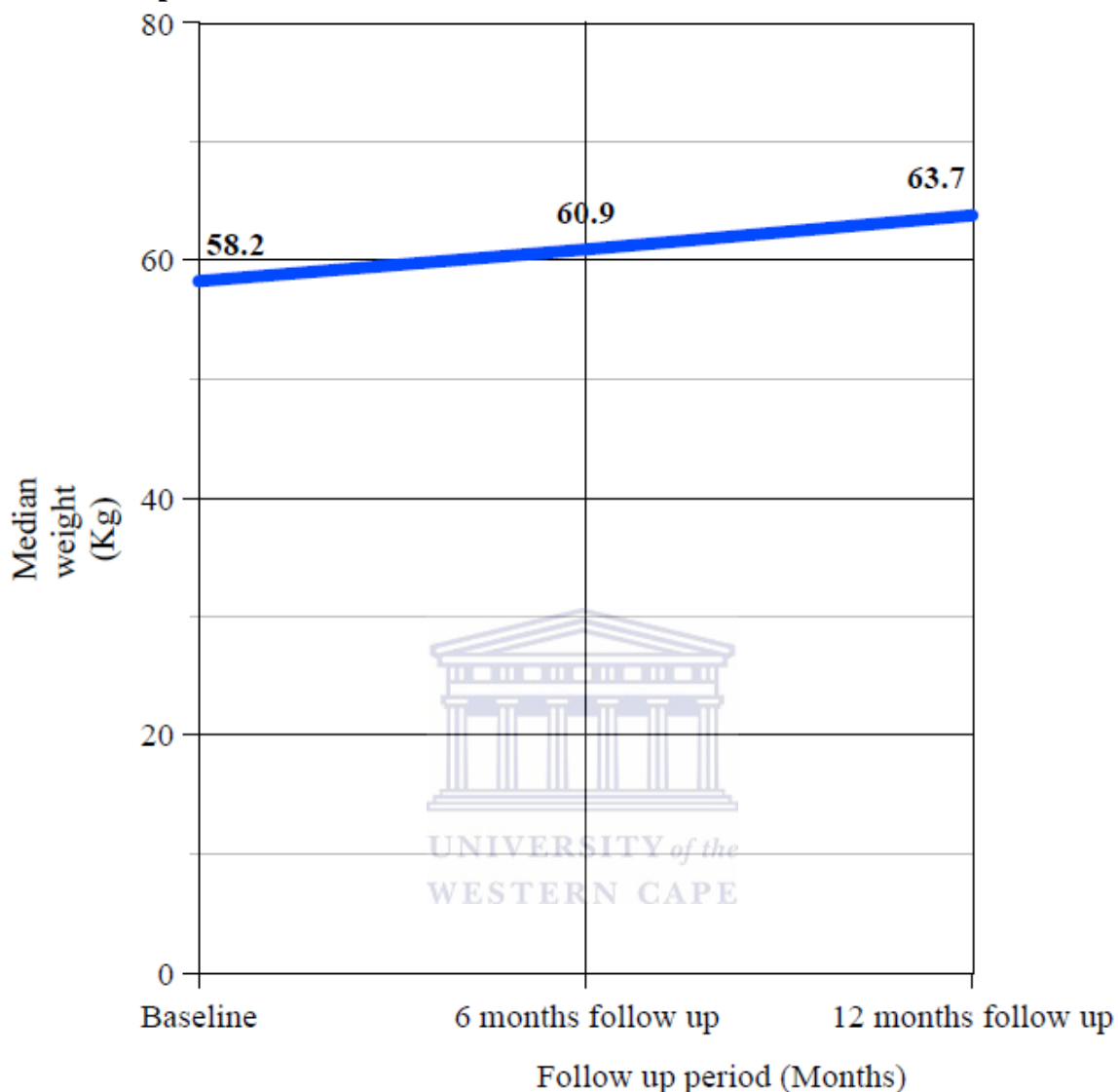


Figure.2: Median weight (Kg) followed up at 6 and 12 months.

The median weight at baseline was 58.2kg (IQR: 50.9 – 66.6, n=833). At follow up intervals of 6 months, the median weight for the cohort increased to 60.9kg (IQR: 54-71, n=561). At 12 months the median weight further increased to 63.7 kg (IQR: 55.85-72.58, n=508). The median weight at baseline for females was 57.8kg (IQR: 50.6 – 68) and for males was 58.9kg (IQR: 51.9-65.8) (p=0.697). There were missing values for weights recorded at 6 months and 12 months follow up.

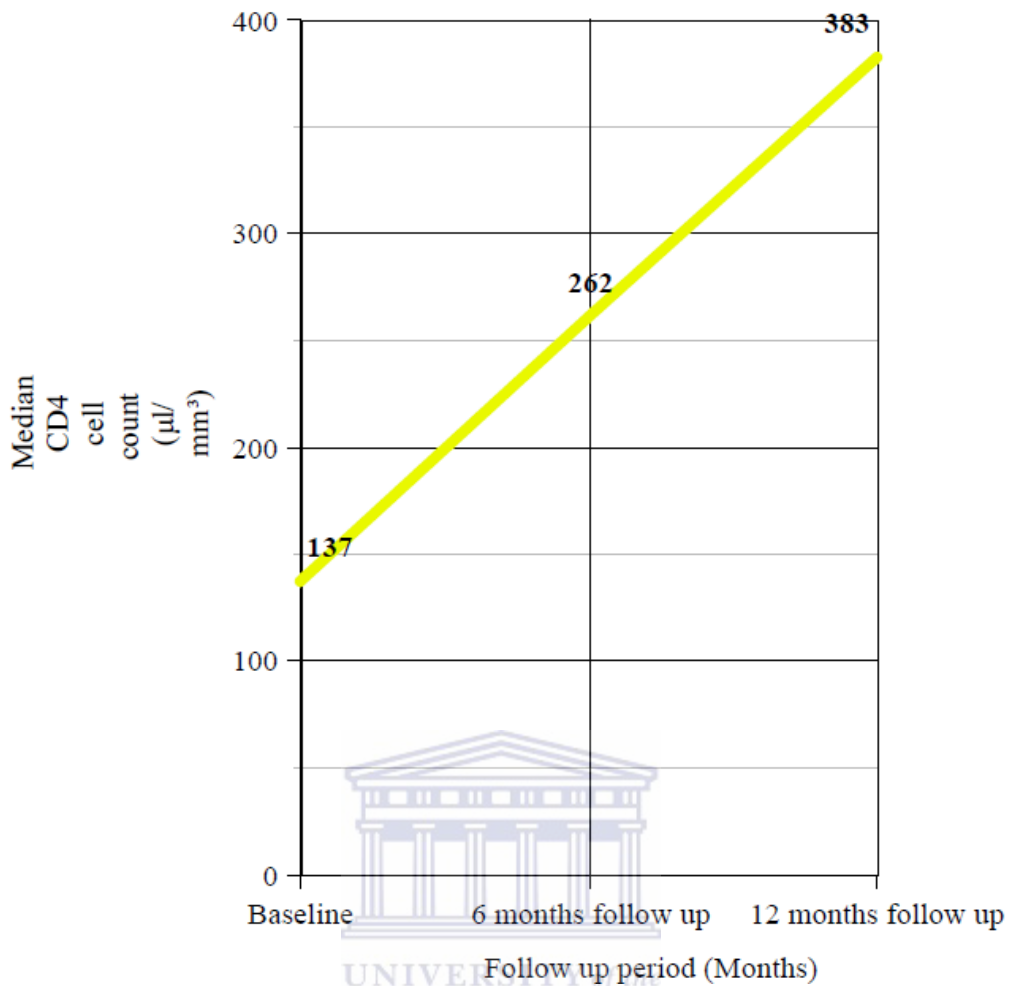


Figure. 3: Median CD cell count followed up at 6 and 12 months

The median CD4 cell count increased from 137 $\mu\text{l}/\text{mm}^3$ at baseline ($n = 784$) to 262 $\mu\text{l}/\text{mm}^3$ ($n = 444$) at 6 months and further increased to 383 $\mu\text{l}/\text{mm}^3$ ($n = 269$) at 12 months. There were missing CD4 test results for participants at baseline, 6 months and 12 months follow up.

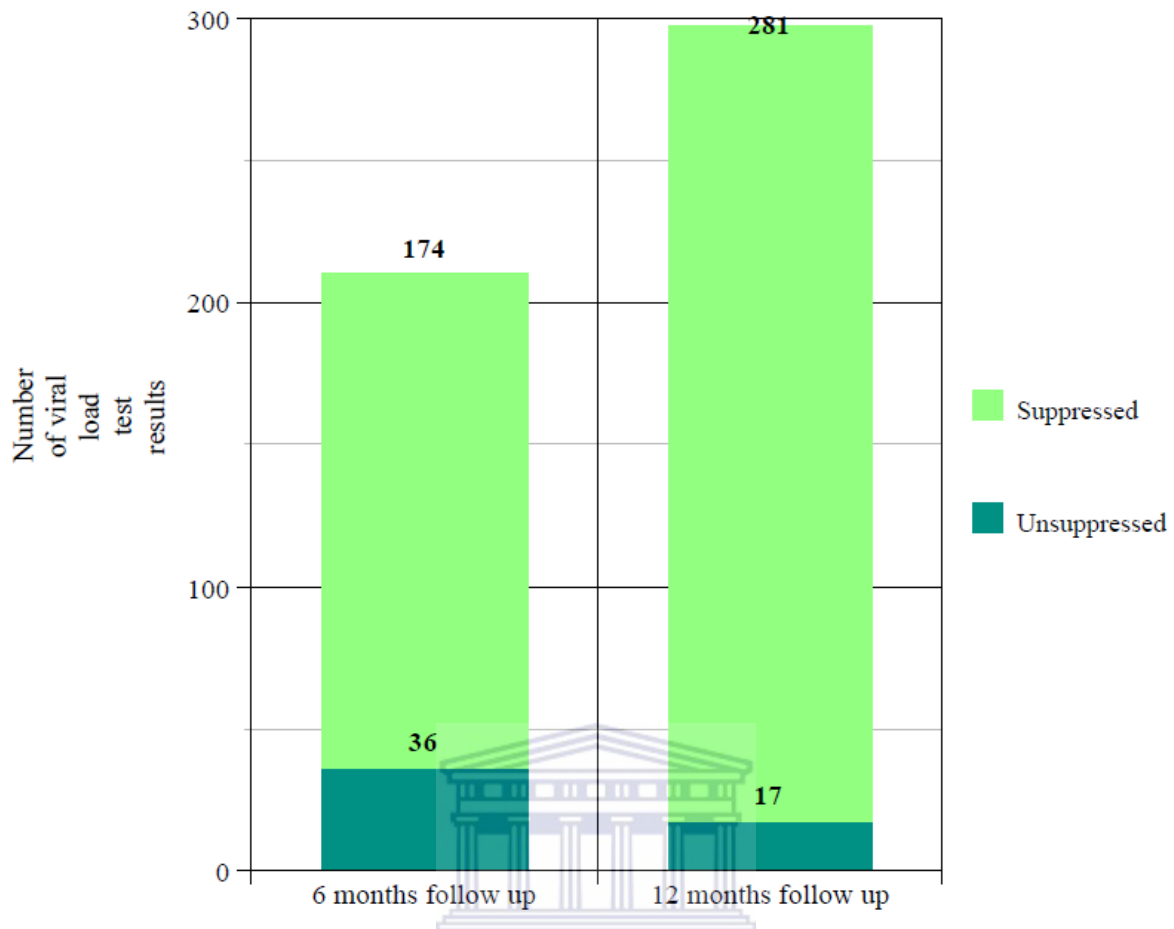


Figure.4: Viral load results followed up at 6 months and 12 months¹

¹ Categories <25 copies / ml refer to an undetectable viral load and >25 copies / ml refer to viral loads that are in excess of 5000 copies / ml (requiring intervention of stepped up adherence counseling and regimen changes where there is a confirmed case of virological resistance). There were missing laboratory results for the viral load at 6 months and 12 months follow up. The results available (n=210) indicate that 174 (83%) clients had undetectable viral loads at 6 months, and 210 (94%, n= 298) had undetectable viral loads at 12 months.

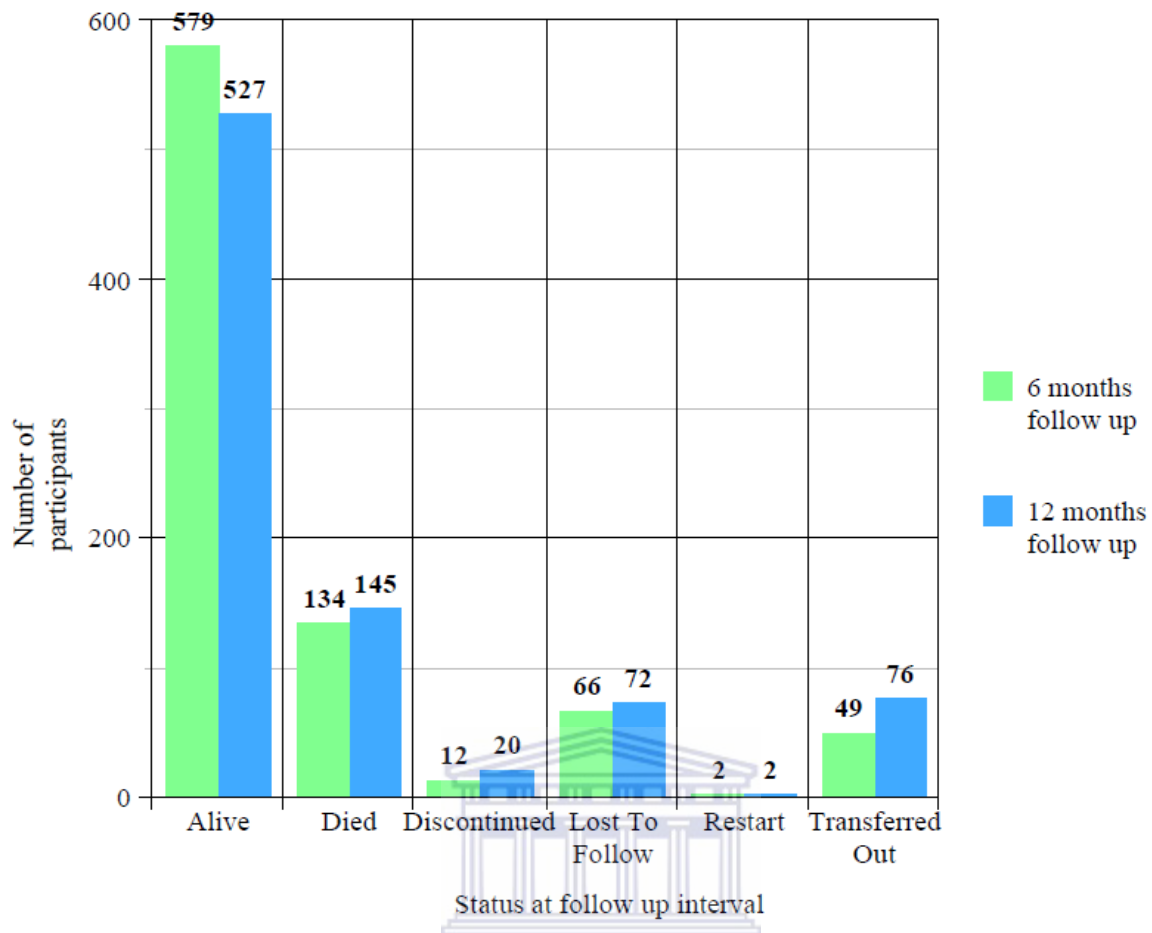


Figure. 5: Status of clients at 6 months and 12 months follow up.

At 6 months follow up: There were 579 participants (69%, n=842) that were alive, 134 deaths, 66 lost to follow ups (defined as a participant missing two consecutive appointment dates), 49 transfers and 12 discontinuations reported.

At 12 months follow up: There were 527 participants (63%, n=842) that were alive, 145 deaths, 72 lost to follow up, 76 transfers, and 20 discontinuations reported.

CHAPTER 5

DISCUSSION

This study set out to determine the effectiveness of provision of ART via mobile HIV/AIDS treatment teams. The discussion below represents the findings of the study within the context of the study question and current literature.

5.1 Enrolment characteristics

The study results indicate that 545 (64.7%) women participated in the study. Other studies in Sub-Saharan Africa have also reported that females were the majority of the participants accessing HAART in resource poor settings. Mutevedzi *et al.* (2010) reported that 67.9% of the participants were female in their cohort and Ferradini *et al.* (2006) reported that 64% of their cohort who accessed HAART were female. Women tend to access HAART in numbers more than men for reasons such as their increased attendance at PHC clinics for antenatal care and family planning services (Muula *et al.*, 2007). Interventions such as health promotion messages in the clinics, community mobilization, announcements on local radio stations and the use of print media advocating for HIV testing and highlighting the importance of HAART have been deployed by the Department of Health to deal with the low uptake of HAART amongst men.

The majority of the participants in this study belonged to the age group 20-39 years (65.08%). Men were initiated onto HAART at a higher median age than women. Fatti *et al.* (2010) and Mutevedzi *et al.* (2010) also reported similar findings in their studies. It has been determined that men tend to access HAART at a later stage than women due to unwillingness to accept HIV status and the stigma that is associated with HIV infection (Muula *et al.*, 2007). Women on the other hand have more frequent visits to the PHC clinic and have more exposure to clinic programs and this could be a reason why they tend to be initiated on HAART at an earlier stage.

5.2 Clinical Characteristics of Participants at Baseline

A large proportion of our study participants (77.14%) had a baseline WHO staging defined as stage III or IV disease. Fatti *et al.* (2010) and Ferradini *et al.* (2006) reported similar findings. The reason why so many clients had such advanced WHO staging can be directly attributed to the South African National Treatment Guidelines for HIV in 2010 that set a cut off CD4 cell count of 200 $\mu\text{l}^3/\text{ml}$ as an entry point for eligibility of HAART. This translated into a large proportion of participants who accessed HAART via the mobile HIV/AIDS treatment teams already presenting with significant immune suppression. The 2013 South African National HIV treatment guidelines have amended the entry point for eligibility to HAART with a cut of a CD4 cell count of 350 $\mu\text{l}^3/\text{ml}$. It has been determined that the initiation of HAART in patients with significant immune suppression does not necessarily result in positive outcomes to treatment. Paradoxically, patients with significant immune suppression may experience early mortality when initiated on HAART (Lawn *et al.*, 2005). This finding could be a factor (although not directly determined) of mortality amongst clients in the first six months of HAART in this study. The mobile HIV/AIDS treatment teams played a very important role in expediting clients with very low CD4 cell counts and advanced WHO staging onto HAART.

The mobile HIV/AIDS treatment teams were not only focused on initiating clients on HAART, but also worked closely with PHC clinic nurses to mentor and train them on ensuring clients are thoroughly screened and acquainted with the national guidelines. In this study, it was encouraging to note that all participants were screened for TB prior initiation of HAART. The results indicate that 124 (14.73%) participants were diagnosed with TB prior to HAART initiation. The prevalence for TB at baseline was more common in males (19.9%) compared to females (11.9%) ($p = 0.001$). This result is consistent with the study by Mutevedzi *et al.* (2010) where that study indicated that the prevalence of TB at HAART initiation was more common in males (20.4%) than females (15.6%) ($p < 0.001$). The status of these patients who were diagnosed with TB at HAART initiation indicated that 28 (23%) had died before reaching 6 months of treatment. This result is of concern. One of the aspects that could have improved the outcome for patients who have TB and were initiated on HAART would have been to integrate HIV and TB services as one package. Whilst the mobile HIV/AIDS treatment team doctors were primarily responsible for HAART initiation, TB treatment and its outcomes was not part of the mobile treatment package. More vigilance is

required to identify and diagnose TB in patients commencing HAART and integrate TB treatment with HIV/AIDS treatment and care. TB has been shown to be a major cause of mortality in clients taking HAART. The 2013 South African National HIV Treatment guidelines advocates for the provision of isoniazid prevention therapy (IPT) in all HIV positive people as an intervention to circumvent TB in this population.

The mobile HIV/AIDS treatment teams had prioritized the initiation of pregnant women on HAART. Eighty five participants that were pregnant commenced HAART in this study. The outcomes of these pregnancies were not determined, however at the end of the study period, six (7.1%, n=85) women had died. The cause of death was not determined but maternal mortality due to HIV is well documented. A study conducted by Chweneyagae, Delis-Jarrosay, Farina, Fawcus, Godi, Khaole, Kunene, Mhlanga, Mbambisa, Mbombo, Molefe, Moodley, Moran, Pattinson, Rout, Schoon and Seabe (2012) determined that “HIV infection is the most important condition contributing to maternal death in South Africa” (Chweneyagae *et al.*, 2012). It is important to note that the 2007 and 2010 South African National HIV treatment guidelines for HIV indicated that Nevirapine was the first line non-nucleoside reverse transcriptase inhibitor (NNRTI) for indicated for pregnant women requiring HAART. Bera, Naidoo and Williams (2012) reported that maternal deaths due to Nevirapine ART related toxicity have been on the increase. As a result of the concerns with the safety profile of Nevirapine and its propensity to cause mortality in pregnancy, the new 2013 South African National HIV/AIDS treatment guidelines indicate that Efavirenz should now be the NNRTI of choice to be used for all pregnant females requiring HAART unless contraindicated (Department of Health, 2013).

The South African National Treatment guidelines had set out a standardized robust first line ARV regimen. There was a high degree of compliance to the guidelines by the mobile HIV/AIDS treatment teams. Only two participants in the study were initiated onto a mixed regimen of ARVs. The reasons for this were contraindications to first line ART treatment. This study did not take quantify the participants that were switched over to second line agents due to ART related toxicities or virological failure. The inclusion of data from these patients' could have influenced the study result if there were available. The District Office of Health made a decision at that time, that due to the high costs, intense laboratory monitoring, and limited treatment options associated with second line ARV treatment, all patients in need of second line treatment were referred from the PHC clinic to Madadeni hospital for treatment.

A specialist in HIV medicine was responsible for initiating these patients on second line treatment.

The baseline line CD4 cell count for this study indicates that 80% (627) of participants had CD 4 cell counts below 200 $\mu\text{l}^3/\text{ml}$. The median baseline CD4 cell count was 137 $\mu\text{l}^3/\text{ml}$ (IQR: 77-188). Fatti *et al.* (2010) reported that the median baseline CD4 cell count in their study was 113 $\mu\text{l}^3/\text{ml}$ (IQR: 57-165) whilst Ferradini *et al.* (2006), reported that their cohort had a median baseline line CD 4 cell count of 114 $\mu\text{l}^3/\text{ml}$ (IQR: 66-177). The mean base line CD cell count for females was 143 $\mu\text{l}^3/\text{ml}$. This result was higher than that for males (123 $\mu\text{l}^3/\text{ml}$) ($p = 0.009$). The study result has established that the participants had accessed ART at a very late stage with significant immune suppression. The mobile HIV/ AIDS treatment teams had to abide to the South African National Clinical Guidelines for the Management of HIV /AIDS in Adults and Adolescents 2010. These guidelines set out a cutoff point of a CD4 cell count of 200 $\mu\text{l}^3/\text{ml}$ or less, or WHO stage IV as the entry point for eligibility for HAART.

As evidence has become clearer, it is now known that the outcomes to HAART are better when patients are initiated onto HAART at an earlier stage (higher CD4 cell count). The new South African National HIV treatment Guidelines for 2013 indicates that the entry point for eligibility for HAART has changed from a CD4 cell count of 200 $\mu\text{l}^3/\text{ml}$ to 350 $\mu\text{l}^3/\text{ml}$. This decision by the National Department of Health is encouraging as patients with higher CD4 cell counts initiated on HAART are likely to have better outcomes (Fox, Sanne, Conradie, Zeinecker, Orrell, Ive, Rassool, Dehlinger, van der Horst, McIntyre & Wood , 2010).

There were missing values of CD4 cell count for 58 (6.9%) participants at baseline. These missing values could result in confounding the data and cause bias in the result. The mobile HIV/ AIDS treatment teams did try to trace blood results by telephonic consultation with the laboratory. The reasons cited for missing test results by the mobile HIV/AIDS treatment teams included: delays in obtaining results from the laboratory due to printing difficulties, laboratory results sent to incorrect facilities, unavailability of specimen tubes, unavailability of laboratory stationary and challenges with the printing of laboratory results (Dr. Vilakazi, Personal communication, 2012).

5.3 Parameters of interest at follow up intervals

The median body weight at baseline was 58.2kg (IQR: 50.9 – 66.6). At follow up intervals of 6 months, the median weight for the cohort increased to 60.9kg (IQR: 54-71) and at 12 months the median weight was 63.7 kg (IQR: 55.85-72.58). Coetzee, Hildebrand, Boule, Maartens, Louis, Labatala, Reuter, Ntwana and Goemaere (2004) reported in a study conducted in Khayelitsha that the median weight gain for participants on HAART was 5.0kg (IQR: 1,5-9.6kg) and 9.0kg (IQR: 4.0-14.3kg) at 12 months. A study conducted in India reported that cohort of malnourished HIV patients that had been initiated on HAART had a mean weight gain of 2.7 kg (IQR: 12.5-22.5) (Saghayam, Kumarasamy, Cecelia, Solomon, Mayer & Wanke, 2007). The results of this study may be interpreted such that there was a significant increase in weight of participants from baseline to follow up intervals. The progressive increase in weight over the study period could be attributed to HAART. The mobile HIV/AIDS treatment teams' doctors played an important role in ensuring that clients were followed up at monthly intervals and progression reported in clinical charts appropriately. It is important to note that there were missing values for the weight at baseline, 6 months and 12 months follow up for certain participants. The cause could have been due to clients missing appointment dates or the unavailability of scales for weighing clients on the day of appointment. Missing results may cause abnormal distribution of the data and confounding.

5.3.1 CD 4 cell count

Of the available results for participants in the study, the median CD4 cell count increased from 137 $\mu\text{l}/\text{mm}^3$ (IQR: 75 – 188) at baseline (n = 784) to 262 $\mu\text{l}/\text{mm}^3$ (IQR: 180-351) at 6 months (n= 444) and further increased to 383 $\mu\text{l}/\text{mm}^3$ (273-518) at 12 months (n = 269). At 12 months only 18 (6.71%) participants from a total of 268 CD4 test results available had a CD4 cell result less than 200 $\mu\text{l}/\text{mm}^3$. The remainder (250 participants, 93.29%) had CD4 cell result above 200 $\mu\text{l}/\text{mm}^3$. Ferradini *et al.* (2006) reported in their study that of patients with available CD4 counts at baseline (n=980), the median gain of CD4 cells was 139 $\mu\text{l}/\text{mm}^3$ (IQR 63–234) at 6 months (n=102) and 165 $\mu\text{l}/\text{mm}^3$ (67–259) at 12 months (n=192). Coetzee *et al.* (2004) reported in their study that CD 4 cell count increased by a median of 134 $\mu\text{l}/\text{mm}^3$ (IQR: 76- 206) at 6 months follow up, whilst a study by Lawn, Myer, Bekker and Wood (2006) indicated that their cohort had a CD4 cell count increase from a median of 97 cells/ μl

at baseline to 261 cells/ μl at 48 weeks. A study conducted by Nash, Katyal, Brinkhof, Keiser, May, Huges, Dabis, Wood, Sprinz, Schechter and Egger (2008) combined data from 27 centers in resource limited settings reported that their study had a median CD4 count increase from 114 $\mu\text{l}/\text{mm}^3$ at ART initiation to 230 $\mu\text{l}/\text{mm}^3$ (IQR:144-338) at 6 months, 263 $\mu\text{l}/\text{mm}^3$ (IQR:175-376) at 1 year. The study result showed comparable increases for the CD4 cell count to cohorts described above. The outcomes of treatment have been such that participants with increases in CD4 cell count were alive at the follow up period of 6 months and 12 months respectively. There were missing values for CD4 cell counts at baseline, 6 months and 12 months follow up for certain participants. The mobile HIV/AIDS treatment teams did assist with telephonically communicating with the hospitals to obtain results for certain clients. Missing results are a cause for concern and the results must be interpreted accordingly.

5.3.2 Viral Load

The available viral load results from this study indicate that at 6 months, 174 participants (83%, n =210) had an undetectable viral load. At 12 months 281 participants (94%, n=298) had an undetectable viral load. 36 participants (17%, n=210) had detectable viral loads at 6 months, and 17 (6%, n=298) participants had detectable viral loads at 12 months. Ferradini *et al.*(2006) reported that 87% (n=397) of their cohort had undetectable viral loads at follow up (median 8.3 months, IQR: 5.5-13.1) whilst Mutevedzi *et al.* (2010) reported that out of 2527 participants recorded active at 12 month post HAART initiation, only 758 (30%) had a recorded viral load result. From the 758 results available, 174 participants had detectable viral loads.

In this study, there were many viral load test results that were missing. Upon further investigation it was determined that all blood specimens marked for viral load tests had to be transported 350km away from Newcastle to Inkosi Albert Luthuli Central Hospital (IALCH). This facility was the only hospital in KZN that was certified to conduct viral load testing in 2010. Personal communication with nurses, and doctors who were part of the mobile HIV treatment teams indicated that there were numerous challenges in delivery of test results. Mutevedzi *et al.* (2010) reported that there were many missing viral load test results in their cohort and this was attributed to: blood samples being unsatisfactory for evaluation, results not returned from the central laboratory and errors in data capturing. Although there were

missing test results for viral loads in this cohort, the available results do indicate a high degree of virological suppression at 12 months. Such results are promising and indicative that participants were adherent to their ART regimens. The suppression outcome for viral load is comparable to other studies in Sub-Saharan Africa and rich countries (Ferradini *et al.*, 2007). Ivers *et al.* (2005) reported in a meta-analysis conducted to determine the efficacy of ART programs in resource poor settings that approximately 57% of ART results in that study had viral load suppression. They conclude their study by mentioning that the viral load suppression rate was similar to that of those results in developed countries and hence ART programs in resource poor settings are effective.

5.3.3 Status of participants at 6 months and 12 months follow up

At 6 months follow up there were 579 participants (69%, n=842) that were alive, 134 (15.9%) deaths 66 (7.83%) lost to follow ups, 49 (5.8%) transfers and 12 (1.4%) discontinuations reported. At 12 months follow up there were 527 participants (63%, n=842) that were alive, 145 (17.2%) deaths, 72 (8.5%) lost to follow up, 76 (9%) transfers, and 20 (2.4%) discontinuations reported.

The study results show that the majority of clients were alive at 6 months and 12 months follow up. Most deaths occurred in the first 6 months of treatment. More males had died whilst on HAART compared to females. Mortality contributed to 55% of the attrition rate within this cohort. Although the reasons for deaths were not determined in this study, the low CD4 cell count as an eligibility criterion for HAART and TB are major factors that have contributed to death in other cohorts (Lawn *et al.*, 2005). Lost to follow up is another major contributor to attrition in this study. Upon further investigating loss to follow ups (which entailed telephonically calling the participants to enquire about their wellbeing and reasons for not coming to the clinic, or sending out a community care giver to the patient's household) we discovered the following:

- 1) Many of the participants' contact details provided in the patient clinical clerking form were invalid making it impossible to contact them telephonically or to go to their houses to conduct a home visit.
- 2) Some clients had opted to go to another district / province to obtain their treatment.
- 3) Some clients had died.

- 4) Some had chosen to default on treatment due to stigma attached to them drinking ARV's.

The irregular transfer out of patients to other facilities poses challenges to the Department of Health. Therapeutic duplication of services is possible given the absence of a universal electronic information system that can detect patient movement or patient's trying to access ARV treatment at another facility.

5.4 Study Limitations

This was an observational and analytical retrospective cohort analysis of data that was routinely collected at the PHC clinic facilities in Amajuba District. There were challenges relating to the completeness (missing variables) of the data required for the study. Participant profiles with missing laboratory test results might have changed the study result if these results were made available. The study was limited by a small sample size and short follow up period which was 12 months. A possibility exists that participants could have been incorrectly classified as lost to follow up, when in fact they could have transferred out to another facility. It was not possible to calculate the body mass index (BMI) of the participants as data pertaining to height was not available. Pill counts were conducted routinely for clients to determine adherence to HAART, however there were no records of clients being interviewed to determine their knowledge on how to take their medication. It is possible that clients may have been eligible for HAART initiation but were not include in the booking system to be seen by the mobile HIV/AIDS treatment teams. These patients were not quantified and this could be seen as a limitation to the study. Where participants were classified as died in the follow up period, the cause of death was not determined. The lack of information in terms of switching participants who had unsuppressed viral loads onto an alternate ART regimen also was a limitation that could have affected the study result.

CHAPTER 6

6.1 CONCLUSION

This study has shown that HAART can be successfully scaled up via mobile HIV/AIDS treatment teams at rural PHC clinics with good outcomes to treatment despite barriers to access treatment and scarcity of human resources. The activities of the mobile HIV/AIDS treatment teams have been effective. This can be seen whereby participants in this study have responded well to HAART with improvement of baseline CD4 cell counts, weight and attaining good suppression of viral load. Although the outcomes to treatment in this cohort analysis has been positive and comparable to cohorts in Sub-Saharan Africa and developed countries, the lack of availability of blood results is of concern. Lack of results made it very difficult to make clinical decisions and delayed participants from being initiated onto HAART speedily by the mobile HIV/AIDS treatment teams. Maternal deaths were also a major concern. The recent amendment of the National HIV treatment guidelines to remove Nevirapine as a first line agent for pregnant women requiring HAART will greatly reduce ART associated toxicities in pregnancy. TB is another major contributor to mortality in patients with HIV. The guidelines for the prophylaxis of Isoniazid preventive therapy will assist with reducing TB mortality however, an integrated approach to this challenge is warranted.

The mobile HIV/AIDS treatment teams of Amajuba District have scaled up HAART in Amajuba District. They have been effective and have been of tremendous value in saving the lives of many. Apart from positive outcomes to treatment, we note that patients also had to travel much less distances compared to when they had to travel to the hospital to access HAART. This increased convenience to the patient may have also had an impact of improved adherence to treatment as well.

6.2 RECOMMENDATIONS

From the findings of this study, herewith are my recommendations:

- 1) There is a need to strengthen the systems to obtain laboratory results from the hospital. One major limitation of this study was the unavailability of laboratory results that could have impacted on the study result. The mobile HIV/AIDS treatment teams mentioned that laboratory results were being delivered to the incorrect facility and there were challenges relating to the printing of blood results. A mechanism should be established to track laboratory results with a tracking form and register for signature by the operational manager of the clinic.
- 2) Nurses need to be mentored by doctors so that they can make the best clinical decisions when the doctor is not present. Even though policies are now in place for nurses to initiate and manage patients on HAART, we have discovered that nurses who are not properly trained and mentored find it challenging to treat patients on HAART due to lack of confidence and clinical expertise. The advent of nurse initiated managed antiretroviral treatment (NIMART) provides an ideal platform for doctors in the mobile HIV/AIDS treatment teams to strengthen the role of mentoring.
- 3) TB management should be integrated into the package of care provided by the mobile HIV/AIDS treatment teams. The silo approach to managing TB alone has challenges. Professional nurses at the clinic need to be aware of the management of TB and HIV. The new guidelines for HIV management do endorse the integration of TB and HIV management.
- 4) Pregnant women need to be expedited onto HAART if we are to achieve maximal therapeutic outcomes and eliminate mother to child transmission of HIV. The mobile HIV/AIDS treatment teams did encounter many delays when trying to initiate pregnant women on HAART due to blood results not being available on time.
- 5) The National Department of Health has indicated that all ART sites should now be utilizing the tier.Net software for data capture of clinical information for patients on ART. A study should be conducted to determine the reliability of data which is

captured on this system as it is this data from this system that will inform decisions to be made in relation to monitoring and evaluating the performance of the ART program as a whole.



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Appendix A : Data Extraction Tool

Study ID Number:

Initiating clinic

Nellies Farm	Naas Farm	Mndozo	Osizweni 2
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Age (years):

Gender: Male = 1 / Female = 2

HAART Initiation Date: ddmmyyyy

Pregnant: Yes = 1 / No = 2

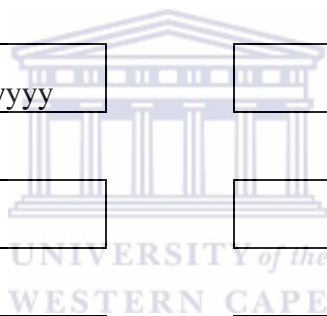
Base line weight (Kilograms)

Weight at 6 months (Kilograms)

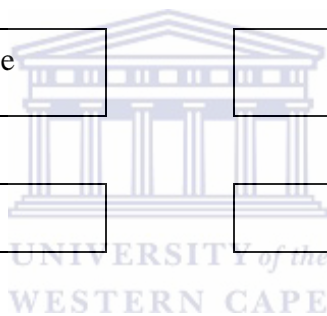
Weight at 12 months (Kilograms)

TB at HAART Commencement Date:

WHO Staging at Baseline (stage 1,2,3,4)



WHO Staging at six months (stage 1,2,3,4)	
WHO Staging at twelve months (stage 1,2,3,4)	
HAART Regimen (1a,1b,1c,1d,1e,2a,2b,2c)	
Baseline CD 4 cell count ($\mu\text{l}^3/\text{ml}$)	
CD 4 cell count ($\mu\text{l}^3/\text{ml}$) at six months	
CD 4 cell count ($\mu\text{l}^3/\text{ml}$) at twelve months	
Virological load at 6 months	
Virological load at 12 months	
Patient Outcomes at 6 and 12 months (Alive , Died , Lost to Follow up , Transferred to another facility)	



Appendix B: Letter indicating permission to conduct study (District Office of Health).



health

Department:
Health
PROVINCE OF KWAZULU-NATAL

Amajuba District Office of Health
38 Voortrekker Street
Newcastle
Tel: 034 328 7002
Fax: 03431 32123
E-mail: pravina.naidoo@kznhealth.gov.za
www.kznhealth.gov.za

Date: 27/07/2012
Enquiries: Mamosa Tshabalala
Ref:

Mr. Abdus-Samad Cassim
P.O. Box 1118
Newcastle
2940

Re: PERMISSION TO CONDUCT RESEARCH AT AMAJUBA DISTRICT PRIMARY HEALTH CARE CLINICS

I have pleasure in informing you that permission has been granted to you by the District Office to conduct research on "A Retrospective Evaluation of the Effectiveness of the Mobile HIV/ AIDS Treatment Teams in Amajuba District Kwa- Zulu Natal".

Please note the following:

1. Please ensure that you adhere to all policies, procedures, protocols and guidelines of the Department of Health with regards to this research.
2. This research will only commence once this office has received confirmation from the Provincial Health Research Committee in the KZN Department of Health.
3. Please ensure that this office is informed before you commence your research.
4. The District Office will not provide any resources for this research.
5. You will be expected to provide feedback on your findings to the District Office

Thank you


.....
MRS. A.M.E.T TSHABALALA
DISTRICT MANAGER
AMAJUBA DISTRICT OFFICE

uMnyango Wezempilo . Departement van Gesondheid

Fighting Disease, Fighting Poverty, Giving Hope

Appendix C: Letter indicating permission to conduct study (Provincial KZN Department of Health).



health

Department:
Health
PROVINCE OF KWAZULU-NATAL

Health Research & Knowledge Management sub-component
10 – 103 Natalia Building, 330 Langalibalele Street
Private Bag x9051
Pietermaritzburg
3200
Tel.: 033 – 3953189
Fax.: 033 – 394 3782
Email.: hrkm@kznhealth.gov.za
www.kznhealth.gov.za

Reference : HRKM159 /12
Enquiries: Mrs G Khumalo
Telephone : 033 – 395 3189

24 October 2012

Dear Mr A S Cassim

Subject: Approval of a Research Proposal

1. The research proposal titled 'A retrospective evaluation of the effectiveness of the Mobile HIV/AIDS treatment teams in the Amajuba District KwaZulu-Natal' was reviewed by the KwaZulu-Natal Department of Health.

The proposal is hereby **approved** for research to be undertaken at selected clinics at Amajuba district.

2. You are requested to take note of the following:
 - a. Make the necessary arrangement with the identified facility before commencing with your research project.
 - b. Provide an interim progress report and final report (electronic and hard copies) when your research is complete.
3. Your final report must be posted to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to hrkm@kznhealth.gov.za

For any additional information please contact Mrs G Khumalo on 033-395 3189.

Yours Sincerely



Dr E Lutge
Chairperson, Health Research Committee
KwaZulu-Natal Department of Health

Date: 25/10/2012

uMnyango Wezempilo. Departement van Gesondheid

Fighting Disease, Fighting Poverty, Giving Hope

Appendix D: Letter indicating permission to conduct study (University of Western Cape Higher Degrees Ethics Committee).



UNIVERSITY of the
WESTERN CAPE

**OFFICE OF THE DEAN
DEPARTMENT OF RESEARCH DEVELOPMENT**

08 October 2012

To Whom It May Concern

I hereby certify that the Senate Research Committee of the University of the Western Cape has approved the methodology and ethics of the following research project by:
Mr. A-S Cassim (School of Public Health)

Research Project: A retrospective evaluation of the effectiveness of the mobile HIV/AIDS Treatment teams in the Amajuba District, Kwazulu-Natal.

Registration no: 12/8/12

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

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

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