FACTORS INFLUENCING TREATMENT ADHERENCE AMONG ADULT PATIENTS RECEIVING ANTIRETROVIRAL THERAPY AT EXTENSION 15 CLINIC, GABORONE, BOTSWANA

by

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DECLARATION

I declare that **FACTORS INFLUENCING TREATMENT ADHERENCE AMONG ADULT PATIENTS RECEIVING ANTIRETROVIRAL THERAPY AT EXTENSION 15 CLINIC, GABORONE, BOTSWANA** is my own work and that all the resources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any other degree at any other institution.

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ABSTRACT

This study analysed data obtained from respondents and their medical records to determine the barriers and motivators for good adherence to ART. Respondents' records were also reviewed together with their pharmacy refill records to identify any correlation between CD4 cell counts, viral load, VL and adherence to antiretroviral drugs at extension 15 ARV clinic in Gaborone, Botswana. The study investigated whether the combination of pharmacy refills and pill counts adherence measurement methodologies could predict immunological recovery and virologic response through increased CD4 cell counts and suppressed VL. There was a positive relationship between adherence, CD4 cell counts and VL. Pharmacy refills and pill counts adherence measurement methodologies scored high on sensitivity, specificity, and positive predictive values but low on negative predictive values.

Key words

Highly active antiretroviral therapy (HAART), HIV/AIDS, ART, treatment adherence, motivators for good adherence, barriers to adherence, ARV pharmacy records, CD4 cell counts, viral load, Botswana,

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- My colleagues and friends for their invaluable contributions.
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DEDICATION

I dedicate this dissertation to my dear parents Godwin (late) and Florence Ndubuka, my lovely wife Justina and wonderful sons Nnamdi Jr and Nnaemeka, and to all people living with HIV/AIDS.

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CHAPTER 1

INTRODUCTION AND BACKGROUND INFORMATION

1.1 INTRODUCTION

Since it was first recognised in 1981, Acquired Immune Deficiency Syndrome (AIDS) has killed more than 25 million people, making it one of the most destructive pandemics in recorded history, according to the World Health Organization (WHO 2006:23). Every day over 6 800 persons become infected with the Human Immune-deficiency Virus (HIV) and over 5 700 persons die from AIDS, mostly because of inadequate access to HIV prevention and treatment services (UNAIDS/WHO 2007:4).

According to the WHO (2006:23) AIDS can kill because the infected individual's immune system is unable to fight the infection. The effect of HIV on an individual can be detected by measuring the number of circulating CD4 cells in the blood stream or the viral load which is defined as the number of human immune-deficiency virus in the blood stream. A healthy individual has a CD4 cell count of about 1000 per mm^3 and once it falls to 200 per mm^3, the individual is likely to suffer from various infections unless he/she is treated with anti-retrovirals (ARVs). In 2007, AIDS claimed an estimated 2.1 million lives globally and an estimated 2.5 million people were newly infected with the virus. In this same period it was estimated that 32.2 million people worldwide were living with HIV of whom 22.5 million lived in sub Saharan Africa (SSA)(UNAIDS/WHO 2007:1).

SSA is the global epicenter of the AIDS pandemic and remains the worse affected region in the world. More than 68% (22.5 million) of all HIV positive people live in this region where more than 76% (1.6 million) of all AIDS deaths occurred in 2007. It is also estimated that between 1.7 and 2.4 million people in this region were newly infected with HIV during 2007. Unlike other regions, the

majority of people living with HIV in SSA (61%) are women (UNAIDS/WHO 2007:15). The impact of HIV in SSA is threatening development in all sectors of society. Although people of all ages are affected by the virus, most of those affected are in the age group 25-45. This group is particularly important not only in terms of economic productivity but also as carers, parents and providers. The loss of productive workers and increased spending on health care services require difficult decisions about resource allocations across all government sectors (UNAIDS 2005:12).

But why is SSA more severely affected than other parts of the globe? Buve, Bishikwbo-Nasrhaza and Mutangadura (2002:2011) indicated that HIV type 1 is responsible for the majority of HIV infections in SSA. The viral strain prevalent in the region is the virulent subtype C (McGregor 2002), likely to develop ART resistant mutations. Buve et al (2002:2011) maintain that HIV-1 epidemics in SSA are the result of a complex interplay of sexual behaviour and biological factors that affect the probability of HIV-1 transmission per sex act. Sexual behaviour patterns are determined by cultural and socioeconomic contexts. In SSA, some traditions and socioeconomic developments have contributed to the extensive spread of HIV-1 infection, including the subordinate position of women, impoverishment and decline of social services, rapid urbanisation and modernisation, wars and conflicts.

Botswana, a developing SSA country has one of the highest HIV prevalence rates in the world (MoH 2006b:1; Smart 2006; Weiser, Wolfe, Bangsberg, Thior, Gilbert, Makhema, Kebaabetswe, Dickenson, Mompati, Essex & Marlink 2003:281) and has a population of 1.76 million (UNAIDS/WHO 2006:15). The Botswana AIDS impact survey, conducted in 2004, estimated the HIV prevalence in the general population at 17.1%. In 2005, antenatal clinic HIV prevalence among pregnant women aged 15-49 was 33.4%. The 2006 Botswana second generation HIV/AIDS surveillance revealed a prevalence of 32.4% among

pregnant women attending government antenatal clinics (MoH 2006a:27; NACA 2006).

In 2002, Botswana officially launched an antiretroviral therapy (ART) programme on a national scale and became the first African country to provide ARVs free of charge to its citizens who qualify for treatment. The programme became known as *MASA*, the Setswana word for "new dawn" (WHO 2006:85). The *MASA* programme was launched initially at four sites in Botswana consisting of two referral hospitals and two district hospitals. The programme has been scaled up to such an extent that by the end of 2004, all 32 districts and primary hospitals throughout the country were providing ART. Botswana's Ministry of Health (MoH 2008:3) stated that by the end of December 2007, an estimated number of 75 082 patients were on treatment in the public sector, of whom 61% were females. A further 8 336 patients' ARV treatment had been outsourced from the public to the private sector under the government's out-sourcing programme. Another 9 514 patients were being treated in the private sector of the country comprising the medical aid schemes and the work place programmes. This gave a total of 92 932 patients receiving highly active antiretroviral therapy (HAART) in Botswana.

The introduction of HAART in the 1990s brought new hope to the people living with HIV/AIDS (PLWH/As) and has qualitatively changed the HIV clinical landscape (Fogarty, Roter, Larson, Burke, Gillespie & Levy 2002:95). The increased availability of treatment has improved survival rates and lowered the incidence of opportunistic infections in persons living with AIDS (PLWAs) (UNAIDS 2005). People who have access to ARVs, and the adequate care needed to maintain therapy, can survive for many years with this chronic disease. ARVs are not a cure for HIV. However, ARVs are effective in controlling the virus and can even reduce the level of the virus to undetectable levels in the blood. These drugs prevent the rapid multiplication of HIV and at the same time, boost the body's immune system, increasing the length and quality of life of

people with HIV/AIDS while enabling them to lead full and productive lives (WHO 2006:26). The goal of HAART is to suppress the viral load to an undetectable level for as long as possible and significantly elevate the CD4 cell counts (Fogarty et al 2002:93; Splete 2005).

According to the WHO (2006:24) there are different types of ARVs which attack the virus in different ways. The most commonly used ARVs are from three different classes: nucleoside reverse transcriptase inhibitors (NRTIs), non-nucleoside reverse transcriptase inhibitors (NNRTIs) and protease inhibitors (PIs). Highly active antiretroviral therapy is therefore defined as the use of three or more ARV drugs for the suppression of HIV replication in the human body. All ARVs have different side effects which can impact on how the medicines will be used and how the patients take them. HAART medications are also classified into first, second and third line regimens. First line HAART is relatively cheaper than second line ARVs. Second and third line regimens are required when drug resistance develops with the first line regimen, a possible consequence of non-adherence to ART. Second and third line medicines are much more expensive than first line and are associated with more side effects (UNAIDS 2006:25).

The widespread use of HAART has significantly reduced HIV-associated morbidity and mortality where treatment has been available (Anderson & Weatherburn 1999:445; Gibb, Duong, Tookey, Sharland, Tudor-Williams, Novelli, Butler, Riordan, Farrelly, Masters, Peckham & Dunn 2003:1019). However, it has been noted that extremely high levels of adherence to such therapies, which may often be complex in terms of pill burden, dietary restrictions and dosing frequency, are required to ensure optimal treatment benefit (Altice, Mostashari & Friedland 2001:47; Poppa, Davidson, Deutsch, Godfrey, Fisher, Head, Horne & Sherr 2003) estimated to be achievable with at least 95% ART adherence rates.

According to Machtinger and Bangsberg (2005:2) ARV adherence has emerged as both the major determinant and the Achilles' heel of ARV treatment success.

They further stated that non-adherence has been found to diminish the immunological benefit of HAART and increase AIDS related morbidity and mortality, and hospitalisations. Antiretroviral adherence is the second strongest predictor of progression to AIDS and death, after CD4 counts (Hogg, Heath, Bangsberg, Yip, Press, O'Shaughnessy & Montaner 2002:1051).

Although there is no universally accepted definition, medication adherence may be defined as the extent to which a patient takes medications in the way intended by a health care provider (Machtinger & Bangsberg 2005:2; WHO 2006:27). The terms adherence and non-adherence are meant to be non-judgemental, statements of fact rather than any expression of blame towards the patient or provider (Machtinger & Bangsberg 2005:2; WHO 2006:27). The average rate of ART adherence varies by the assessment method used but appears to be approximately 70% in the United States (Machtinger & Bangsberg 2005:2). According to Altice and Friedland (1998:503) non-adherence might mean not taking medications at all, taking reduced amounts, not taking doses at prescribed frequencies or intervals or not matching medication to food requirements.

Though effective adherence levels have not been fully defined for HAART, levels of adherence of at least 95% are required to achieve full and durable viral suppression (Jani 2004:9; Ostenberg & Blaschke 2005:488; Orrell, Bangsberg, Badri & Wood 2003:1369; Paterson, Swindells, Mohr, Brester, Vergis, Squier, Wagener & Singh 2000:27; Poppa et al 2003:47; Saple 2005; Simone, Frick, Pantalone & Turner 2003:185). These high adherence levels are by no means universal amongst PLWAs.

The consequences of non-adherence are serious for the individual, for public health and for the optimal use of limited health care resources. For the individual, lower levels of adherence are associated with the development of viral resistance, treatment failure and increased risk of disease progression (Hogg, Yip & Chan 2000; Machtinger & Bangsberg 2005:4). Upon such treatment failure,

while on first line regimen, the patient is switched to the second line regimen which is more complex, expensive and associated with higher levels of toxicity (Fogarty et al 2002:93; Poppa et al 2003:47, WHO 2006:26-27).

From a public health perspective, the increase in prevalence of resistance virus as a result of (amongst other reasons) low adherence is likely to result in an increase in transmission of ART-resistant HIV to newly infected individuals. From an economic perspective, low adherence will result in the increased use of second line and salvage regimens, which are more expensive than initial ART regimens. In addition, since low adherence is associated with an increased risk of disease progression, the cost of treating opportunistic complications will have a further negative impact on the established cost-benefit ratio of HAART (Poppa et al 2003:47).

While the ultimate goal of HAART is to reduce HIV-related morbidity and mortality, the initial goal is full and durable viral suppression. According to Botswana's Ministry of Health (MoH 2005:3-4), the earliest indicator for success of a chosen regimen is a rapid fall in plasma viral load (VL) by three months after the start of therapy. The VL should fall to levels below the threshold of detection by six months. Botswana's government HIV reference laboratories utilise test procedures that measure down to 400 copies per ml of blood. The fall in VL should be associated with a steady rise in CD4 cell count. VL and CD4 cell count are done at baseline before initiation of HAART, then at three months after starting therapy and every three months thereafter (MoH 2005:19).

The chances of treatment success depend mostly on the level of adherence which must be greater than 95% (Fairly, Permana & Read 2005:368; Jani 2004:9; MoH 2005:4; Ostenberg et al 2005:488; Paterson et al 2000:27; Poppa et al 2003:47 & Saple 2005) for the best results. Therefore every effort should be made to ensure a high level of adherence to the first line ARVs in order to achieve success.

The researcher therefore aimed to identify the barriers and motivators of adherence to ART. Furthermore, it was attempted to determine any relationship between adherence as determined by pharmacy refill data and pill count, and immunological and virological response as reflected in the increased CD4 cell counts and suppressed VL amongst HIV positive adults on treatment at a government clinic in Gaborone, Botswana.

1.2 BACKGROUND INFORMATION

HIV/AIDS has remained the most important health challenge for Botswana and the biggest threat to its development. The first case of HIV/AIDS in Botswana was diagnosed in 1985 and the prevalence has increased rapidly since then (WHO 2002:6). The current data on Botswana's 2007 prevalence is yet to be published by the MoH.

The introduction of HAART in 1996 has lead to marked decreases in the morbidity and mortality rates of HIV/AIDS (Gibb et al 2003:1019). In January 2002, the government of Botswana rolled out the ARV programme in a bid to curtail the morbidity and mortality associated with the infection (McGregor 2002; WHO 2006:85; MoH 2008:3; Smart 2006). The ARV programme aimed at providing HAART to citizens who were eligible and in need of ARVs. Patients are initiated on HAART according to the Botswana government national guidelines.

These Botswana national ART guidelines stipulate that (MoH 2005:6) HIV positive adults are eligible to start HAART when their CD4 cell count is less than 200 cells per mm^3. Those patients with severe or recurrent AIDS-related disease or tumours qualify for HAART irrespective of their CD4 cell count. These conditions include wasting syndrome, chronic diarrhoea, encephalopathy, and recurrent severe bacterial infections. HIV positive patients with tuberculosis (TB) co-infection qualify for treatment with ARV in Botswana because TB is the most common opportunistic infection and the majority (about 70%) of affected patients

are co-infected with HIV. Botswana's Ministry of Health (MoH 2007:12) stated that the proportion of TB patients who are co-infected with HIV in Botswana has been shown to range from 60% to 86%. It further stated that TB is responsible for 13% of all adult deaths and 40% of deaths among PLWH/A. TB is the leading cause of death of PLWH in Botswana (Botswana University of Pennsylvania Partnership 2006).

Before a patient is initiated on HAART, adherence counselling is done by a social worker or nurse in the presence of a treatment supporter/adherence partner to determine patients' readiness to begin treatment. During this counselling session, adherence issues are addressed including, but not limited to expected benefits, potential side effects, goals of HAART, role of CD4 and VL testing, why adherence counselling is important, drug resistance, food requirements, beliefs about therapy, social support, use of drugs or alcohol, mental health issues, and the person's ability to meet his/her basic needs (MoH 2005:2; Poppa et al 2003:56). On the day of initiation, patients undergo drug adherence counselling sessions with the pharmacist. Re-enforcement counselling is done subsequently at every visit by the attending doctor, nurse or pharmacist. Health issues discussed are recorded on patients' files by the attending doctor or nurse. The pharmacist records the ARVs supplied on each patients' ARV dispensing checklist.

After initiating treatment, patients are given appointments to visit the doctor and refill their medications after two weeks. At this visit, patients are required to bring back the pill containers to enable the doctor and pharmacist do the pill counts. The balance of the pills is documented on the patients' adherence sheet. While adherence can be expressed quantitatively as a percentage of expected treatment actually taken, its accurate measurement is very difficult. There is no gold standard for adherence measurement. While adherence can be enhanced by directly observed therapy (DOT), this may not be practical for twice daily therapy which has to be taken for life. As a result, levels of adherence can only

be estimated by the use of individual measures (WHO 2006:27). The most commonly used methods include pill counts, pharmacy refill records, patients' self reports, measurements of blood levels and medication event monitoring systems (MEMS) (Goudge, Ngoma & Scheider 2004:6; Poppa et al 2003:54; WHO 2006:27). The Botswana ARV guideline (MoH 2005:2) asserts that adherence is crucial; therefore practical ways to monitor it must form an essential part of follow up-care. The following methods are used for monitoring adherence: careful history taking about the person's actual ARV adherence, including missed or incorrect doses, directly observed therapy (DOT) by a nurse, pharmacist, family member or friend, pill counts and periodic VL and CD4 cell count determinations.

At Gaborone's extension 15 ARV clinic, pharmacy refill records and pill counts are used to identify defaulters. Neither MEMS nor self report forms are used as adherence measurement tools. The researcher wanted to know if there were any correlations between the pharmacy refill records, pill counts, and surrogate markers (CD4 and VL).

1.3 RESEARCH PROBLEM

A research problem is a troubling situation in need of a solution, improvement or alteration. It is an area of concern where there is a gap in the knowledge base needed for professional practice (Burns & Grove 2005:70; Polit & Beck 2004:65). Antiretroviral therapy has been available free of charge to all citizens of Botswana who qualify for treatment. However, there is a growing concern about the level of adherence (WHO 2006:83). Studies conducted in Botswana have reported adherence of 83% (Nwokike 2004) in the public sector and 54% (Weiser et al 2003) in the private sector. According to the WHO (2005:12) these adherence rates were found to be below the minimum level of 95% required for treatment success.

Kumarasamy, Safren, Raminani, Pickard, James, Sri Krishnan, Solomon and Mayer (2005:526) identified the main barriers to adherence as treatment-related cost, privacy, and stigma while the enhancers were the perceived benefits of HAART, awareness of the consequences of sub-optimal adherence and social support mechanisms.

In December 2007, 200 patients defaulted treatment by not collecting their ARVs from the pharmacy and 350 patients were on second line regimens due to treatment failures (Extension 15 ARV pharmacy 2008). As at December 2007, an estimated number of 682 patients were on treatment at this site. It was therefore critical to study and understand the key factors that influence adherence and develop strategies to improve adherence to HAART among patients receiving HAART at this clinic.

1.4 RESEARCH QUESTIONS

In conducting this research, the researcher had the following questions in mind:

- What are the barriers to adherence among ARV patients?
- What are the motivators of good adherence to HAART?
- Are pharmacy refill records and pill counts good predictors of CD4 cell counts and VL?

1.5 PURPOSE OF THE STUDY

The purpose of this study was to identify the barriers and motivators for good adherence to ART and determine the relationship between adherence to ART as measured by pharmacy refills and pill counts, and immunologic and virologic responses indicated by increased CD4 cell counts and suppressed VL respectively among HIV-positive adults on treatment at extension 15 ARV clinic.

1.6 RESEARCH OBJECTIVES

Specific objectives of this study were to:

- determine the motivators of good adherence
- determine the barriers to good adherence
- determine if there is a correlation between adherence to ARVs as measured by pharmacy refill records, pill count, CD4 cell counts and VL.
- recommend interventions to improve ARV treatment adherence rates at this clinic.

1.7 ASSUMPTIONS UNDERLYING THE STUDY

The researcher's objectives were based on the assumptions that high levels of adherence to ARVs will be predicted by an increase in CD4 cell counts and full viral suppression and that adherence is measured by regular and prompt collection of ARVs from the pharmacy. The researcher hypothesised that patients who refilled their ARVs regularly and maintained high levels of treatment adherence would show immunologic recovery and complete viral suppression as reflected in steady rises in CD4 cell counts and undetectable VL.

1.8 SIGNIFICANCE OF THE STUDY

- Lessons learned will be used to improve ARV adherence among patients receiving treatment at this clinic.
- This study may contribute to the revision of clinical guidelines to inform providers about more effective and efficient treatment adherence monitoring tools to be used at extension 15 clinic in Gaborone.

1.9 RESEARCH METHODOLOGY

According to Mouton (2001:56), research methodology outlines the process of the research and what tools are needed to achieve the research objectives. The research methodology used in this study is discussed in more detail in chapter 3 of this dissertation.

1.9.1 Study design

A cross-sectional, quantitative, cohort study which was retrospective and descriptive in nature was used for this research.

1.9.2 Research setting

This study was conducted at extension 15 ARV clinic, a public health facility located in Gaborone, the capital city of Botswana. Extension 15 clinic is a ten roomed health facility with a pharmacy and a large open space that serves as the patients' waiting area. As at July 2008, this clinic had two medical officers, three nurses, one social worker, two pharmacists, one data clerk, one cleaner and a driver. Only adult patients aged 21 years and older are consulted at this clinic three times per week (Mondays, Wednesday and Fridays).

1.9.3 Research population

The population comprises the entire set of individuals having some common characteristics conforming to the eligibility criteria and who are available for a particular study (Burns & Grove 2005:342; De Vos 2002:198). The study population comprised HIV-positive adult patients who were initiated on HAART at extension 15 clinic, Gaborone Botswana between 1st January 2007 and 31st December 2007 and who had completed at least six months' treatment by 31 July 2008.

1.9.4 Sample size

A sample is a subset of a population selected to participate in a study (Polit and Beck 2004:291). Sample size refers to the number of elements that are included in the sample (Burns & Grove 2005:343). The sample in this study included patients initiated on HAART at this clinic between 1 January 2007 and 31 December 2007 and who had been on HAART for at least six months and had at least baseline and one additional set of subsequent CD4 and VL laboratory test results. These patients would have received a series of adherence counselling sessions as reflected in their files. Preliminary investigations of clinic electronic attendance records gave an estimate of between 120 and 150 patients. Only eligible patients who attended the clinic for routine check-up visits between 1 and 31 August 2008 were selected from this population.

1.9.5 Sampling

Sampling is the process of selecting a portion of the population to represent the entire population (Polit & Beck 2004:291). Purposive sampling was used for this study as only 116 eligible patients who agreed to participate in the research were interviewed out of the population of 280 patients who attended this clinic between 1st and 31st August 2008.

1.9.6 Data collection instrument

A structured interview schedule with closed-ended items and response options was developed specifically for this study. This was translated into the local language (Setswana) by a bilingual expert. (See the bilingual expert's letter and curriculum vitae in Annexure L & M). The interview schedule comprised items derived from the research variables.

1.9.7 Data collection

A structured interview was conducted with each patient by one research assistant, fluent in both English and Setswana, who had been trained by the researcher. Eligible patients were asked for formal consent before participating in the study. Data were collected over a period of one month (1st to 31st August 2008) from participants who attended the clinic during this period for their routine check-up visits.

1.9.8 Data analysis

Data collected were analysed using the Centre for Disease Control (CDC) Epi Info version 3.3.2. The Statistical Package for Social Science (SPSS) version 15 was used to calculate the Cronbach's coefficient for this study. The researcher was assisted by a statistician in analysing and interpreting the data. (See the statistician's letter in Annexure N).

1.9.9 Ethical considerations

Research ethics involves protecting the rights of the respondents and the institution in which the research was done, and maintaining scientific integrity (Babbie & Mouton 2001:531; Burns & Grove 2005:181-206). Approval was obtained from the Botswana Ministry of Health through the National Health Research Committee and the management of extension 15 clinic (see Annexure G & H). Ethical clearance was also obtained from the Ethics and Research Committee of the Department of Health Studies, Unisa (see Annexure E). Informed consent was obtained from each respondent before the structured interview was conducted (see Annexure I).

The informed consent process involved the research assistant giving a verbal explanation to each potential respondent on the nature of the study, its purpose, the procedure involved, and the expected duration. Each potential respondent was also informed that participation in the study was completely voluntary and that refusal to participate in the study would not affect their subsequent treatment or relationship with the facility or other persons in any manner whatsoever.

Although the names of the patients were reflected on their medical records, the researcher only recorded the ARV clinic reference numbers as well as the ARV pharmacy reference numbers. Respondents were also assured that all information gathered would be treated as confidential. Anonymity would also be maintained in the research report.

1.10 SCOPE AND LIMITATIONS OF THE STUDY

During the period under study (1st January 2007 to 31st December 2007), about 150 patients were initiated on HAART at extension 15 clinic. Only adult patients (aged 21 years and older), on HAART for at least six months and who had at least two CD4 cell counts and VL results were included in the study. The study covered demographic characteristics, clinical data, ART data, pharmacy refills and pill counts. The results from the study may be applied only to the study population. However, it might also have a broader relevance especially among patients on ART in urban communities.

The knowledge attitudes, practices and perceptions about ARVs, or the personal characteristics of the patients who agreed to be interviewed could be different from those who declined to participate in the study. These findings, however, cannot be generalised to all ARV patients.

A quantitative approach may not be able to assess other areas of concern with adherence problems such as the quality of adherence counselling being given at

the clinic; cultural beliefs and practices which could influence adherence and medication shortages at the clinic such as procurement and supply chains. These could have been better approached through observations, in-depth interviews and focus group discussions for which a qualitative approach would be more useful.

Findings from pill count and pharmacy refill records may not reflect the actual level of adherence and those who are not adhering are also most likely to miss their clinic visits. Low CD4 cell counts and high VL indicate treatment failure which may possibly result from primary resistant virus instead of the patients' non-adherence to treatment. The investigation of this possibility falls beyond the scope of this study.

This was a cross sectional study representing one point in time, not reflecting possible changes in individual perceptions, beliefs and behaviours over time.

1.11 DEFINITION OF KEY CONCEPTS

Terms used throughout this dissertation are defined to enhance better understanding between the researcher and the readers of the dissertation.

Adherence to ART: Adherence is defined as the "extent to which a client's behaviour coincides with the prescribed health care regimen as agreed through a shared decision-making process between the client and the health care provider" (Carter 2005:12; KITSO manual 2004). It also refers to the ability of a person living with HIV/AIDS (PLWHA) to be involved in choosing, starting, managing and maintaining a given therapeutic combination medication regimen to control viral replication and improve immune function (Jani 2004:3). For the purpose of this study, adherence has been defined as the regular and consistent collection of ARVs from the pharmacy. Adherence was also measured by counting the remaining pills and assuming that remaining pills, in excess of what was

expected, represented missed doses. Good adherence was defined as 95%+ adherence while non-adherence was defined as 94%- adherence. Usually the actual number of doses taken is calculated out of the total number of doses that had to be taken (if the patient must take ART twice daily, he/she would need to take 60 doses over a 30 day period; if only 45 doses had been taken the calculated percentage would be 45/60 = .75 X 100 = 75%). A composite adherence measure was computed as the means of the adherence rates of the two measures used, namely pill counts and pharmacy refills.

Adult patient: Any patient 21 years and older receiving ART from extension 15 clinic in Gaborone.

Anti-retroviral: Medications designed to suppress the replication of HIV and prevent the progression of AIDS.

CD4 cell: A type of immune system cell that is depleted during the progression of HIV infection. They are cells which fight infections.

CD4 cell counts: A useful and reliable monitoring test commonly used as a surrogate for adherence (Poppa et al 2003:55) and it is also used to determine the stage of the disease and monitor response to therapy. It is one of the criteria that can be used for deciding when to start HAART. The normal CD4 cell count is about 1000 cells per mm^3 (WHO 2006:23). Turn around time for CD4 results at extension 15 clinic is about two weeks. Treatment commences when this CD4 count is 200 or less; CD4 counts increase with adherence to ART while it decreases with non-adherence and/or ART-resistance HIV strains.

Descriptive study: A descriptive study design is one in which the primary goal is to assess a sample at one specific point in time without trying to make inferences or causal statements (NEDARC 2006).

Highly Active Antiretroviral Therapy (HAART): This is defined as HIV/AIDS treatment containing three or more anti-HIV medicines for the suppression of HIV viral replication in the human body (Population briefs 2005).

Immunological response: This implies the increase of CD4 cell counts in response to effective ART. It is one of the goals of ART.

Treatment cost: ARVs are offered free of charge to any Botswana citizen who is eligible for treatment. Weiser et al (2003:287) found the cost of ARVs to be a major predictor of low adherence in their cohort. However, since their research was conducted in the public health sector, where there is no longer a charge for ARVs in Botswana, this study will focus on other treatment-related costs such as transport fares, foregoing wages, expenditure on snacks and meals while waiting to be consulted at the clinic, and increased spending on food as a result of being on ART.

Viral load: Levels of HIV found in the blood. It is measured as the number of copies of HIV RNA per millilitre (copies/ml). VL goes below the level of detection (less than 400 copies per ml) by six months after starting ART (MoH 2005:18). At extension 15 clinic, it takes an average of two months to receive a VL result.

Viral response: Viral response is one of the primary goals of ART. Plasma VL decreases predictably to undetectable levels in response to effective ART within six months.

1.12 ABBREVIATIONS

The following abbreviations have been used throughout this dissertation.

AIDS	Acquired Immune Deficiency Syndrome
ART	Anti-retroviral therapy
ARVs	Anti-retrovirals

CDC	Centre for Disease Control
CSO	Central Statistical Office
DAART	Directly Administered Anti-retroviral Therapy
DOT	Directly Observed Treatment
HAART	Highly Active Anti-retroviral Therapy
HCV	Hepatitis C Virus Infection
HIV	Human Immune Deficiency Virus
KITSO	Knowledge, Innovation and Technology Shall Overcome (HIV and AIDS)
MEMS	Medication Events Monitoring System
MoH	Ministry of Health (Botswana)
NACA	National AIDS Coordinating Agency of Botswana
NEDARC	National Emergency Medical Services for Children Data Analysis Resource Center
NRTIs	Nucleoside Reverse Transcriptase Inhibitors
NNRTIs	Non-Nucleoside Analogue Reverse Transcriptase Inhibitors
PLWAs	People Living with AIDS
PLWH/A	People Living with HIV/AIDS
PLWHIV	People Living with HIV
PI	Protease Inhibitor
PIs	Protease Inhibitors
RNA	Ribonucleic Acid
SPSS	Statistical Package for Social Science
SSA	Sub-Saharan Africa
SVR	Sustained Virologic Response
TB	Tuberculosis
UDVL	Undetectable viral load
UK	United Kingdom
UNAIDS	United Nations Joint Programme on HIV/AIDS
UNISA	University of South Africa
USA	United States of America

VL	Viral load
WHO	World Health Organization

1.13 ORGANISATION OF THE REPORT

This dissertation has been organised into five chapters.

Chapter 1 introduced the study and provided background information about HIV/AIDS globally, in SSA, and Botswana emphasising the importance of ART adherence. It also highlighted the Botswana national ART programme.

Chapter 2 discusses the literature reviewed on adherence to ARVs.

Chapter 3 describes the research methodology used in collecting data for the study.

Chapter 4 presents the results, analyses and discussions of the findings.

Chapter 5 discusses the conclusions and limitations of this study and provides recommendations for increasing adherence to ARVs.

1.14 CONCLUSION

This chapter provided background information on the global overview of HIV/AIDS, the situation of the epidemic in SSA and Botswana. The following areas were discussed: the research problem, research question, purpose of the study, research objectives, assumptions underlying the study, significance of the study, definitions of key concepts, organisation of the report and conclusion.
The next chapter presents a discussion on the relevant literature reviewed in this study.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

This chapter covers both published and unpublished reports related to HIV/AIDS, HAART, factors affecting adherence to HAART and adherence measurement methods. Reviewed documents on adherence to ARVs were obtained from websites as cited in the list of references, articles from various journals and the MoH of Botswana (both published and unpublished documents). The review of literature covered the period between 1998 and 2008.

2.2 ADHERENCE TO HAART

The following key words were used in the website search: HIV/AIDS treatment, adherence to ARV therapy, barriers to ARV treatment adherence in Botswana, HAART, predictors of antiretroviral adherence, virological and immunological outcomes ARV adherence, and measurement of adherence.

2.2.1 Defining adherence

Although there is no universally accepted definition, medication adherence may be defined as the extent to which a patient takes his/her medication in the way intended by a health care provider (Machtinger & Bangsberg 2005:2). Other researchers have defined medication adherence differently. Goudge et al (2004:5) defined adherence as the proportion of prescribed doses actually taken.

Jani (2004:1) defined medication adherence in HIV/AIDS as "*the ability of the person living with HIV/AIDS to be involved in choosing, starting, managing and*

maintaining a given therapeutic combination medication regimen to control viral replication and improve immune function". He also cited Ickovics (1997) who defined medication adherence as the percentage of prescribed doses taken.

Fogarty et al (2002:95) reviewed 20 articles and 74 conference abstracts to explore the nature of adherence research. One study defined adherence as the ratio of days of drug supply to days between drug dispensing and subsequent refill of greater than 90%. Another study described adherence as when a patient filled a prescription less than seven days from an expected refill date.

For the purpose of this study, adherence has been defined as the regular and consistent collection of prescribed ARVs from the pharmacy. The collected ARVs are assumed to have been taken as prescribed. The adherence level for each respondent was then calculated and assessed whether it was 95% or lower.

2.2.2 Overview and significance of HAART patients' adherence

The biological and chemical goals of treatment have been defined as the suppression of viral replication, restoration of the immune response, a halt in the progression of disease, increased survival rates, reduced morbidity and a better quality of life. Maximum and sustainable suppression of HIV viral replication to below the level of detection is necessary to achieve these biological and chemical goals (WHO 2006:263).

Adherence rates of 95% (Jani 2004:9; Paterson et al 2000:27; Poppa et al 2003:47; Saple 2005; Simone et al 2003:185) or more is required for maximum viral suppression. However, many PLWAs do not manage to achieve such high levels of adherence. Failure to suppress viral replication inevitably leads to the development (through mutation) of drug-resistant HIV strains, limiting the effectiveness of therapy. Sub-optimal adherence to ART is the strongest

predictor of failure to achieve viral suppression below the level of detection and most often underlies treatment failure (WHO 2006:264).

The challenges in the face of potential viral resistance, treatment failure, disease progression and the spread of drug resistant virus to sexual partners are of great concern. The WHO (2006:264) cited Furtado, Callaway, Phair, Kunstman, Stanton, Macken, Perelson, & Wolinsky (1999) indicating that patients on long term ART with undetectable levels of HIV still harbours replication-competent viruses. For this reason, with the available medication, ART is a lifelong process. While achieving high levels of treatment adherence is difficult under any circumstances, the unforgiving nature of HIV replication, the complexity of the HAART regimens, and the associated short- and long-term toxicity of HAART all pose challenges for patients and health care providers.

The importance of adherence has been demonstrated in various chronic diseases and it is known that patients tend to tell health care providers what they want to hear. Patients may therefore overestimate their level of adherence. Unlike treatment for many other chronic diseases, which may respond to only a portion of the prescribed medication, HAART requires a patient to take at least 95% of prescribed doses. If medications are not taken as prescribed, the virus can mutate and become resistant to the ARVs and drug resistance is the major threat to the effectiveness of HAART. If a patient develops resistance to a particular drug, the health provider may switch the patient to another drug in the same class but this strategy may not work because the patient may have developed resistance to every drug in that class (Jones 2004). The emergence of drug resistance during therapy and transmission of drug resistant HIV, underscores the role that adherence plays in controlling HIV in the individual, as well as in preventing a larger public health problem (Jani 2004:9; Wu, Ammassari & Antinori 2002:S96).

Viral suppression with HAART reduces the infectiousness of an individual but does not eliminate the risk of transmission. Replication competent virions have been obtained from the secretions (urine, saliva, amniotic fluids, ascitic fluids and genital secretions) of patients on HAART who had undetectable viral loads (Jani 2004:9). Drug resistance is not only a problem to the individual but it is a public health concern with serious social and economic consequences. Changing regimens from first to second line can be very costly. The available funds for ART will then be used to treat fewer people with more expensive ARVs. If patients are not sufficiently adherent (95%+) to the second and third line ART regimens, they can spread HIV strains resistant to these regimens. This could lead to a situation where newly infected HIV patients will not react to any ARVs.

2.2.3 Levels of known compliance with antiretroviral drugs

Estimates of average adherence rates to HAART, implying the use of these drugs at the right dose, frequency and at the agreed times range from 50% to 70% in different social and cultural settings. The risks associated with sub-optimal adherence are extensive at both individual and community levels (Chesney 2000:S172; Safren, Kumarasamy, James, Raminani, Solomon & Mayer 2005:854). Studies in African settings have indicated adherence rates (implying the proportion of patients adhering to their ART schedule for at least 95% of the time) as varying from 54% to 98% depending on the assessment method used. Findings by different researchers are: Botswana 54% (Weiser et al 2003:285); Nigeria 79% (Daniels, Ogun, Odusoga, Falola, Ogundahunsi, Salako, Oladapo, Osho, Adenekan, Kolapo, Oluwole, Krain, Boyle & Jacobs 2004); South Africa 77% (Ferris, Dawood, Chiasson, Diamond, Hammer & Lalloo 2004) and Uganda 98% (Muganzi, Bondo, Draru & Biryeri 2004). Although these data may not be comparable as the researchers used different methods in different settings, they show that the level of adherence is low in African countries where these studies had been conducted.

Concerns about low adherence have been cited by those who question the feasibility of the rapid scaling up of ART programmes especially in resource limited settings (Gill, Hamer, Simon, Thea & Sabin 2005:1245; Stevens, Kaye & Corrah 2004:280). Other researchers like Harries, Nyangulu, Hargreaves, Kaluwa and Salaniponi (2001:411-412) argued that adherence problems would constitute a major barrier to the delivery of ART in SSA. This is due to poor health infrastructures, poor social security systems, illiteracy, ignorance and poverty levels.

Sarna, Pujari, Sengar, Garg, Gupta and Van Dam (2008:28) studied 310 HIV+ patients receiving ART in India. This study revealed that although the overall adherence was high, lower levels of adherence were documented among patients receiving free ART. They were also able to demonstrate an association between self-report adherence and improvement in CD4 counts. The study concluded that provision of free treatment without adequate patient preparation and adherence support may compromise the success of ART scale-up programmes.

In another study, Weiser et al (2003:281) studied 109 patients receiving ART in Botswana to identify the social, cultural and structural determinants of treatment adherence. The study showed that 54% of patients were adherent by self-report, while 56% were adherent by provider assessment. Principal barriers to adherence were identified as financial constraints (44%), stigma (15%), travel/migration (10%), and side effects (9%). The study concluded that ARV adherence rates in Botswana were comparable with those in many developed countries.

2.2.4 Correlation between ART adherence and treatment outcomes

Adherence to ART is important for the successful treatment of HIV infection and sustained viral control. Adherence rates of 95% or higher are required for

optimum viral suppression in order to prevent viral mutation and thus drug resistance (Jani 2004:9; Ostenberg & Blaschke 2005:488; Paterson et al 2000:27; Poppa et al 2003:47; Saple 2005; Simone et al 2003:185). Several studies have demonstrated that lapses in adherence decrease the likelihood of suppressing viraemia below detectable levels.

Friedland et al (2004:424) studied 20 patients who were administered HAART through directly observed treatment (DOT) in South Africa. The outcome indicated enhanced immunological and virological responses among the 17 patients who completed the study. They achieved a viral load of <50 copies per ml and a mean increase in CD4 cell counts of 148 per mm^3. This was in agreement with other studies indicating that adherence correlated with immunological and virological responses (Ferris, Dawood, Chiasson, Diamond, Hammer & Lalloo 2004; Ickovics & Meade 2002: S98; Palella, Delaney, Moorman, Loveless, Fuhrer, Satten & Holmberg 1998:853; Paterson et al 2000:27).

In their study of 304 patients with HIV who were prescribed ART in Chennai, India, Safren et al (2005:853) observed that adherence was not associated with demographic variables. However, it was associated with current CD4 and with changes in CD4 counts since initiation of ART. This association was significant over and above the effect of time on ART. They concluded that although most patients in this Indian cohort reported regular adherence to ART, a subset admitted to less than regular adherence to ART, and those who admitted to less than regular adherence had worse CD4 outcomes.

In the United States of America (USA), Paterson et al (2000:25) studied 99 HIV infected patients receiving protease inhibitors (PIs) to assess the effect of different levels of adherence to therapy on virologic, immunologic, and clinical outcomes. Adherence was significantly associated with successful virological outcome and increased CD4 cell counts. The study revealed that only 22% of

patients with adherence of 95% or greater had virological failure, while 61% of patients with adherence between 80% and 94% had virological failure and 80% of patients with adherence of 79% or less. In this study, virological failure was defined as the detection of viral load of more than 400 copies per ml. There was a significant association between adherence and duration of acute care hospital stays during the study period. This study used the sophisticated electronic adherence measurement system (MEMS) and it was conducted in a clinical setting.

Palella et al (1998:858) followed 1 255 HIV/AIDS patients who were receiving ARVs at nine outpatient clinics in the USA from 1994 to 1997. The data showed significant reductions in morbidity and mortality rates among patients with CD4 cell counts of less than 100 cells per mm^3.

Though most studies were conducted in clinical settings, the studies agree that there was a relationship between adherence and good clinical outcomes. These clinical outcomes include increased CD4 cell counts, reduced viral loads and/or improved clinical outcomes, including weight gain, decreased numbers of opportunistic infections, and enhanced feelings of general well-being.

2.2.5 Factors affecting adherence to ART

Multiple factors affect adherence to ART and are often classified into five interwoven categories (Ammassari et al 2002:S125; Ickovics & Meade 1997:385; Poppa et al 2003:48; Reiter, Stewart, Wojtusik, Hewitt, Segal-Maurer, Johnson, Fisher, Zackin, Masters & Bangsberg 2000:67; WHO 2006:88). They include patient variables, treatment regimens, disease characteristics, clinical settings and patient-provider relationships. Other possible barriers may include the number of pills to be taken, frequency of taking medications, frequency and severity of side effects, and dietary requirements.

2.2.5.1 Patient variables

These include socio demographic factors (age, sex, race, income, education, literacy, housing status, HIV risk factors) and psychosocial factors (mental health, substance abuse, socio cultural issues and support, knowledge and attitudes about HIV and its treatment) (Carriere, Caillefon & Le moing 2002:232; Machtinger & Bangsberg 2005:9; WHO 2006:88).

Socio demographic and psychological issues can impact significantly on ART adherence. For instance, family support and religious beliefs about illness and medication may influence motivation and adherence (Klitzmann, Kirshenbaum, Dodge, Remien, Ehrhardt, Johnson, Kittel, Daya, Morin, Kelly, Lightfoot & Rotheram-borus 2004:628). The issue of disclosure has serious implications for adherence. For example, the use of medication may inadvertently reveal a person's HIV positive status; poverty may prevent individuals from following treatment-related dietary advice; drug and alcohol abuse may impair judgment and the ability to adopt and maintain routine medication use; and family responsibilities may require adults to prioritise the health care needs of others above their own.

Mental health problems, such as depression and one's perceived inability to adhere to the ART regimen have been associated with low adherence in HIV positive adults and adolescents (Murphy, Marelich, Hoffman & Steers 2004:4721; Singh, Squier, Sivek, Wagener, Hong-Nguyen & Yu 1996:261; Tuldra & Wu 2002:154).

Although side effects have been cited by some studies in developed countries as predictors of adherence, experience of symptoms and views about medications may be complex and may vary according to the type of regimen (Carr 2002:81). Symptoms may stimulate the use of medications by acting as a reminder or reinforcing beliefs about the necessity for treatment. However, patients'

expectations of symptom relief are also likely to have an important effect. This could be problematic if expectations are unrealistic, or where treatment is given for asymptomatic disease, as occurs with HIV infection with CD4 counts below 200 (Horne 2001).

At extension 15 clinic, newly diagnosed HIV patients are examined clinically and categorised according to the WHO clinical staging. The WHO clinical staging for HIV/AIDS was developed in 1990; it emphasized the use of clinical parameters to guide clinical decision-making for the management of HIV/AIDS patients. (WHO 2005a:2). This system was designed for use in resource limited settings where there was limited access to laboratory services. "Asymptomatic" patients are categorised as stage 1, patients with "mild disease" as stage 2, "moderate disease" as stage 3 while those with "severe disease" are categorized as stage 4. Asymptomatic patients with CD4 counts of less than 200/mm^3 are started on ART while those with CD4 counts of greater than 200/mm^3 are appointed to recheck their CD4 cell counts. Patients with WHO stage 3 or 4 are initiated on ART irrespective of their CD4 cell counts.

2.2.5.2 Treatment regimens

Treatment guidelines include the number of pills prescribed, the complexity of the regimen (dosing frequency, food instructions), medication side effects, and the specific type of ARV. These medications are usually taken once or twice daily at specified times and some may require food restrictions like didanosine which is usually taken on empty stomach about 30 minutes before or two hours after meals. These are obviously difficult to adhere to in patients' busy daily lives. Most available ARVs have unpalatable side effects like nausea, vomiting, diarrhoea, hepatotoxity (presenting as nausea and vomiting), skin rashes (Bartlett & Gallant 2003:70-75; KITSO 2004). Experiencing any or a combination of these side-effects will pose threats to continuing medication adherence. Pill burden associated with concurrent medication for other co-morbidities like tuberculosis

are associated with sub-optimal adherence (Machtinger & Bangsberg 2005:9). Also as patients' conditions improve on ARVs, their appetites improve and patients who do not have sufficient money to spend on food could then reduce the ARVs in an attempt to curb their appetites.

The role of traditional healers poses a challenge to the efficacy of ARV. Western health facilities are widely available across Botswana. However, a large proportion of the population continues to use the services of traditional healers, often in tandem with the services of western medicine. Patients who are taking ARVs might seek the assistance of traditional healers for treatment for the same illness (Motsumi 2002). This concomitant use of traditional medicines and ARVs could lead to potential drug-drug interactions with resultant adverse reactions that may negatively affect patients' ARV treatment adherence levels and/or outcomes.

The WHO (2004:11) cited Motsumi and Burton (2003) who conducted a survey in Botswana in December 2002 and demonstrated that there were 100 times more traditional practitioners compared to biomedically trained doctors. The same survey indicated that an estimated 50% of traditional healers made a diagnosis of AIDS through bone-throwing, prayer or identification of signs and symptoms, 35% treated AIDS with herbs and traditional medicines and 17% of traditional practitioners advised patients, who had enrolled in ARV therapy programmes, to discontinue treatment. The researchers further stated that the majority of traditional practitioners expressed interest in collaborating more closely with the ARV programme to provide a positive contribution in terms of adherence management and counselling.

2.2.5.3 Disease characteristics

These include the stage and duration of HIV infection, associated opportunistic infections, and HIV related symptoms (Machtinger & Bangsberg 2005:9). The

severity of the illness could impact negatively or positively on adherence to ART. HIV infection has a long latency period of about 8 to 10 years, aside from flu like illness during the acute sero-conversion period, infected individuals are usually asymptomatic. Following the latency period is the phase of full blown AIDS, consisting of rapidly increasing viral replication, declining CD4 counts and increasing frequencies of opportunistic infections like tuberculosis, oropharyngeal candidiasis, chronic diarrhoeas, papular pleuritic dermatitis, weight loss and finally death in the absence of treatment. With the use of ARV, most of these opportunistic infections are usually brought under control and individuals can lead normal, healthy lives. The desire to get well may make an individual comply with prescribed medications. However, with improved health, medication adherence becomes an increasing problem as some may not understand why they have to continue taking the medications regularly while they are healthy. This contributes to poor adherence with consequent viral rebound and treatment failure.

2.2.5.4 Clinic setting

This includes the availability of transport, general environment and flexibility of appointments, perceived confidentiality and satisfaction with past experiences with the health care system. Chesney (2000:S171) found that dissatisfaction with the health services is a predictor of non adherence. In a study by the WHO (2006:9) in four district hospitals across Botswana which were providing ART, the problem of long waiting times was cited as a major challenge to adherence. In the same study, respondents reportedly spent around four hours at the clinic. Nearly half of the respondents spent even more than that, with the longest reported wait being 12 hours. Patients' waiting time at extension 15 clinic is about four hours. The problems with out-of-stock supplies might be minimal at this clinic because of its proximity to the central medical stores from where medicines are delivered on a regular basis.

2.2.5.5 Patient-Provider relationship

These include the patient's overall satisfaction with and trust in the provider and clinic staff including the patient's opinion of the provider's competence; the provider's willingness to include the patient in the decision making process; the affective tone of the relationship (warmth, openness, cooperation); the compatibility of race/ethnicity/gender between patient and provider; and the adequacy of referral (Machtinger & Bangsberg 2005:9; WHO 2006:89). Trust is difficult to come by and it is also very fragile, implying that it can easily be destroyed (Friendenberg 2003:306). With increasing numbers of patients to care for on a daily basis, in a busy out patient clinic in the era of HIV/AIDS, less and less time is being spent by physicians with patients who might not have the opportunities to discuss concerns affecting their treatment with their physicians. Over time this trust might diminish and the patients might find it difficult to adhere to their doctors' instructions.

2.2.6 Measurement of adherence

Clinical studies employ a number of methods, either alone or in combination, to measure medication adherence. This reflects the fact that there is no measurement tool that is found to be of a higher standard than any other one. However, Machtinger and Bangsberg (2005:10) cited a number of studies (Liu, Golin, Miller, Hays, Beck, Sanandaji, Christian, Maldonado, Duran, Kaplan & Wenger 2001:973; Paterson et al 2000:25; Wagner 2002:599) which showed that the objective measure used in research, although impractical for most clinical settings, are more sensitive than patients' self-reports for detecting medication adherence. When reading any study on adherence to HAART, there is always a need to ascertain how adherence was measured (Ammassari et al 2002:S126; Goudge et al 2004:6). Different adherence measures applied to the same patients suggested different levels of adherence.

Although there is no ideal ARV adherence measurement tool, various strategies are available and have been used in clinical settings to monitor adherence to HAART (AIDS Read 2000; Jani 2004:17 & Paterson et al 2000:25). These strategies include medication event monitoring system (MEMS), pill counts, self reports, pharmacy refill data, provider estimates, and directly observed therapy (DOT) or directly administered antiretroviral therapy (DAART).

2.2.6.1 Medication Event Monitoring System (MEMS) Caps

The MEMS or cap technology (Vitolins, Rand, Rapp, Ribisi, & Sevick, 2000:S188) involves the use of smart pill bottles that contain computer chips which electronically measure every opening of the bottle. It records the time and date whenever the bottle is opened and closed. Data are retrieved by downloading the information from the cap device to the computer. Interpretation of the data assumes that a single dose was removed each time the cap was removed however, this might be incorrect because multiple doses might have been removed at one time or a cap might have been removed without taking out any pills (AIDS Read 2000; Chesney 2000:S172; Jani 2004:18; Ostenberg & Blaschke 2005:488). The number of pills actually taken out of the bottle with each opening is not recorded. If the patient takes out an additional dose to be taken at a later time, the system may underestimate adherence. The number of pills actually swallowed can never be recorded by this system.

Bell, Kapitao, Sikwese, van Oosterrhout and Lalloo (2007:562) used the MEMS method in their study which compared three methods of measuring adherence to ART in HIV-infected adults receiving free treatment from a public hospital in urban Malawi. They found a poor correlation between MEMS cap and pill count measures of adherence. The mean MEMS adherence rate among the 88 participants was found to be 88.1% while the mean pill count adherence was 96.6%. The authors further observed that MEMS cap records underestimated or

overestimated adherence because it could not be determined whether the patient actually took a tablet every time the bottle was opened.

Though this method is the most sensitive for detecting non-adherence, it is complex and expensive and not useful in clinical settings, because it is too expensive for large-scale use.

2.2.6.2 Pill counts

Pill count adherence is usually calculated by counting the remaining doses of medication and assuming that remaining pills, in excess of what is expected, represent missed doses. Chesney (2000:S171), Jani (2004:17) and Ostenberg and Blaschke (2005:488) stated that pill counts have been widely used where a patient is required to bring back actual pill containers in order for health practitioners to count left-over pills. Excess pills provide evidence of non-adherence.

However, this method has limitations because patients either forget to bring the pill containers or deliberately remove and dump some pills before their next hospital visit. As a result of this practice, pill counts may also lead to an overestimation of adherence. Pill count is one of the methods used at extension15 clinic for the assessment of adherence.

2.2.6.3 Self reports

Self report is the most commonly used measure of adherence in resource limited settings because of the ease with which it may be included in routine clinical practice. In this method, a patient is asked how many doses he/she missed in the last day or two days or two weeks. The format of the questions may vary from study to study and non-adherence rates are higher in studies where a longer recall time is used. Answers to the questions are influenced by patients' desires

to provide socially acceptable answers or mere forgetfulness on the part of the patients (Goudge et al 2004:6; Nieuwkerk & Oort 2005:445). These measures include surveys, interviews and diaries that are easy to use and inexpensive.

Poppa et al (2004:54) argue that although self report is a good marker of adherence, it is not perfect. There is evidence that self reports may overestimate adherence to ART compared with other methods (Liu et al 2001:968).

2.2.6.4 Pharmacy refill data

Pharmacy refill data can serve as an adherence measure by providing the dates on which ARVs were dispensed. These dates can be provided by the pharmacy. In the event that refills are not obtained in a timely fashion, it is assumed that the patient is not taking medication between refills or is missing doses in a way that allows the medication to last longer than it should.

A number of studies in the treatment of HIV and other diseases have used pharmacy refill records to assess adherence. For example, a study by Fairly et al (2005:368) compared long-term adherence to HAART as measured by two practical inexpensive methods (self reports and pharmacy refill records) at an HIV clinic in Melbourne, Australia. The study found clinically useful levels of adherence required to suppress viral load in most patients. It showed correlations between self reports and pharmacy refill records, using <95% as non adherent for pharmacy records and <97% as non-adherent for self reports. Pharmacy refill records identified about twice as many individuals to be non-adherent as had been identified with self reports (27% versus 14%).

Machtinger and Bangsberg (2005:11) cited Maher, Klimas, Fletcher, Cohen, Maggio, Triplett, Valenzuela and Dickinson (1999) who demonstrated that patients who are adherent to ART, as measured by consistent pharmacy refills for more than four months, were significantly more likely to achieve virologic

control and benefit immunologically than less adherent patients. Other studies have demonstrated that, in large populations of people, pharmacy refill measures are associated with viral suppression, resistance, and progression to AIDS and death (Hogg et al 2002:1051; Pires, Ventura & Magdalena 2005).

2.2.6.5 Provider estimate

Poppa et al (2004:54) cited Miller et al (2002) and Bangsberg et al (2001) who stated that health care provider estimates of adherence to ART have been demonstrated to be poor and their use as a method of measuring adherence is therefore inadvisable.

According to Goudge at al (2004:6), assessments by the health care providers are often inaccurate because providers do not have the time to collect detailed adherence assessment data to determine which pills were taken less frequently, why and at what times. This causes providers to miss opportunities to help patients to find solutions for their adherence challenges.

This method of adherence measurement is also used at extension 15 clinic to trace or identify defaulters. The pharmacy refill records are computerised and it is assumed that when the ARVs are collected, they are taken as prescribed. The date for the next pharmacy refill is usually written on the patients' cards at extension 15 clinic in Gaborone.

2.2.6.6 Directly observed therapy (DOT) or directly administered anti-retroviral therapy (DAART)

DOT has been widely used in the management of TB. In this method a patient is supervised and seen to be taking the drugs. Previously the main challenge in using this strategy in HIV patients was that ARVs were taken three to four times per day and therefore DOT or DAART was not feasible. Once medications

become available that can be taken once or twice per day, DOT or DAART can be considered for measuring adherence to ARVs (Jani 2004:19).

2.3 CONCLUSION

This chapter emphasised the critical importance of ARV adherence in the successful treatment of HIV infection and sustained viral control. Adherence rates of 95% or higher are required for optimum viral suppression in order to prevent viral mutation and thus drug resistance. Though this strict adherence is required, the experiences of adherence to treatment in other chronic diseases have been below optimal levels and studies have shown that similar levels of adherence are experienced by PLWAs. It is therefore a serious challenge to attain and maintain high levels of adherence to ARVs due to their side effects and the complexities of the regimen.

Although no single measure of adherence is appropriate for all settings or outcomes; it is believed that the use of more than one measure of adherence will allow the strength of one method to compensate for the weakness of the other and to capture more accurate information needed to determine adherence levels (Vitolins et al 2000:S188). It is important that each country assesses the adherence measuring tool(s) used in its ART programme to estimate patients' adherence to HAART. Extension 15 clinic, being sited in a resource limited setting, requires a simple inexpensive adherence measuring tool. Therefore, the pharmacy refill records and pill count methods need to be assessed to determine whether these are effective in predicting CD4 cell counts and VL, indicating patients' levels of adherence to ARV regimens.

Chapter 3 will discuss the research methodology adopted to determine if there is a correlation between adherence to ARVs as measured by pharmacy refill records and pill count, compared to CD4 cell count and VL laboratory results, at extension 15 clinic in Gaborone.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Data were collected by the researcher using a structured interview schedule designed by the researcher specifically for the purpose of this study addressing only the variables of interest. A quantitative research methodology was adopted for this study.

3.2 STUDY DESIGN

Strydom, Fouche and Delport (2002:137) define a research design as a specification of the most adequate operations to be performed in order to test a specific hypothesis under given condition. It can also be defined as an overall plan or blueprint which stipulates how the researcher intends to collect the data.
A cross-sectional, quantitative, cohort study design which was retrospective and descriptive in nature was used because the researcher was interested in analysing available quantifiable data to investigate a phenomenon that had already occurred. The purpose of the study was to identify the barriers and motivators for good adherence to ART and determine the relationship between adherence to ART (as measured by pharmacy refills and pill counts) and immunologic and virologic responses (indicated by an increase in CD4 cell count and suppressed VL respectively).

3.2.1 Cross-sectional

Cross-sectional studies are done to examine the presence or absence of disease and the presence or absence of an exposure at a particular point in time (Grimes & Schulz 2002:58). It is sometimes termed a frequency survey or a prevalence study.

3.2.2 Quantitative

Burns and Grove (1997:808) described quantitative research as a "... formal, objective, systematic process to describe and test relationships..." This study systematically and objectively analysed data obtained from respondents to determine the barriers and motivators for good adherence. Respondents' records were also reviewed together with their pharmacy refill records to identify any correlation between ART adherence (as reflected in pharmacy refill records and pill counts) and enhanced immunologic and virologic responses (increased CD4 cell counts and suppressed VL). Statistics were used to summarise and describe the data.

3.2.3 Cohort

For research purposes, a cohort is any group of individuals who are linked in some way or who have experienced the same significant life event within a given period. Burns and Grove (1997:792) described cohort as a sample of people participating in a study who meet specific time requirements. In this study the cohort had to be on HAART for at least six months by 31 July 2008.

3.2.4 Retrospective

The researcher used data from respondents who were started on HAART between 1st January 2007 and 31st December 2007 and who had completed at

least six months of treatment by 31 July 2008, and who attended extension 15 ART clinic during August 2008.

3.3 RESEARCH METHOD

The following section outlines the process of data collection, including the research population, research setting, sample size and sampling.

3.3.1 Research population

The study population can be organisations, groups or human beings (Welman & Kruger 2001:46). The study population comprised HIV-positive adult patients who were initiated on HAART at extension 15 clinic, Gaborone between 1 January 2007 and 31 December 2007 and who had completed at least six months of treatment by 31 July 2008. Eligible patients were interviewed and their records reviewed. Potential respondents were included in the study based on the following criteria:

Inclusion criteria:

- HIV-positive adults (21 years and older) who had started HAART at extension 15 clinic between 1 January and 31 December 2007 and were willing to participate in the study.
- Adult patients who had completed at least six months of treatment by 31 July 2008.
- Attended the clinic between 1 and 31 August 2008.
- Adult patients who had received the results of at least two CD4 cell counts and VL.

Exclusion criteria:

- Adult patients who were not initiated on HAART at extension 15 clinic.
- Adult patients who were initiated on HAART before 1 January 2007.

- Adult patients who had been referred or transferred from other sites to extension 15 clinic.
- Adult patients without at least two CD4 cell count and VL results.
- Adult patients who had not been on HAART at extension 15 clinic for at least 6 months.
- Adult patients aged 20 years and younger.

A total of 140 patients who had started HAART at extension 15 clinic between January and December 2007 were approached to be interviewed. Of this number, 13 patients were excluded because 3 did not have at least two results of CD4 and VL while 10 patients were not on HAART for at least six months. Only 116 patients eventually participated in this study because six eligible patients refused to give consent while records from five patients who were interviewed during the pre-test, were excluded from the actual study.

3.3.2 Research setting

This study was conducted at extension 15 ARV clinic, a public health facility located in Gaborone, the capital city of Botswana. The researcher conducted the study at this site because it was the only site that dispensed ARVs among the four government ARV clinics in Gaborone.

3.3.3 Sample size

Sample size refers to the number of elements that are included in the sample (Burns & Grove 2005:343). The sample in this study included patients initiated on HAART in this clinic between 1 January 2007 and 31 December 2007 and who had been on HAART for at least six months and had at least baseline and one additional set of subsequent CD4 and VL laboratory test results. These patients would have received a series of adherence counselling as reflected in their files. Preliminary investigation of clinic computerised attendance records gave an

estimate of between 120 and 150 patients. Only eligible patients who attended the clinic for routine check-ups between 1 and 31 August 2008 were selected from this population.

3.3.4 Sampling

Polit and Beck (2004:219) defined sampling as the process of selecting a portion of the population to represent the entire population. Purposive sampling was used for this study. This sampling technique was based on judgment of the researcher regarding the respondents. Only eligible patients who agreed to participate in the research were interviewed.

3.4 DATA COLLECTION

Data collection refers to the techniques that are employed to gather data. In this research, a structured data collection approach was applied. Both the researcher and the research assistant interviewed eligible patients and transcribed data from the ARV dispensing tool and patients' medical records onto the interview schedule which was specifically designed for this study.

3.4.1 Data collection instrument

The structured interview schedule (see Annexure F) comprised closed-ended and open-ended items derived from the research variables. The structured instrument was pre-tested on five patients before the study and modified by including questions about religious beliefs, time spent at the clinic during each visit, number of pills taken, and patient-provider relationships. Pharmacy refill records covering the period between 1 January 2007 and 31 July 2008 were recorded, and a column on the number of days delayed (before actual ARV refills had been collected) was also added. This instrument was divided in the following seven sections:

Section A: This section covered the respondents' clinical information including ART clinic number, pharmacy reference number, date of HAART initiation, calculated duration of treatment in months, baseline CD4 and baseline VL results, follow-up CD4 and VL results, present ARV regimen, changes to therapy and reasons for changing, pharmacy refill records and pill counts.

Section B: This section covered the respondents' general information including demographic data, time taken to get to the clinic, time spent at the clinic before getting ARVs, cost involved and financial losses incurred by attending the ART clinic.

Section C: This section covered respondents' treatment supporter, adherence counselling before starting treatment, frequency of adherence counselling, and persons providing counselling during treatment.

SECTION D: This section covered respondents' self adherence reports including the number of appointments missed, reasons for missing medication doses and actions taken if doses had been missed.

SECTION E: This section covered disclosure issues.

SECTION F: This section covered ARV side effects experienced by respondents.

SECTION G: This section covered the use of traditional healers/medicines.

3.4.2 Data collection procedures

Formal consent was obtained from eligible patients before they were interviewed for data collection. A research assistant, fluent in both English and Setswana,

trained by the researcher, interviewed eligible patients using the structured schedule and recorded their responses accordingly. Setswana answers to open-ended questions or Setswana explanations were written verbatim in Setswana and were later translated into English by a bilingual expert. Each structured instrument was numerically numbered before data collection commenced. The respondents' ARV clinic numbers and ARV pharmacy reference numbers were recorded on the data collection instrument in order to allow cross checking of data for correctness and reliability. The research assistant also transcribed data from each respondent's manual medical records and ARV dispensing tool onto the interview schedule.

The researcher calculated adherence by dividing the number of pills actually taken by the number of pills needed to be taken over a 30-day period multiplied by 100. The remaining pills in excess of what was expected were considered as missed doses. At extension 15 clinic, patients refilled their medications on a monthly basis.

Exact dates when ARVs were collected from the pharmacy were compared with the expected refill dates as previously appointed and exact number of days of being late for pharmacy refills were recorded. Pharmacy refills which occurred on the appointed dates were recorded as 0, with 1 indicating that the refill took place one day late, and so forth. The researcher calculated adherence by dividing the number of refills that occurred the same day as appointed by the total number of refills.

3.4.3 Data management

The completed structured interview schedules were kept secured. These structured instruments contained no names but were handled in a very confidential manner to prevent the use of ARV reference numbers to trace and obtain the name of the patient.

All completed interview schedules were kept locked up, only the researcher and the statistician had access to the raw data recorded on the interview schedules. Subsequent to the acceptance of the research report, the completed interview schedules would be destroyed.

3.4.4 The use of routine data

Part of the data used for this study was routinely collected as part of service provision and also to monitor patients' adherence to ART.

3.4.4.1 Advantages of using routine data

According to Katzenellenbogen et al (1997:133), routine data can provide a rich source of information to the researcher who will then spend less time on data collection and more time analysing and interpreting the data.

3.4.4.2 Disadvantages of using routine data

According to Katzenellenbogen et al (1997:133) routinely available data can be of poor quality because of incomplete records, incorrect recordings and/or the unavailability of some records or some aspects. The researcher encountered poor recording of the data and some variables could not be recorded because of missing data on some patients' medical records.

3.5 DATA ANALYSIS

Data collected were analysed using the Centre for Disease Control (CDC) Epi info version 3.3.2. Responses for open-ended questions were compiled into similar groups and analysed quantitatively. The Statistical Package for Social Science (SPSS) version 15 was used to calculate the Cronbach's coefficient for this study. The researcher was assisted by a statistician from the University of

Botswana in analysing and interpreting the data (See the statistician's letter in Annexure N).

3.5.1 Measurement

The outcome measure that was considered vital was the effectiveness of the pharmacy refill data and pill counts in measuring adherence to HAART, and the correlation of these measures to the changes in the patients' CD4 cell counts (increases) and VL results (decreases).

3.5.1.1 Adherence measure

Pharmacy refill records and pill counts were the adherence measuring tools used in this study. The ARV dispensing tool was also computerised and this electronic form was used by the pharmacist to dispense the ARVs in addition to the hard copies. When a patient's ARV reference number is entered on the clinic's computer program, the history of the patient is displayed indicating the history of prescription refills. This allowed the pharmacist to alert other health care workers (doctors, nurses, and social workers) in case of defaulters and to be able to trace the patient telephonically or through home visits by the social worker using the official vehicle attached to the clinic. Tracing defaulters who had neither a fixed telephone line nor a physical address posed a big challenge. The social worker is unable to call patients with cell phones from the clinic's landline phone because of high costs. Between 1 January 2008 and 31 July 2008, 18 patients defaulted treatment (Extension 15 ARV site manager monthly report 2008).

The initial date when HAART was started, the type of regimen, pill counts, the dates the ARVs were collected from the ARV pharmacy were transcribed onto the structured interview schedule. Incorrect pill counts or missed doses, missing pharmacy refill data and discrepancies between actual refill dates and

appointment dates gave an indication that the patient was defaulting from prescribed treatment.

3.5.1.2 Outcome measures

The outcome measures of interest were the consistent pharmacy refill records and correct pill counts of respondents and assessing if these could predict CD4 cell counts and VL after at least six months of HAART. However, the measurement may be affected by inaccurate information given by respondents and/or poor record keeping as routinely collected data were used.

3.5.1.3 Bias due to confounding variables

Bias is any influence or action in a study that distorts findings or slants them away from true or expected results (Burns & Grove 2005:728). Possible bias threats included:

- The respondents could have given inaccurate information to try to conceal certain important information and to portray themselves in a good light.
- The meaning of the questions might have been changed during the translation process (Burns & Grove 2005:106; Polit & Beck 2004:359-360). However, steps taken to counteract this possibility included employing the services of a qualified Setswana-English translator (see Annexures L & M) and employing a trained research assistant who could speak both English and Setswana fluently.
- Recording errors might have been caused by transcribing data from one respondent onto another respondent's structured interview instrument.
- Some respondents might have HAART resistant HIV implying that even though they are adherent, their immunological and virologic status might remain poor.
- Some respondents might have had poor absorption of the medicines due to concurrent illnesses like gastroenteritis. As a result, respondents might

have experienced poor immunologic and virologic response even if they had been adherent.

- Some respondents might already have high CD4 cell counts especially if they were in the WHO stage III or IV clinical category. They were started on ARVs because they had indications for HAART initiation irrespective of CD4 counts. This is counteracted by comparing each patient's measures of adherence with his/her change in CD4 and VL results from baseline to the latest results rather than comparisons with the absolute results.
- There might have been a discrepancy between respondents' CD4 cell counts and VL values meaning that a respondent might have experienced a fall in CD4 with a corresponding decrease in VL despite adequate treatment adherence. This could occur due to laboratory mistakes or recording errors. In these cases, further investigations would be conducted to discover reasons for such results. If no reasons could be discovered, these patients would be advised to undergo repeat tests, at no cost to the individual patients.

3.6 VALIDITY

Validity of a data collection instrument refers to the extent that it measures what it is intended to measure. In other words, a valid instrument actually measures the concept it is supposed to measure accurately (Stommel & Wills 2004:222). The structured interview schedule's validity was tested based on face validity, content validity and construct validity. The structured instrument was also assessed based on sensitivity, specificity, positive predictive value and negative predictive value.

3.6.1 Content validity

Content validity is concerned with the sampling adequacy of the content being measured. According to Katzenellebogen, Joubert & Abdool Karrim (1997:92) the measure should include or account for all elements of the variables that are being investigated. In this study, the variables of measure were all included in the measuring tool. Adherence was measured as a consistent collection of ARVs from the pharmacy at prescribed intervals. If a respondent failed to collect ARVs then he/she was considered to be non-adherent. Adherence was also measured by counting the remaining pills and assuming that remaining pills in excess of what was expected represented missed doses.

Content validity is relevant in the development of effective measures. Researchers designing a new instrument should begin with a thorough conceptualisation of the construct so that the instrument can capture the entire content domain. Two key issues in evaluating the content validity of an instrument are whether individual items are relevant and appropriate in terms of the construct, and whether the items adequately measure all dimensions of the construct. With regard to items' relevance, some researchers compute interrater agreement indexes and a formal content validity index (CVI). The CVI for the total instrument is the proportion of items rated very high by independent raters who are experts in the studied field (Polit & Beck 2004:356-357). The CVI for the structured data collection instrument for this study was calculated as 0.72.

3.6.2 Face validity

This refers to whether the instrument looks as though it is measuring the appropriate construct. Babbie and Mouton (2001:123) define face validity as the extent to which a measure covers the range of meaning included within the

concept. The required information on the structured interview schedule was easily transcribed from the respondents' medical records and was also clear.

3.6.3 Construct validity

Construct validity is an instrument's adequacy in measuring the focal construct. It is based on the reasonable relationship among variables (Babbie & Mouton 2001:122). The key construct validity questions are: what is this instrument really measuring? Does it adequately measure the abstract concept of interest? In this study the pharmacy refill records and pill counts were used to determine if there was a relationship between adherence to HAART and immunological and virologic response, as measured by the CD4 cell counts and VL respectively.

The structured instrument was valid because it only measured whether adherence to HAART would lead to both immunological recovery and viral suppression. If the respondents adhere, the measurement should detect the increase in CD4 cell counts as well as decrease in VL and if the respondents fail to adhere, then there should be a decrease in the CD4 cell counts and an increase in VL.

3.7 RELIABILITY

Reliability of a data collection instrument refers to the accuracy or precision of an instrument (De Vos 2002:168-169). It is the consistency with which an instrument measures the target attribute. Stommel and Wills (2004:209) define reliability as the relative absence of unsystematic, random measurement error. That implies that if the same data collection instrument is used by different data collectors, the recorded data should be comparable.

Reliability estimates are only specific to the sample being tested and therefore high reported reliability values on an established instrument do not guarantee

that reliability will be satisfactory in another sample or with a different population. It is therefore important that reliability testing be performed on each instrument used in a study prior to performing other statistical analyses.

3.7.1 Stability

It refers to the extent to which similar results are obtained on two separate administrations. Stability is concerned with the consistency of repeated measures which is referred to as test-retest reliability. The test-retest method is a procedure that is used to establish the reliability of the instrument (Strydom et al 2002:168). The data collection instrument was pre-tested on five patients and their responses analysed before the main data collection commenced. Collected data can easily be verified for accuracy and correctness by comparing the transcribed data on the structured interview schedule with that from the two data sources (respondents' medical records and ARV dispensing tools).

3.7.2 Cronbach's alpha coefficient

The reliability coefficients are important indicators of an instrument's quality. Unreliable measures do not provide adequate tests of a researcher's hypotheses. If the data fail to confirm a prediction, one possibility is that the instruments were unreliable and not necessarily that the relationship did not exist. Knowledge about an instrument's reliability is thus critical in interpreting research results, especially if research hypotheses are not supported.

Cronbach's alpha is a statistical estimator used as a measure of the reliability of a psychometric instrument (Vehkalahnti, Puntanen & Tarkkonen 2006:6). It is defined by the formula:

$$\alpha = \frac{N}{N-1}\left(\frac{\sigma_X^2 - \sum_{i=1}^{N}\sigma_{Y_i}^2}{\sigma_X^2}\right)$$

where N is the number of components (items or tests). The SPSS version 15 was used to estimate the Cronbach's alpha coefficient for the scheduled data collection instrument. According to Burns and Grove (2005:374) a reliability coefficient of 0.70 is sufficient for a newly developed psycho-social instrument.

3.8 CONCLUSION

During this study, data collection covered the period 1st to 31st August 2008 and included patients who completed at least six months of HAART and had at least the baseline and one additional set of subsequent CD4 cell counts and VL laboratory results. A cross-sectional, quantitative, descriptive, retrospective, cohort study design was used to collect data from respondents as well as from their medical records and ARV dispensing tool. Data were collected from 116 patients using a structured interview schedules that were specifically designed for this study. The collected data were analysed using the Centre for Disease Control (CDC) Epi info program version 3.3.2.

Chapter 4 presents the analysis and discussion of the collected data.

CHAPTER 4

ANALYSIS AND DISCUSSION OF RESEARCH RESULTS

4.1 INTRODUCTION

This chapter deals with the analysis and discussion of data collected, as described in section 3.4 of this dissertation. The overall purpose of this study was to identify the barriers and motivators for good adherence to ART and determine the relationship between adherence to ART as measured by pharmacy refills and pill counts, and immunologic and virologic responses indicated by increased CD4 cell count and suppressed VL respectively among HIV-positive adults on treatment at extension 15 ARV clinic in Gaborone, Botswana.

Specific objectives of this study were to:

- determine the motivators of good adherence
- determine the barriers to good adherence
- determine if there is a correlation between adherence to ARVs as measured by pharmacy refill records and pill counts, and CD4 cell counts and VL.
- recommend interventions to improve ARV treatment adherence rates at this clinic.

One hundred and twenty-two eligible patients were approached for interviews but only 116 eventually participated because 6 refused to consent. The response rate was therefore 95%.

4.2 DEMOGRAPHIC DATA

This section addresses the research results pertaining to respondents' gender, age, marital status, education levels, type of employment, monthly income earned, cost incurred as a result of taking ARVs, means of getting to the clinic, time taken to get to the clinic, and time spent at the clinic before getting ARVs.

4.2.1 Gender

There were more female (59.5%; n=69) than male (40.5%; n=47) respondents' who initiated HAART between 1st January 2007 and 31st December 2007 and attended routine check ups during the period of the study (see Figure 4.1). This result mirrors the Botswana Ministry of Health's HAART updates summary of December 2007 (MoH 2008:3) which stated that by the end of December 2007, an estimated number of 75 082 patients were on treatment in the public sector, of whom 61% were females. Out of the 116 respondents, 73.3% (n= 85) had an adherence level equal to or greater than 95%, while 26.7% (n=31) had an adherence level equal to or smaller than 94%. Of the 73.3% who adhered, 45.7% were females and 27.6% were males. The association observed between gender and adherence was not statistically significant at the 5% level of significance (Chi square χ^2=12.32; p=0.65; degrees of freedom (df) =115).

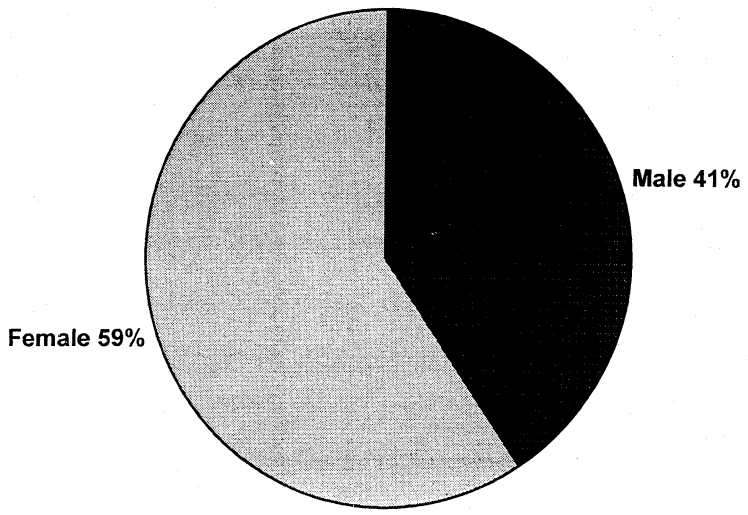

Figure 4.1 Gender distribution of respondents (n=116)

Medication adherence predicts immunological and virologic responses which are shown by the increase in CD4 cell counts and undetectable VL. The mean male CD4 cell counts before treatment was 126.4 cells per mm^3; after treatment this value became 365.8 cells per mm^3; the mean male VL before treatment was 257 005 copies per ml; after treatment it was 1 383 copies per ml. In this study there was therefore an average immune recovery in terms of CD4 count gain for males of 239.4 cells per mm^3 and an average virologic response in terms of suppression of VL of 255 622 copies per ml. On the other hand, the mean female CD4 cell counts before treatment was 119.3 cells per mm^3 and after treatment this value became 370.6 cells per mm^3 while the average female VL before treatment was 199 830.2 copies per ml and became 1 061 copies per ml after treatment. The mean gain in CD4 cell counts and mean viral suppression for female patients were 251.3 cells per mm^3 and 198 766.2 copies per ml respectively compared to 239.4 cells per mm^3 and 255 622 copies per ml for the males. The difference in CD4 cell counts gained by gender is not statistically significant at the 5% level of significance (p=0.24; df=115).

Table 4.1: Gender versus adherence (n=116)

	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
Male	32	27.6	15	12.9	47	40.5
Female	53	45.7	16	13.8	69	59.5
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

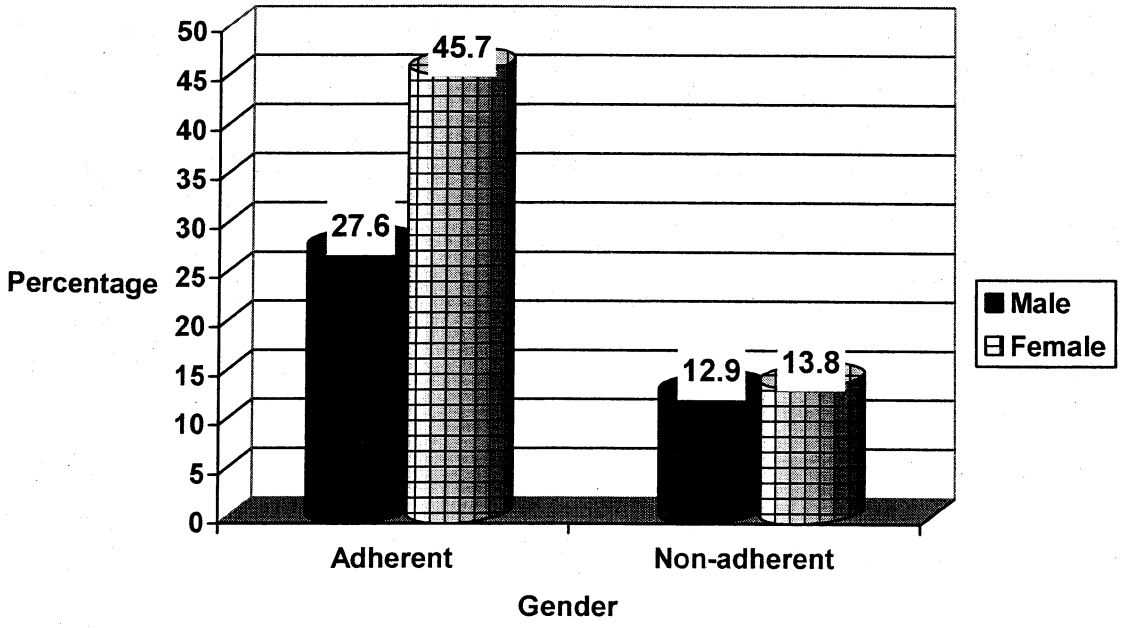

Figure 4.2: Relationship between gender and adherence (n=116)

The findings in this study correlated with those of other studies which reported no statistical difference in adherence rates between genders. The WHO (2006:106) reported no association between gender and adherence. However, Mehta et al (1997:1666) found an association between adherence and gender where females were reportedly less adherent than males. Women might be more non-adherent than men because women are prone to depression which is one of the main causes of non-adherence in patients on HAART (Starace, Ammassari, Trotta, Murri, De Longis, Izzo, Scalzini, Monforte, Wu & Antinori 2002:S136).

4.2.2 Age

All respondents met the minimum age of 21 as stated in the inclusion criteria. Table 4.2 displays the number of respondents in each age group which ranged from 22 to 60 years. Respondents aged 26-45 years constituted the majority (n=95; 81.9%; male=36; female=59). This is in line with results from the 2006 Botswana national HIV sentinel survey conducted among pregnant women

visiting government antenatal clinics, which revealed that the same age group was the most affected by HIV infection (MoH 2006a:11). Of the respondents, 48 (41.4%) fell within the age group 36-45, no respondent was aged 66 and above. At 5% level of significance, age was found to be significant (p=0.01). From this study, it can be deduced that the older the respondents, the more adherent they were (see table 4.3). This is in agreement with findings of a study done by Hinkin, Hardy, Mason, Castellon, Durvasulea, Lam and Stefaniak (2004:9) who indicated that older patients had a significant higher adherence rate compared to younger patients. Other studies by Mehta, Moore and Graham (1997:1666) as well as Paterson et al (2000:26) have all suggested that adherence increases with age.

In contrast to the findings of this study Altice and Friedland (1998:503) found that adherence is not predicted by age. Boyle (2003) reported on a clinical trial where the overall sustained virologic response (SVR) rate to Pegasus and Copegus (combined therapy for chronic hepatitis C virus infection) was measured. For those patients who were infected with HCV genotype 1, only the baseline VL had a greater impact over age to achieve a sustained virologic response. Another study indicated that the chances for a 20 year old patient to achieve a SVR were significantly higher than a 60 year old (74% vs. 44.2%).

Table 4.2: Relationship between age group and adherence (n=116)

Age group	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
15-25	5	4.3	1	0.9	6	5.2
26-35	34	29.3	13	11.2	47	40.5
36-45	35	30.2	13	11.2	48	41.4
46-55	5	4.3	2	1.7	7	6.0
56-65	6	5.2	2	1.7	8	6.9
66+	0	0	0	0	0	0.0
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

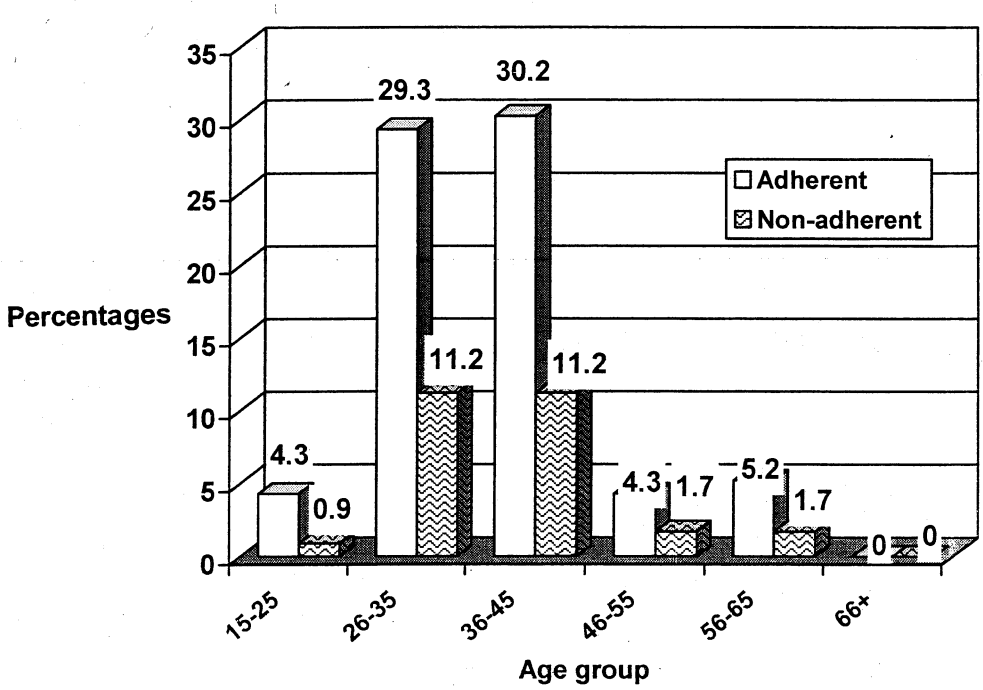

Figure 4.3: Relationship between adherence and age (n=116)

4.2.3 Marital status

Of the 116 respondents, 64 (55.2%) were single. Only 24.1% (n=28) of the respondents were married as shown in Table 4.3. Figure 4.4 shows that of 116 respondents, 38.8% (n=45) were single but adherent while 16.4% (n=19) were single and not adherent. Of the 85 respondents who were adherent, 52.9% (n=45) were single while 24.7% (n=21) were married. All 6 widowed respondents who participated in the study were adherent to treatment. There was no association between marital status and adherence rates (Chi square χ^2=42.89; p=0.953; df=115).

Table 4.3: Marital status of respondents versus adherence (n=116)

Marital status	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
Co-Habiting	8	6.9	4	3.4	12	10.3
Divorced	5	4.3	1	0.9	6	5.2
Married	21	18.1	7	6.0	28	24.1
Single	45	38.8	19	16.4	64	55.2
Widowed	6	5.2	0	0.0	6	5.2
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

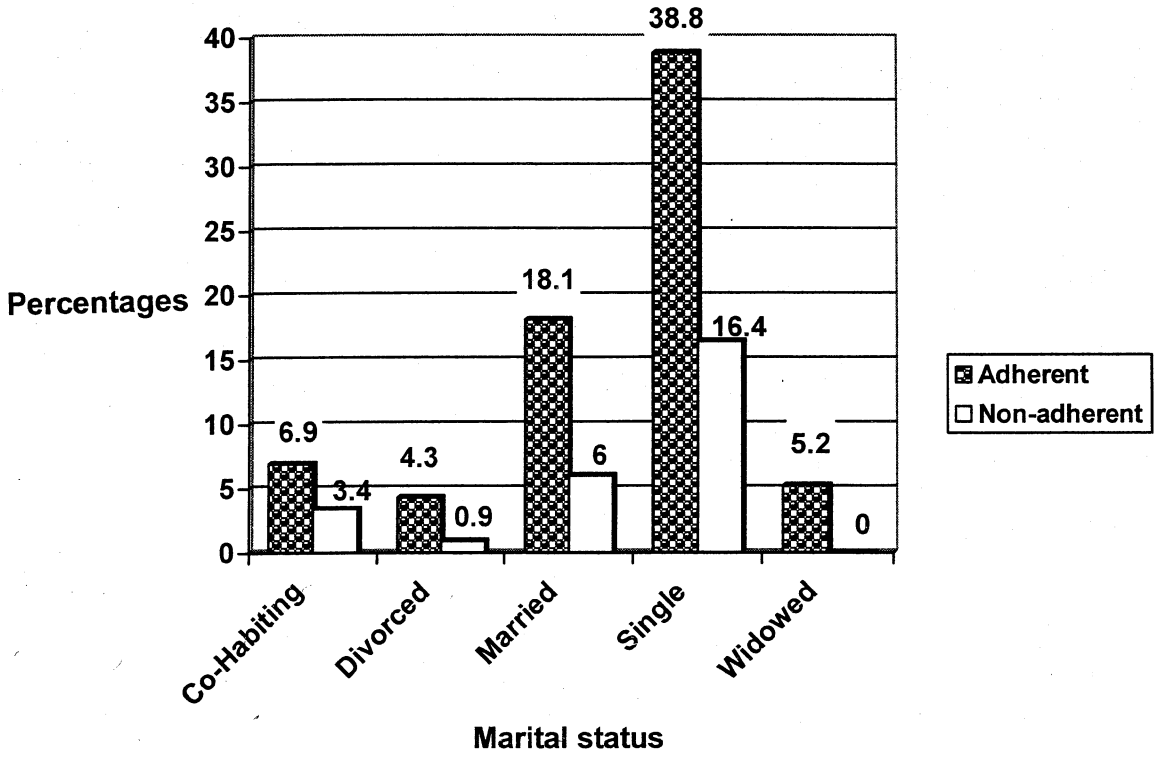

Figure 4.4: Relationship between adherence and marital status (n=116)

4.2.4 Education

Ten (8.6%) respondents had not received any form of education; 27(23.3%) had acquired some primary education, 63 (54.3%) had secondary education, while 16 (13.8%) had tertiary education. A high proportion of the respondents had acquired either a primary or secondary education as presented in Table 4.4 and Figure 4.5. Of the 85 respondents who were adherent to treatment, 8.2% (n=7) did not receive any formal education and 21.2% (n=18) had primary education.

Educational Level	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
None	7	6.0	3	2.6	10	8.6
Primary	18	15.5	9	7.8	27	23.3
Secondary	48	41.4	15	12.9	63	54.3
Tertiary	12	10.4	4	3.4	16	13.8
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

Table 4.4: Level of education versus adherence (n=116)

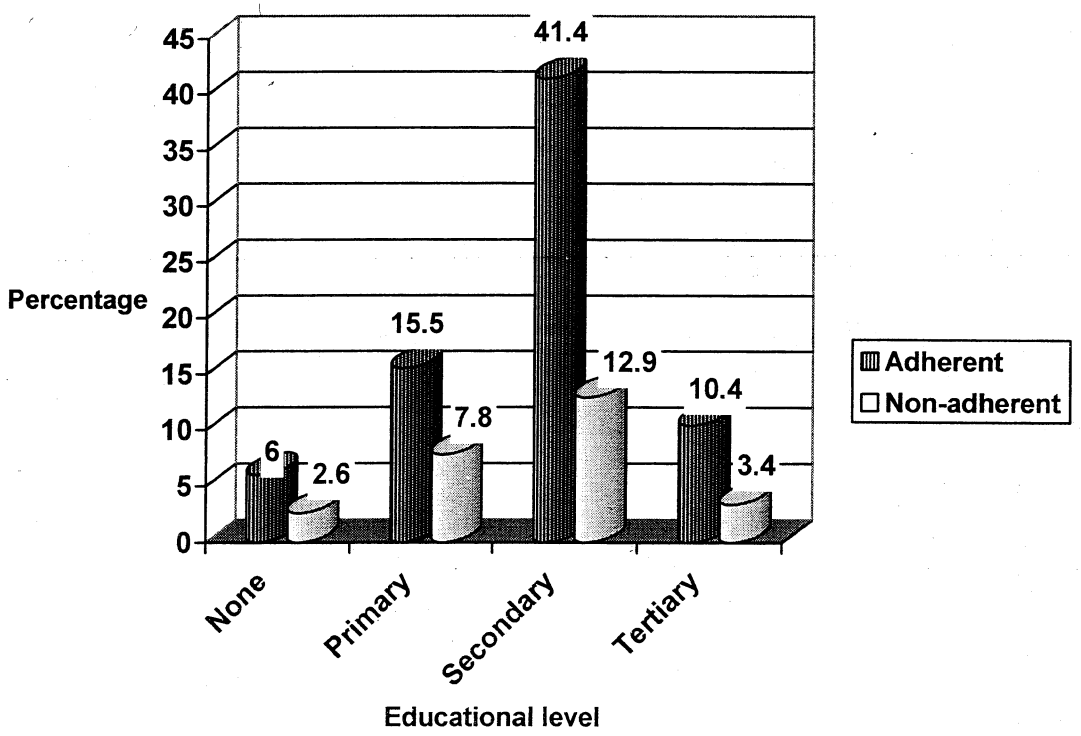

Figure 4.5: Relationship between adherence and educational level (n=116)

In this study there was no association between educational levels and adherence rates (Chi square χ^2=34.12; p=0.882; df=115). Findings of this study therefore reveal that better education did not predict better adherence in this study as shown in Table 4.4 and figure 4.5, this is in agreement with those of the WHO (2006:108) which revealed that an increase in education does not predict enhanced adherence. In contrast, Ickovics and Meade (2002:S98) found a positive correlation between education and adherence rates

4.2.5 Employment

Of the respondents 51.7% (n=60) were employed and 11 (9.5%) were self employed while 29 (25.0%) were unemployed as shown in Table 4.5.

Table 4.5: Type of employment (n=116)

	Frequency	Percent
Employed	60	51.7%
Self employed	11	9.5%
Student	9	7.8%
Unemployed	29	25.0%
Volunteer	7	6.0%
Total	**116**	**100.0%**

Although a higher proportion of the employed persons (78.9%; n=56) were adherent to treatment, compared to 55.2% (n=16) among the unemployed as presented in Figure 4.6, there was no significant relationship between employment status and adherence (p=0.099). The unemployed patients might have had more time to visit the clinic and collect their ARVs, compared to the employed patients. ARVs are provided at no cost to the patients. However these patients need money to pay for transport to the clinic.

Findings of this study agree with those reported by Altice and Friedland (1998:504) who found that adherence did not seem to be predicted by

socioeconomic status. Ammassari et al (2002:S125) also found that unemployment per se did not predict non-adherence. This is in contrast to some other studies. The WHO (2006:106) revealed a significant association between employment status and adherence (χ^2=5.116; p=0.024) suggesting that people who are employed are more likely to adhere to treatment. Mehta et al (1997:1666) also found that lower socioeconomic status (low income) could influence non-adherence levels.

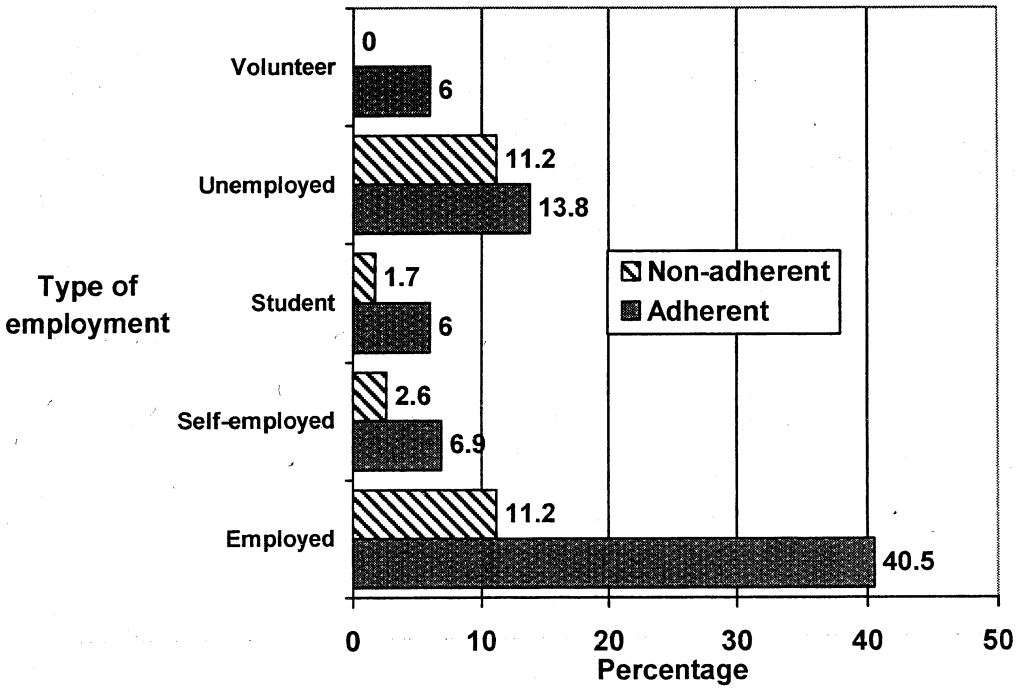

Figure 4.6: Relationship between adherence and type of employment (n=116)

4.2.6 Cost

Consistent with the Botswana national policy, all respondents received ARV treatment free of charge. Forty-one per cent (n=48) of the respondents indicated that they had incurred extra costs in general expenditure as a result of taking ARVs as shown in Figure 4.7. Of the 48 respondents who incurred extra costs 64.6% (n=31) were adherent to treatment while 35.4% (n=17) were non-

adherent. However no association was found between adherence and cost of treatment at the 5% significance level (Chi square χ^2=20.8; p=0.142; df=47).

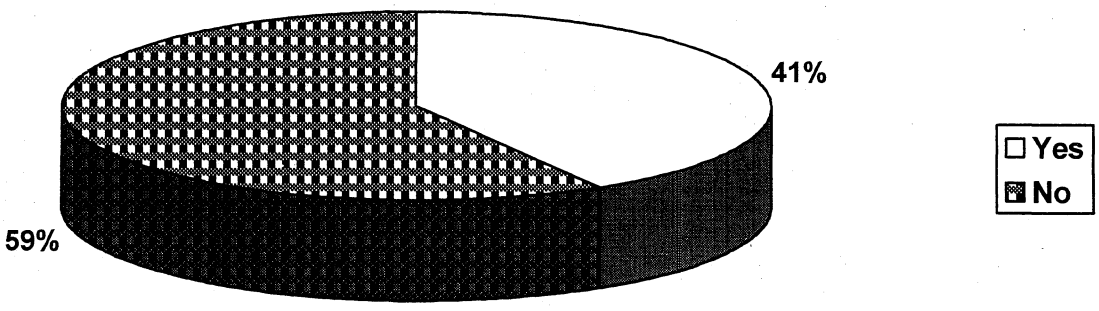

Figure 4.7: Extra cost incurred as a result of taking ARV (n=48)

4.2.7 Means of travelling to the clinic

Of the respondents 64.7% (n=75) used buses/taxis, 20.7% (n=24) used their own cars while 14.7% (n=17) walked to the clinic (see Figure 4.8). The majority of the respondents (75.9%; n=88) took 30 minutes or less to reach the clinic.

Table 4.6: Means of getting to the clinic (n=116)

Means of getting to the clinic	Frequency	Percent
Buses/Taxis	75	64.7
Own cars	24	20.7
Walking	17	14.7
Total	**116**	**100.0%**

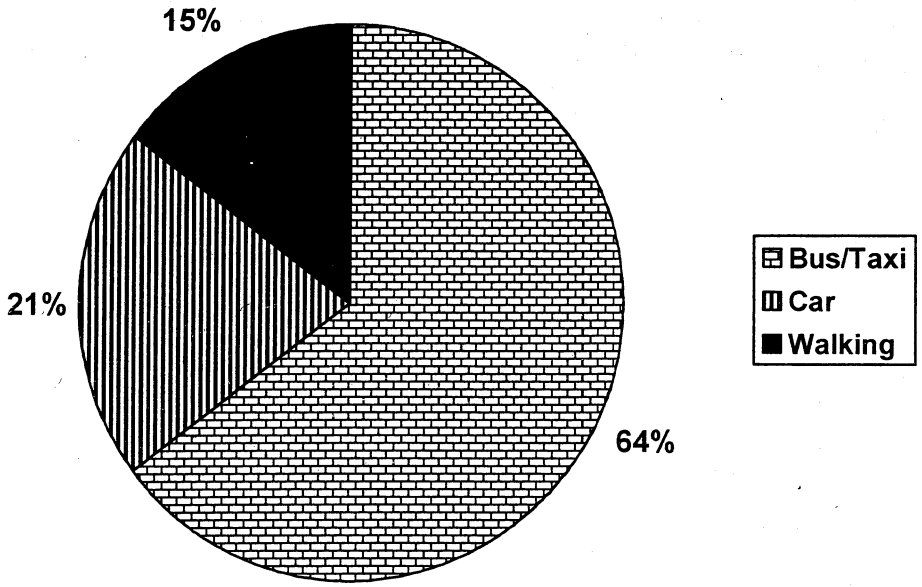

Figure 4.8: Means by which respondents got to the clinic (n=116)

4.2.8 Time spent at the clinic before getting ARVs

Waiting times at the clinic had been anticipated to be a factor influencing ARV treatment adherence, however this study did not find any significant association between time spent at the clinic before getting ARVs and adherence at 5% level of significance (p=0.08; df=115). Figure 4.9 shows that half of the respondents waited for 31-60 minutes before getting their ARVs. Of this number 45 (77.6%) were adherent compared to 66.7% (n=4) adherent respondent among those who spent 120 minutes or more waiting for their ARVs.

Table 4.7: Waiting time at the clinic (n=116)

Time spent at the clinic	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
30 minutes or less	19	16.4	10	8.6	29	25
31-60 minutes	45	38.8	13	11.2	58	50.0
61-120 minutes	17	14.7	6	5.2	23	19.8
121 minutes or more	4	3.4	2	1.7	6	5.2
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

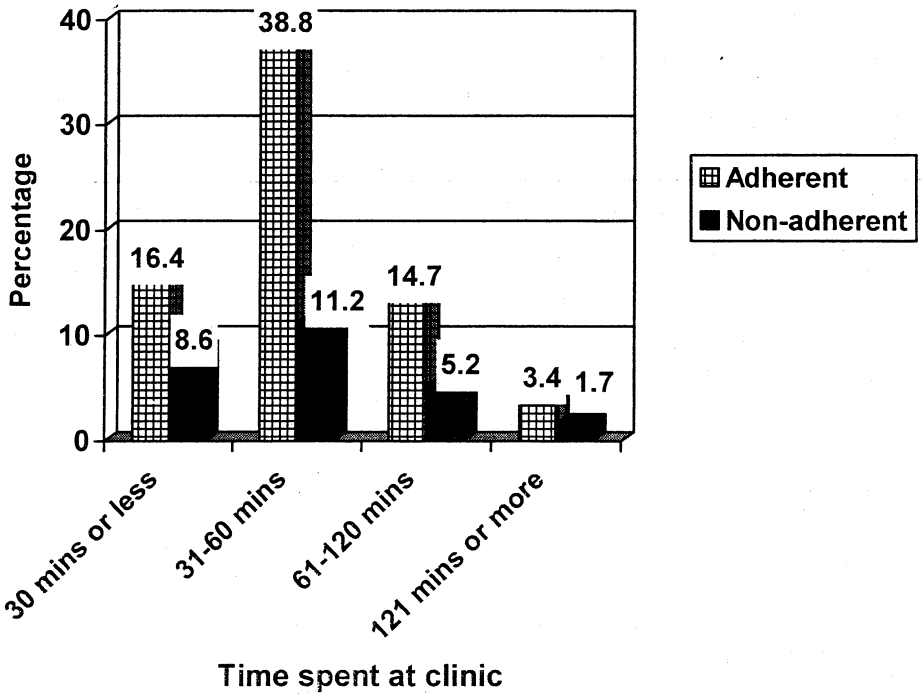

Figure 4.9: Time spent at the clinic before getting ARVs (n=116)

4.2.9 Quality of health care services

The majority of the respondents (85.3%; n=99) were satisfied with the quality of health care services received at the clinic (see Figure 4.10). Among the 17 respondents who were dissatisfied with the quality of services, 58.8% (n=10) indicated shortage of staff as one area that require improvement.

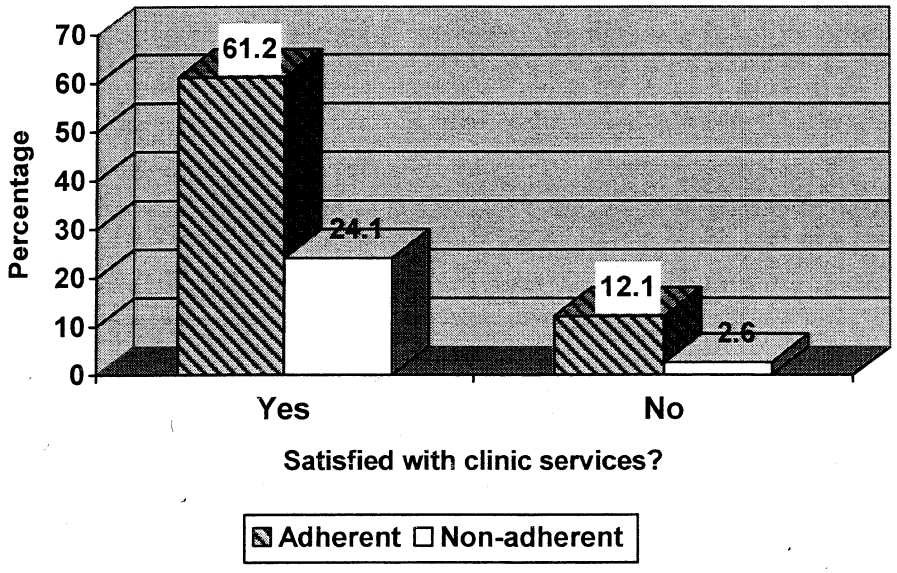

Figure 4.10: Satisfaction with services from the clinic (n=116)

4.3 ADHERENCE COUNSELLING

This section presents the results on the adherence counselling profile of respondents.

4.3.1 Adherence partner/treatment supporter

All the respondents indicated that they had someone as an adherence partner who reminded them about their pharmacy refill dates and also to take their medication regularly. Of the respondents, 41.4% (n= 48) were supported by their spouses/partners while 22 (19%) had friends as supporters, 14 (12.1%) were

supported by their brothers/sisters and 10 (8.6%) were supported by their mothers as shown in Table 4.8.

Table 4.8: Treatment supporter versus adherence (n=116)

Treatment supporter	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
Friend	19	16.4	3	2.6	22	19.0
Father	4	3.5	2	1.7	6	5.2
Mother	7	6.0	3	2.6	10	8.6
Relative	7	6.0	1	0.9	8	6.9
Spouse/partner	34	29.3	14	12.1	48	41.4
Son/Daughter	4	3.5	0	0.0	4	3.4
Brother/Sister	7	6.0	7	6.0	14	12.0
Buddy	3	2.6	1	0.9	4	3.5
Others	0	0.0	0	0.0	0	0.0
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

The Botswana national ART guideline stipulates that each patient who starts taking HAART should have a treatment supporter (MoH 2005:2). The essence is to enhance adherence to ARVs because the patient on HAART might forget his/her appointment date, forget to take the medicines or be too sick to collect the ARVs from the pharmacy. According to Figure 4.11, spouses or partners seemed to have provided good support because 29.3% (n=34) of the 116 respondents

were adherent. Friends also seemed to be good treatment supporters as 16.4% (n=19) out of 116 respondents were adherent. A friend could be living far from the patient but cell phones were commonly used to remind and encourage the patient to drink their ARVs or to collect the ARVs from the pharmacy.

Generally speaking socio-demographic factors did not predict adherence behaviour in this study. However, other studies have found that being male, white, older, having a higher income, higher education and higher literacy levels correlate with better adherence. In clinical trials the patients who were adherent reported greater social, emotional and economic support from staff members and significant others (Ena & Benito 2000:100; Ickovics & Meisler 1997:387).

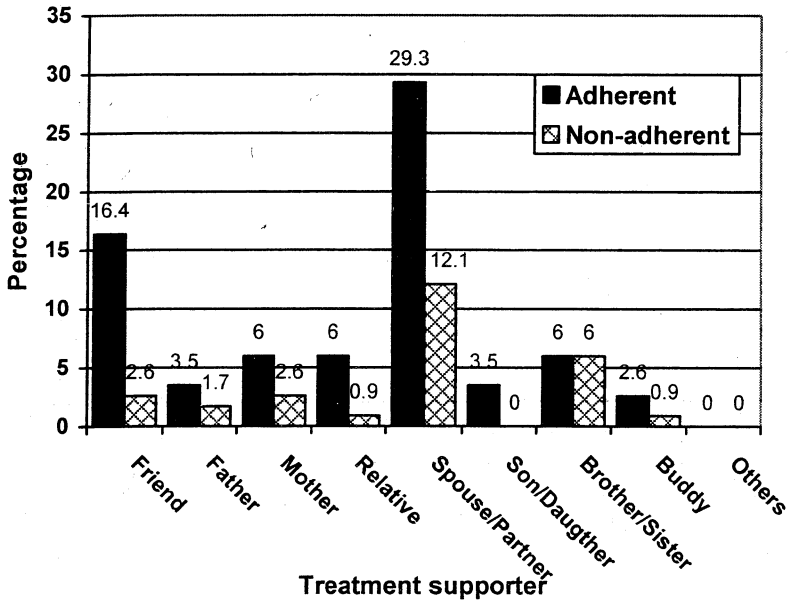

Figure 4.11: Relationship between adherence and treatment supporter (n=116)

4.3.2 Counselling prior to starting ARV treatment

Of the respondents, 114 (98.3%) had a session of adherence counselling before they started HAART. It is interesting to note that the 2 respondents who had not been counselled before starting ARVs were adherent to treatment (see Table 4.9).

Table 4.9: Relationship between adherence and counselling before ARV treatment (n=116)

Counselling before starting ARV	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
Yes	83	71.6	31	26.7	114	98.3
No	2	1.7	0	0.0	2	1.7
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

4.3.3 Number of times respondents were counselled after starting ARVs

The majority of the respondents (92.2%; n=107) were counselled at least once after starting HAART. The remaining 9 respondents indicated that they had not been counselled since starting treatment. Of the 107 respondents who had been counselled, 25 (23.4%) were counselled once, 29 (27.1%) were counselled twice, 27 (25.2%) were counselled three times, while 17.8% (n=19) were counselled five times or more (see Table 4.10).

Table 4.10: Number of times counselled after starting treatment (n=116)

Number of times counselled	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
Once	11	9.5	14	12.1	25	21.6
Twice	26	22.4	3	2.6	29	25.0
Three times	23	19.8	4	3.4	27	23.2
Four times	5	4.3	2	1.7	7	6.0
Five times or more	18	15.5	1	0.9	19	16.4
None	2	1.7	7	6.0	9	7.8
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

It is evident from Figure 4.12 that the higher the frequency of adherence counselling, the better the adherence outcome. Among the 29 respondents who were counselled twice, 3 (10.3%) were non-adherent compared to 1(5.3%) non-adherent respondent among those counselled five or more times. Also, out of 9 respondents who did not receive any counselling after starting HAART, 7 (77.7%) did not adhere to treatment. This study therefore found a significant relationship between the frequency of adherence counselling and adherence at 1% significance level (p=0.001) using a 2-tailed test based on the Pearson r correlation coefficient (parametric test) at 114 degrees of freedom.

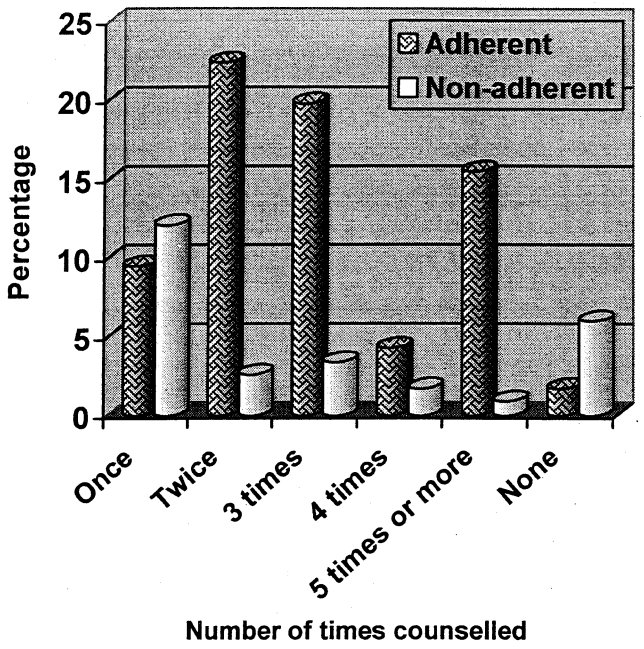

Figure 4.12: Number of times counselled after starting treatment versus adherence (n=116)

Once treatment has been started with an effective drug regimen, the most important determinant of success is adherence to the regimen. Therefore adherence should be addressed throughout the counselling continuum, before starting ART and at every follow-up visit after commencement of treatment (MoH 2005:2).

4.4 SELF ADHERENCE REPORT

This section presents the respondents' self adherence reports and their reasons for having missed ARV doses.

4.4.1 Number of ARV doses missed in the past two days

Most respondents (80.9%; n=93) indicated that they had not missed any ARV medication in the past two days while 15.7% (n=18) had missed their ARVs once within the same period (Table 4.11). In terms of action taken after missing ARV dose, 55.6% (n=10) of the 18 respondents who missed their ARVs did nothing, 33.3% (n=6) took the medicine at the very moment they remembered while 11.1% (n=2) did not respond to this question.

Table 4.11: Number of times ARV medications were missed in the past two days (n=115)

No of times ARV missed in past 2 days	Frequency	Percent	Cumulative Percent
0	93	80.9%	80.9%
1	18	15.7%	96.5%
2	4	3.5%	100.0%
Total	**115**	**100.0%**	**100.0%**

4.4.2 Reasons for missing medication doses

The most commonly cited reasons for missing medication were forgetfulness (19%), side effects (13.8%), ran out of pills (9.5%), alcohol use (8.6%), hospitalisation (6.9%) and feeling better (6.0%) (see table 4.12).

Table 4.12: Reasons for missed medication (n=116)

Reason	No. cited as reason	Percent reported
Felt better	7	6.0%
Clinic not accessible	2	1.7%
Lack of food	6	5.2%
Depressed	4	3.4%
Too many pills	4	3.4%
Lack of care/support	7	6.0%
Hospitalized	8	6.9%
Did not understand instruction	6	5.2%
Alcohol use	10	8.6%
Forgot	22	19%
Ran out of pills	11	9.5%
Side-effects	16	13.8%
Others	5	4.3%

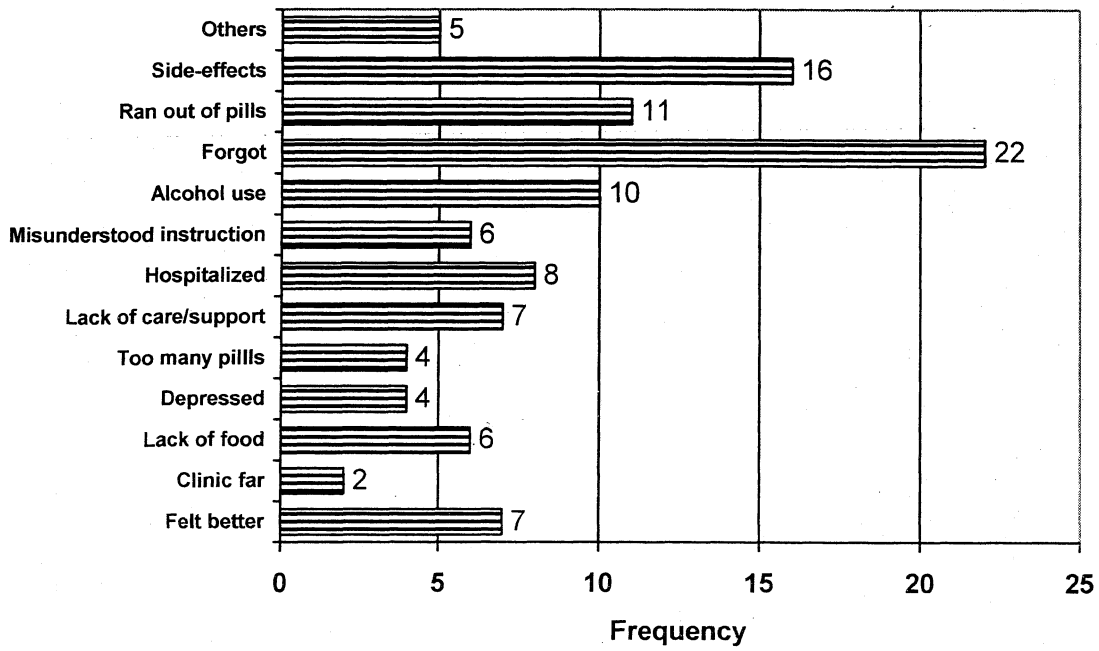

Figure 4.13: Reasons why respondents missed their medications (n=116)

Figure 4.13 indicates that the most common reason for missing ARV medicines was forgetfulness while the least cited reason was the clinic's inaccessibility. This finding is consistent with other studies that identified forgetfulness as the most common cause of non-adherence to medication (Chesney 2000: 174; Turner 2002: 144; WHO 2006:105). However, the specific reason for forgetfulness could not be quantified in this study.

4.5 CLINICAL DATA

This section presents the results on respondents' pre-clinical assessment and anti-retroviral therapy data transcribed from respondents' medical records.

4.5.1 Duration of ARV treatment

Of the respondents in this study, 60 (51.7%) had received treatment ranging from 6 to 12 months. Of the 85 respondents who were adherent to treatment, 45.9% (n=39) had received treatment for 6-12 months. All respondents who had received treatment for 19-24 months were adherent (n=8) (see Table 4.13).

Table 4.13: The relationship between adherence and duration of treatment (n=116)

Duration of ARV treatment	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
6-12 months	39	33.6	21	18.1	60	51.7
13-18 months	38	32.8	10	8.6	48	41.4
19-24 months	8	6.9	0	0.0	8	6.9
25 months or longer	0	0.0	0	0.0	0	0.0
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

4.5.2 CD4 cell count

Baseline CD4 cell counts were available for all respondents. Nearly all respondents 109 (94.0%) had a baseline CD4 of less than or equal to 200 cells per mm^3 which met the ARV treatment inclusion criteria. Only 7 (6.0%) respondents had baseline CD4 cell counts of more than 200 cells per mm^3.

Immunological failure is defined as the persistent decline in the CD4 cell count which is measured at least on two separate occasions (Starace 2002:S137) Immunological failure also occurs if the CD4 cell counts falls steadily or fails to reach 200 cells per mm^3 after six months' ART (MoH 2005:20).

Though patients are generally started on HAART when the CD4 cell count is below 200 cells per mm^3 (WHO HIV/AIDS stage I, II and III), those HIV positive patients who are clinically ill (WHO HIV/AIDS Stage IV), are started on HAART irrespective of their CD4 cell counts. Therefore not all patients were started on

HAART with baseline CD4 cell counts of less than 200 cells per mm^3. In this study, changes in CD4 cell counts were calculated as the difference between the count at baseline and the most recent count.

The results show that the lowest baseline CD4 cell count was 2 cells per mm^3 and after ARV treatment the highest was 500 cells per mm^3 while the lowest most recent CD4 cell count was 59 cells per mm^3 and the highest most recent value after HAART was 2004 cells per mm^3. The mean CD4 cell counts at baseline was 121.9 cells per mm^3 with a standard deviation of 77.3 and after ARV treatment, the mean CD4 cell counts became 367.7 cells per mm^3 with standard deviation of 247.4. That is interpreted as a mean gain of 245.8 cells per mm^3 for all 116 respondents over the 6-12 ART period.

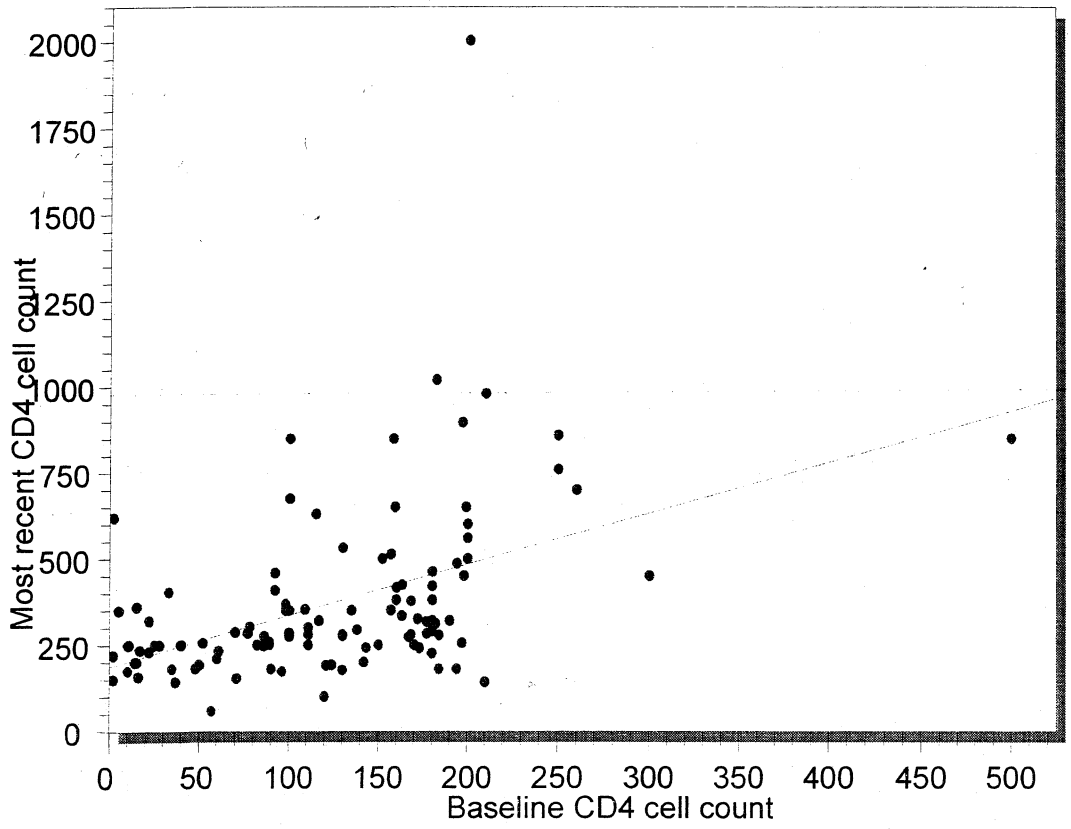

Figure 4.14: Scatter gram: CD4 cell count baseline versus most recent CD4 cell count (n=116)

Figure 4.14 shows a positive relationship between the baseline and the most recent (post-treatment) CD4 cell counts at a 1% significant level (Pearson correlation coefficient, r= 0.458)

4.5.3 Plasma Viral load

All respondents had baseline VL results. Five (4.3%) respondents had undetectable VL (less than 400 copies per ml) at baseline while 111 (95.7%) respondents had VL exceeding 400 copies per ml. Viral suppression is defined as a viral load below detection after six months of therapy (Bartlett & Gallant, 2004: 59, 61). Viral suppression was achieved in 94 (81.0%) respondents. Virologic failure is said to occur when VL is not reduced to less than 400 copies per ml by six months after HAART initiation or when, after initial suppression to less tan 400 copies per ml, VL again becomes detectable any time (MoH 2005: 20).

The results from this study showed that the highest baseline plasma VL was 750 000 and mean plasma VL at baseline was 228 815.1 copies per ml with a standard deviation of 321 760.2. After ARV treatment, the highest most recent VL was 1 580 copies per ml and the mean VL was 1 195.4 copies per ml with a standard deviation of 2 280.

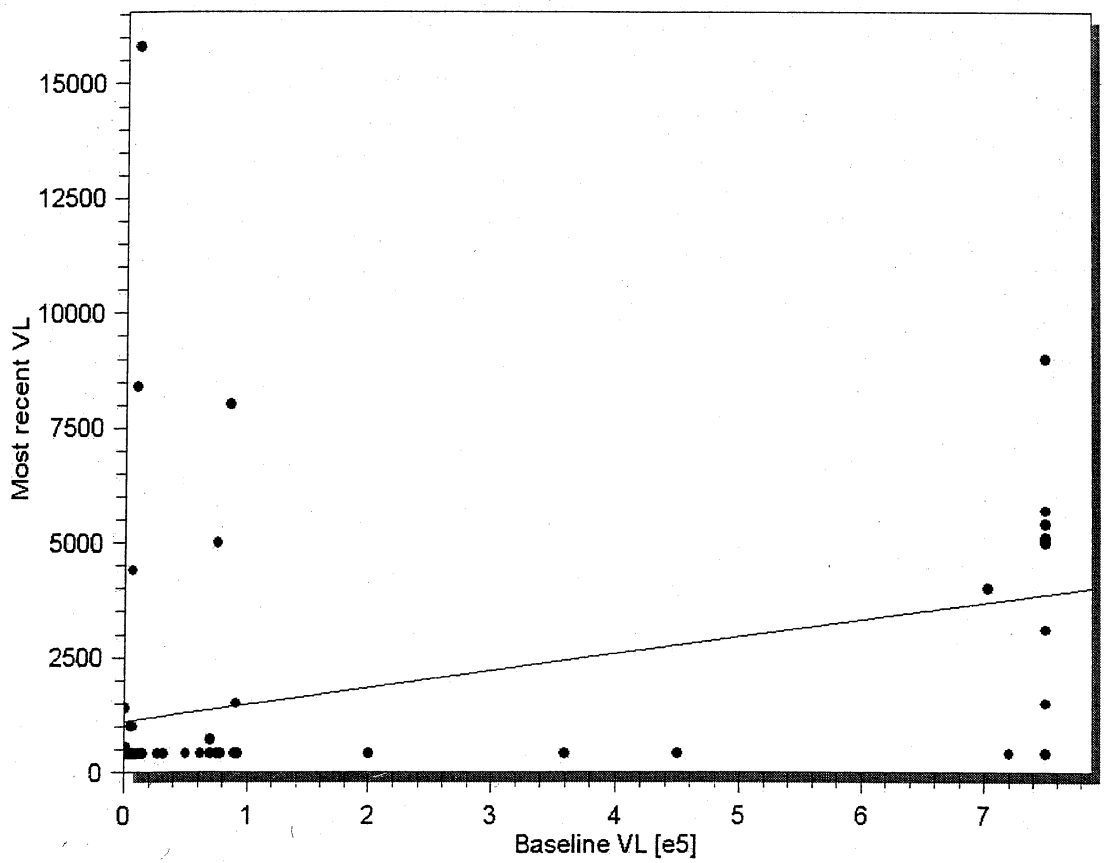

Figure 4.15: Scatter gram: Baseline VL versus most recent VL (n=116)

No visible statistical relationship was seen between baseline VL and most recent VL at 1% level of significance as shown in figure 4.15 (r= 0.139).

4.5.4 Current ARV treatment regimen

According to the Botswana national ART guidelines (MoH 2005:11), the first line regimen consisted on 2 NRTIs plus one NNRTI while the second line regimen consisted of 2 NRTIs and 1 PI. In this study the majority (n=92; 79%) of respondents were still on first line ART while only 24 (21%) had their treatment switched to second line ART as shown in Figure 4.16. However, no respondent was on the third line ART regimen. This is in agreement with the national guidelines which stipulate that all patients requiring third line regime be transferred to the referral hospital.

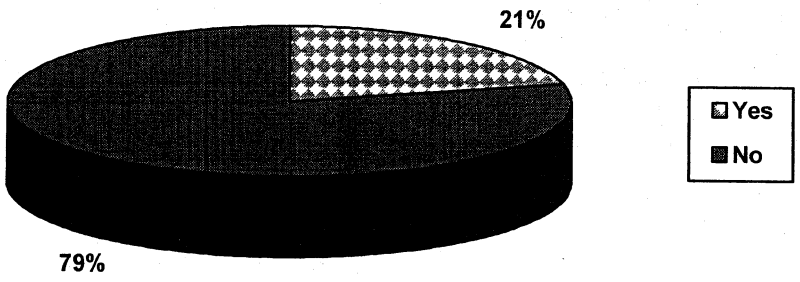

Figure 4.16: Change of ARV regimen (n=116)

Of the 24 respondents who had their treatment regimens changed to second line, 41.7% (n=10) were due to virologic failures, 25% (n=6) were due to toxicity, 20.8% (n=5) were due to immunologic failure (as portrayed in the CD4 cell counts), and 12.5% (n=3) due to clinical failure as determined by the patient's physical state and recurrent infections (see Figure 4.17).

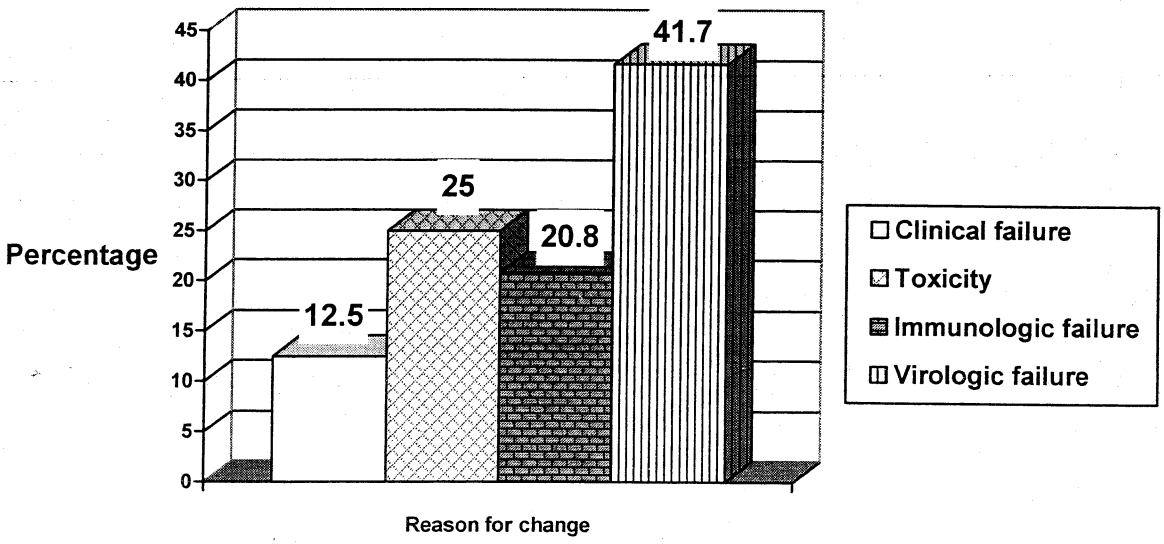

Figure 4.17: Reasons for change of ARV regimens (n=24)

Finding from this study suggest that the clinicians complied with the ART guidelines because the majority of patients were on 1st line compared to those on the 2nd line ARV regimens. The results are also in agreement with those of Jani (2004:9) who documented that 2/3 of patients on HAART remained on the original regimes 12 months after starting HAART.

4.6 SIDE EFFECTS EXPERIENCED

The most common side effects reported by respondents included headache (18.6%), nausea (16.7%), dizziness (14.3%), vomiting (14.3%), and skin rash (10%) as shown in Table 4.14 and Figure 4.18. Of the respondents, 21.6% (n=25) indicated that these ART side effects affected their daily activities.

Table 4.14 Side effects experienced (n=210)

Side effects	Number cited	Percent reported
Nausea	35	16.7%
Vomiting	30	14.3%
Diarrhoea	17	8.1%
Headache	39	18.6%
Skin rash	21	10%
Dizziness	30	14.3%
Depression	15	7.1%
Skin or nail discolour	11	5.2%
Others	12	5.7%

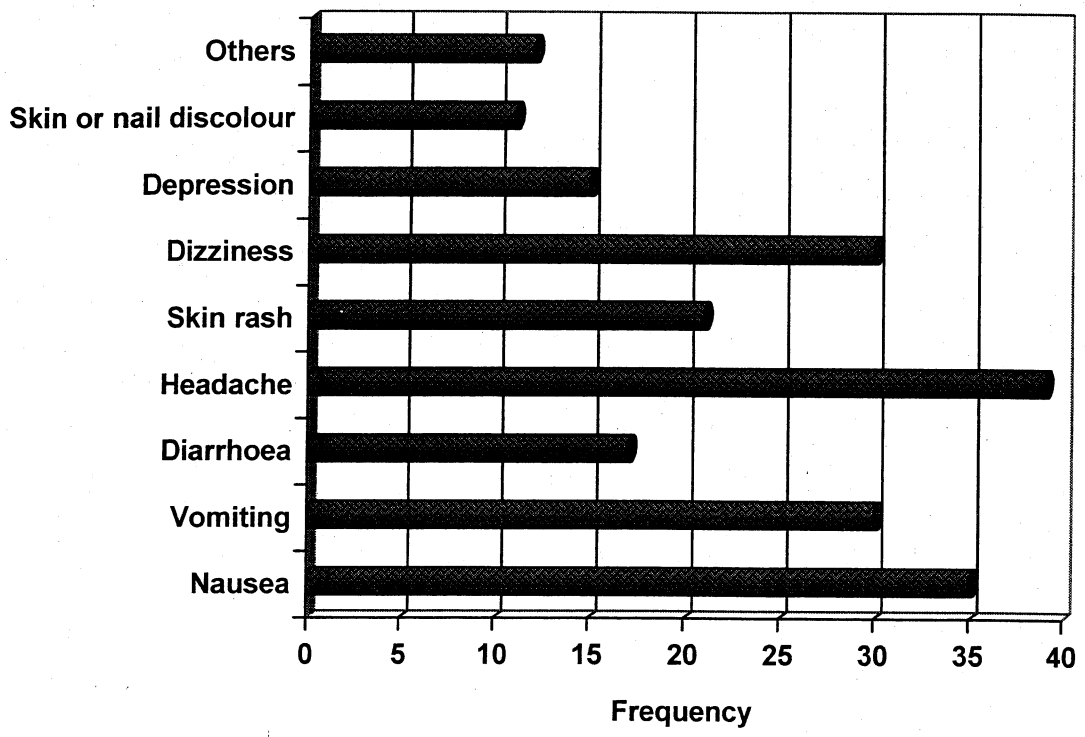

Figure 4.18 Distribution of ARV side effects experienced by respondents (n=210)

Table 4.15 shows that 58.3% of the respondents (n=42) who experienced side effects visited the clinic for consultation while 38.9% (n=28) took no actions when they experienced ART side effects.

Table 4.15 Action taken by respondents when they experience ARV side effects (n=72)

Action taken when side effects are experienced	Frequency	Percent
Nothing	28	38.9%
Came to the clinic for consultation	42	58.3%
Took some medicines	2	2.8%
Total	**72**	**100.0%**

4.7 TRADITIONAL MEDICINES

This section covered respondents' reported use of traditional medicines.

4.7.1 Respondents' reported visits to traditional healers

Almost all respondents (n=108; 93.1%) indicated that they had not visited any traditional healer since they started taking HAART (see Figure 4.19). Only 8 (6.9%) admitted to having visited traditional healers. Of those 8 respondents more than half (n=5; 62.5%) provided no reason for visiting the traditional healer while 25% (n=2) wanted to get a cure for the disease, and 12.5% (n=1) wanted an alternative treatment for HIV.

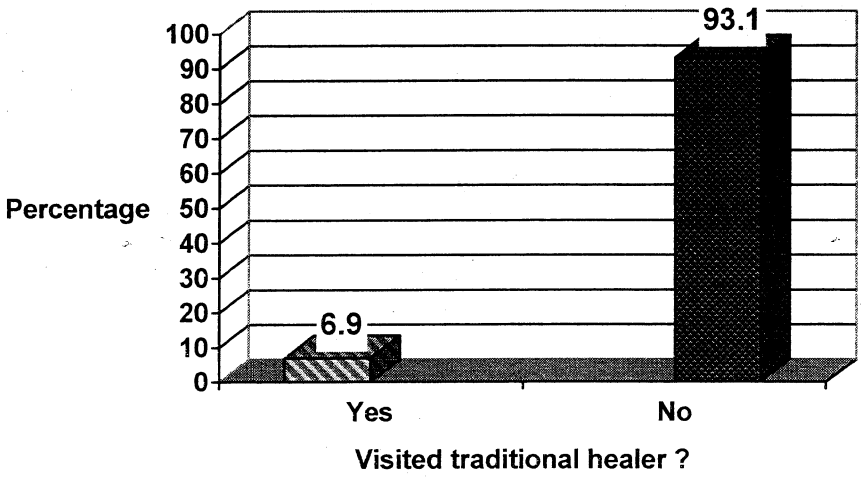

Figure 4.19: Whether respondents visited traditional healers (n=116)

Of the respondents, 110 (95%) were reportedly not taking any traditional medicine together with their ARVs while 6 respondents (5%) did not indicate whether or not they did so (see Figure 4.20). No respondent admitted to the concurrent use of ARVs and traditional medicines.

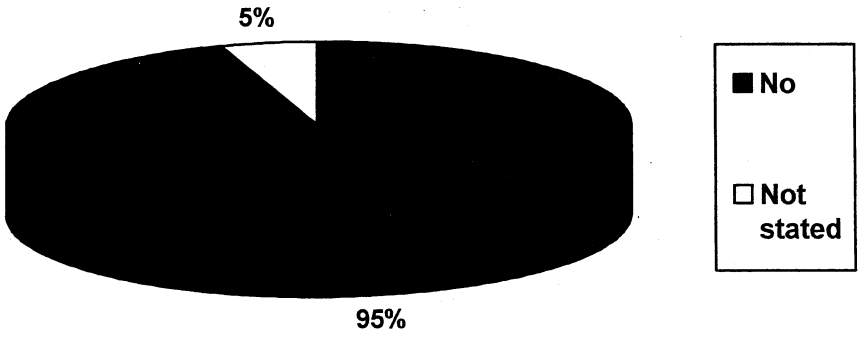

Figure 4.20: Are you taking traditional medicines together with ARVs? (n=116)

4.8 RATES OF ADHERENCE TO ARVs

An adherence level of >95% is required for full viral suppression in the blood. Typical adherence rates for medications prescribed over long periods of times are approximately 50-75% (DiMatteo, Giordani, Lepper & Croghan 2002:794). According to Machtinger and Bangsberg (2005:2) non-adherence to ART is common in all groups of treated individuals. The average adherence varies by the method used to assess it and the group studied, but appears to approximately 70%.

Adherence is an important predictor of morbidity and mortality in clinical trials of drugs for cancer and coronary heart disease and the rates of non-adherence with medical regimens range from 15-93% with average rates of non-adherence estimated at 50%. The costs of non-adherence may be substantial in terms of illness, relapses, recovery (Ickovics & Meisler 1997:385-6) and the development

and spread of ART-resistant HIV strains throughout communities and even throughout countries. .

While the ultimate goal of ART is to reduce HIV-related morbidity and mortality, the initial goal is full and durable viral suppression. Full viral suppression allows for maximum reconstitution or maintenance of immune function and minimises the emergence of drug resistant-virus selected by on-going replication in the presence of antiretroviral drugs (Machtinger & Bangsberg 2005:3).

At extension 15 clinic in Gaborone, the CD4 cell counts and VL are both used to prove immunological and virologic recovery after HAART initiation. In this study, the researcher calculated a composite adherence measure as the means of the adherence rates of the two measures used, namely pill counts and pharmacy refills. Adherence in this study was hence defined as a composite adherence rate equal to or higher than 95% while levels of adherence 94% and lower was considered as non-adherent. Assessments of adherence to ART are summarised in Table 4.16. Two tools were used to measure adherence: pharmacy refill date and pill count. The mean adherence rates were 95.9% for the pharmacy refill and 96.4% for the pill count.

Table 4.16: Adherence rates

	Mean (%)	**Median (%)**	**Mode (%)**	**Minimum (%)**	**Maximum (%)**	**Std. deviation**
Adherence by pharmacy refill method	95.9	99.5	100.0	65.0	100.0	5.9
Adherence by pill count method	96.4	97.0	96.0	85.0	100.0	3.3
Composite adherence rate	**96.2**	**98.0**	**100.0**	**75.0**	**100.0**	**4.2**

The two measures used to identify adherence levels, had both strengths and weaknesses. The pharmacy refill method provides a less intrusive means of measuring adherence than most other measures. Turner (2002:146) reported that in the event that refills are not obtained in a timely fashion, it is assumed that the patient is not taking medication between refills or is missing doses in a way that allows the medication to last longer than it should. Machtinger and Bangsberg (2005:11) cited a study by Maher, Klimas, Flecher, Cohen, Maggio, Triplett, Valenzuela and Dickinson (1999) that demonstrated that patients who are adherent to ART, as measured by consistent pharmacy refills for >4 months, were significantly more likely to achieve virologic control and benefit immunologically than were less-adherent patients. In contrast, the pill count is in some way more 'objective', since it measures the number of pills left over from the previous refill, and can act as a good proxy indicator for actual pill intake (WHO 2006:124). It is, however, subject to manipulation by patients who may fear a bad response from health workers during dispensing if they have not achieved optimal adherence. Pills not left in the container at any pill count episode are assumed to have been swallowed by the patient. This might or might not be the case.

The recognition of the limitations of each of these adherence measures resulted in the researcher calculating a composite rate in the expectation that this would allow the strengths of one method to compensate for the weaknesses of the other. Of the 116 respondents, 73.3% (n=85) had a composite adherence level of ≥95% while 26.7% (n=31) had a composite adherence level of ≤94%. The mean composite adherence level was found to be 96.2% (SD 4.25, median 98%) for the 116 patients enrolled in the study. Though this value is high, it is comparable to the rates found in other countries. For example, a 48-week study of 289 poor South Africans attending a public hospital HIV clinic reported a mean adherence rate, as measured by clinic-based pill counts and pharmacy refill dates of 87.2% (median 93.5%) (Orrell et al 2003:1369).

Table 4.17 shows the strata of adherence of all the patients in the study.

Table 4.17: Composite adherence levels (n=116)

Adherence	frequency	Percentage
≥95%	85	73.3%
90-94%	25	21.6%
81-89%	4	3.4%
≤80%	2	1.7%
Total	**116**	**100%**

4.9 CORRELATION BETWEEN ADHERENCE, CD4 CELL COUNTS AND VIRAL LOAD

Ickovics & Meade (2002:S98) stated that adherence is critical to obtain the full benefits of HAART, including maximal and durable suppression of viral replication, reduced destruction of CD4 cells, prevention of viral resistance, promotion of immune reconstitution and slowed progression to AIDS. According to Ickovics and Meisler (1997:388) adherence rates were lower among patients with lower CD4 cell counts, suggesting that as the disease becomes more severe, adherence may become compromised. Paterson et al's (2000:27) study on adherence to ARVs stated that patients with 95% or greater adherence had superior virologic outcomes, greater increases in CD4 cell counts and lower hospitalisation rates than those with lower levels of adherence. Generally, better adherence rates are observed in patients with higher CD4 cell counts but no direct causal effect of adherence and CD4 cell counts has been established.

The relationship between adherence and virologic control has been investigated in a number of studies. Machtinger & Bangsberg (2005:4) cited Bangsberg et al (2000) who assessed adherence among 34 HIV-positive, homeless individuals taking ART including a PI over three months. They used patients' reports, unannounced pill counts and MEMS caps. In a multivariate analysis, controlling for drug resistance, duration of therapy and CD4 count, each 10% decrease in

adherence rates was found to result in a doubling of the VL. Adherence alone explained between 40-60% of the variation in VL. That study suggested that small differences in adherence can result in major differences in virologic control and that adherence may be the predominant factor determining virologic outcomes.

In this study, an examination of the relationship between adherence and CD4 cell counts and plasma VL revealed that, out of the 116 respondents, there were 85 (73.3%) adherent respondents and 74 (87.1%) of those achieved a CD4 cell count of equal to or more than 200 cells per mm^3 and 75 (88.2%) achieved full viral suppression within six months of commencing HAART. This indicates a positive association between adherence, increasing CD4 cell counts and reduction in VL (see Table 4.18). The mean baseline CD4 cell counts and VL was 121.9 cells per mm^3 and 228 815.1 copies per ml respectively. Therefore there was a gain of an average of 245.8 cells per mm^3 CD4 cells and a decrease of 227 619.7 viral copies per ml in the total study population which comprised 116 respondents.

Table 4.18: Correlations between adherence, age, baseline CD4 cell count, most recent CD4 cell count, baseline VL, most recent VL and Number of times counseled (n=116)

		Age	Baseline CD4	Most recent CD4	Baseline VL	Most recent VL	Adherence	Number of times counselled
Age	Pearson Correlation	1	-0.064	0.004	0.000	-0.077	-0.057	-0.103
	Sig. (2-tailed)		0.494	0.969	0.993	0.409	0.540	0.275
	N	116	116	116	116	116	116	115
Baseline CD4	Pearson Correlation	-0.064	1	0.458**	-0.125	0.030	0.135	-0.020
	Sig. (2-tailed)	0.494		0.000	0.182	0.753	0.149	0.833
	N	116	116	116	116	116	116	115
Most recent CD4	Pearson Correlation	0.004	0.458**	1	-0.046	0.040	0.033	-0.006
	Sig. (2-tailed)	0.969	0.000		0.627	0.669	0.726	0.950
	N	116	116	116	116	116	116	115
Baseline VL	Pearson Correlation	0.000	-0.125	-0.046	1	0.139	-0.244**	0.160
	Sig. (2-tailed)	0.993	0.182	0.627		0.137	0.008	0.088
	N	116	116	116	116	116	116	115
Most recent VL	Pearson Correlation	-0.077	0.030	0.040	0.139	1	-0.186*	0.159
	Sig. (2-tailed)	0.409	0.753	0.669	0.137		0.046	0.090
	N	116	116	116	116	116	116	115
Adherence (%)	Pearson Correlation	-0.057	0.135	0.033	-0.244**	-0.186*	1	-0.294**
	Sig. (2-tailed)	0.540	0.149	0.726	0.008	0.046		0.001
	N	116	116	116	116	116	116	115
Number of times counselled	Pearson Correlation	-0.103	-0.020	-0.006	0.160	0.159	-0.294**	1
	Sig. (2-tailed)	0.275	0.833	0.950	0.088	0.090	0.001	
	N	115	115	115	115	115	115	115

** Correlation is significant at the 0.01 level (2- tailed), *Correlation is significant at the 0.05 level (2- tailed)

Table 4.18 shows the correlation between respondents' adherence, age, baseline CD4 cell count, most recent CD4 cell count, baseline VL, most recent VL and number of times counseled after starting HAART. The results of correlation indicate that there is a weak association between adherence and age (r= -0.057); adherence and baseline CD4 cell counts (r= 0.135); adherence and most recent CD4 cell counts (r= 0.033); and a significant association between adherence and baseline VL (r= -0.244 at 0.01 level of significance); adherence and most recent VL (r= -0.186 at 0.05 level of significance); and adherence and frequency of adherence counselling (r=-0.294 at 0.01 level of significance). In this study, 1.0 was regarded as perfect correlation; 0.0 = no correlation at all; while 0.6 was accepted as strong correlation.

Table 4.19 Relationship of adherence to most recent CD4 cell count (n=116)

CD4 cell counts	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
≤200	11	9.5	11	9.5	22	19.0
>200	74	63.8	20	17.2	94	81.0
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

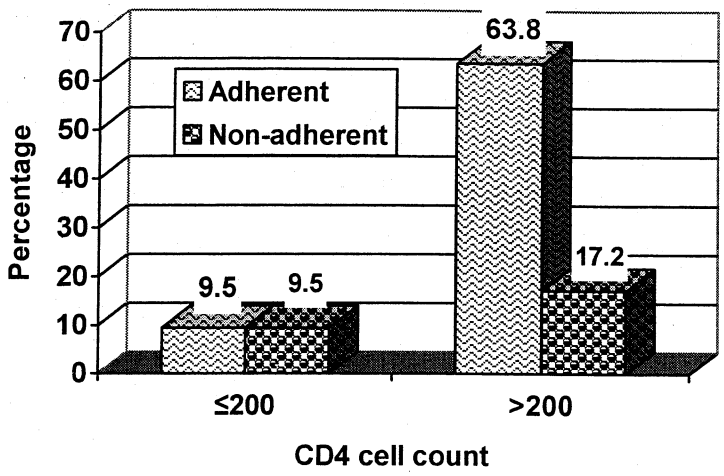

Figure 4.21: Relationship of adherence to CD4 cell count (n=116).

The combined ability of both the pharmacy refill and pill count adherence score in predicting CD4 cell counts of more than 200 cells per mm^3 and VL less than 400 copies per ml are shown in Tables 4.19 and 4.21 and Figures 4.21 and 4.22. Both tools were able to predict that 87.1% (n=74) and 88.2% (n=75) of the respondents who were adherent achieved immune recovery and full viral suppression respectively. More respondents in the adherent group had CD4 cell counts of more than 200 cells per mm^3 and VL less than 400 copies per ml. In contrast, the non-adherent group had fewer respondents with CD4 cell counts more than 200 cells per mm^3. However, 64.5% (n=20) of respondents in the non-adherent group also attained CD4 cell counts of more than 200 cells per mm^3 while 61.3% (n=19) of these non-adherent respondents achieved virologic suppression. Adherence to ART was associated with the reduction of VL to undetectable levels (<400 copies per ml) and increased CD4 cell counts. A positive relationship exists between adherence, CD4 cell counts and VL. Those respondents who did not refill their ARVs consistently, and/or missed taking their ARV doses, were non-adherent and might not have achieved undetectable VL and increased CD4 cell counts.

Table 4.20: Adherence versus most recent VL (n=116)

VL	Adherent	Adherent %	Non-adherent	Non-adherent %	Total	Total %
≥400 (suppressed)	10	8.6	12	10.3	22	19.0
<400 (unsuppressed)	75	64.7	19	16.4	94	81.0
Total	**85**	**73.3**	**31**	**26.7**	**116**	**100.0**

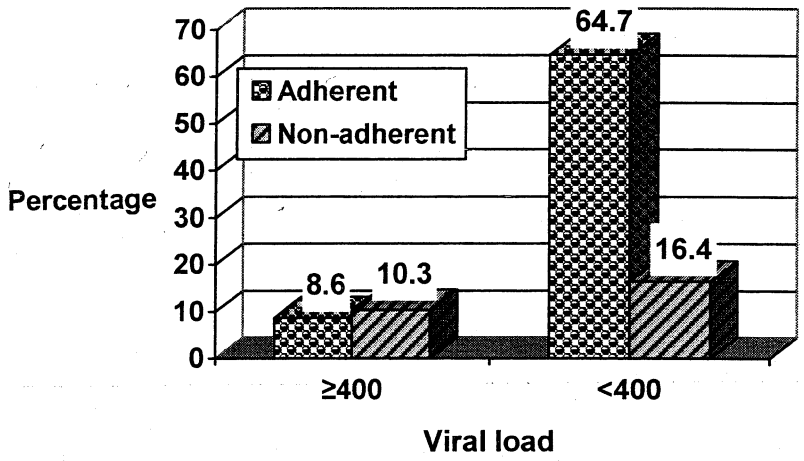

Figure 4.22 Relationship of adherence to VL (n=116)

In this study, forgetfulness was the most common reason for missing ARV medications and hence non-adherence to treatment. Memory aids could be used, including beepers, cell phone reminders, or watches that will sound alarms when it is time to take the medication and cell phones can even display the name of the pill and the number to be taken at a specific time.

Table 4.21: Adherence versus mean most recent CD4 cell count and most recent VL (n=116)

Adherence	Mean CD4 count	Mean plasma VL	Number of respondents	Std. deviation
Adherent	377.2	843.1	85	209.3
Non-adherent	341.7	2161.3	31	333.0
Total	**367.7**	**1195.4**	**116**	**247.4**

Similar methods can be used to alert patients to collect medications when the due date is near. These devices have been used in clinical trials on small populations but are too expensive to give to large numbers of patients on HAART in real life settings because the patients are too many and the resources are scarce (Tennenberger 1999). After therapy has been started, ongoing assessment and reinforcement of adherence is critical because the goal is for patients to live longer and better. Thus, researchers are interested not only in determining what strategies optimise adherence but also to optimise a range of outcomes including virologic, immunologic and clinical aspects. Because adherence is not directly observable, the best that can be done is to estimate the extent of adherence. The most useful answer may be from composite methods that combine multiple measurements into a single score (Wu, Ammassari & Antinori 2002), which was done during this study.

Apart from accurate measurement of adherence, there are other key issues in the study of adherence to ARVs, such as assessment of the impact of adherence on viral load and clinical outcome, determination of the factors that affect adherence and the development of interventions (Chesney 2000:S171). Patients also experience problems with adherence due to factors beyond their control, such as depression which has been associated with HAART non-adherence. Singh et al (1996:262) as well as Starace et al (2002:S137) reported that depression has been associated with HIV infection since the beginning of the HIV/AIDS epidemic and that depression has a significant impact on the quality of life of people living with HIV/AIDS and it is also associated with worse treatment

outcomes. However, depression per se was not addressed during the current study. No respondent indicated feeling depressed, or being too tired to take his/her pills.

Weiser et al (2003:286) identified accessibility and affordability as factors leading to non-adherence. Though, at extension 15 clinic in Gaborone, ARVs are provided free of charge to the patients, they have to travel to this clinic and may have to pay the cost for transport. This may also be a factor leading to non-adherence to ARVs at extension 15 clinic because up to 41% of the total respondents in this study indicated that they incurred extra cost on food and transportation as a result of taking ARVs. These patients might not have the financial means to pay for transport to collect their ARVs or purchase food and may therefore take ARVs on empty stomachs or miss pills because of their fears of side effects. These factors may influence non-adherence among patients receiving HAART at extension 15 clinic.

There is a strong positive relationship between adherence and CD4 cell counts of more than 200 cells per mm^3 but a weak positive relationship between adherence and VL less than 400 copies per ml. The increase in the study's mean CD4 cell count post-treatment of 367.7 cells per mm^3 of respondents and a decrease in mean VL of 1 195.4 copies per ml of respondents is an indication of the positive outcome of HAART treatment as an intervention to reduce morbidity and mortality rates. This can be considered as a great improvement in immunologic and virologic recovery in the study population.

4.10 ASSESSMENT OF THE PHARMACY REFILL AND PILL COUNT ADHERENCE MEASUREMENT METHODOLOGY

In this study, both pharmacy refill records and pill counts were used to calculate the adherence level for each respondent. The researcher calculated adherence by dividing the number of refills that occurred the same day as appointed by the total number of refills multiplied by 100 to obtain the percentage adherence for

each respondent. Adherence was also calculated by dividing the number of pills actually taken by the number of pills needed to be taken over a 30-day period multiplied by 100.

It has been documented that non-adherence leads to immunological and virologic failure in patients on HAART and that optimal adherence improves survival and the durability of regimens (Paterson et al 2000:27). Clinical trial settings may employ direct observation of pill taking and rigorous follow-up on patients but that is hard to achieve in every day practice. Similarly the accurate quantification of taken and missed pills in every day practice is a daunting task, but benefits may be obtained with the use of a combination of adherence measurement methods. The optimal way to assess adherence to anti-retroviral therapy is not known because various studies used different methods to assess adherence and therefore, the best method to assess adherence remains unclear. Wu et al (2002:S95), stated that research on adherence measurement is crucial and that there is a problem because the measure of adherence is not standardised and studies used different adherence measurement methodologies.

The sensitivity of pill counts for detecting non-adherence is compromised when patients remove pills from their containers without taking them ("pill dumping" or "decanting"). This practice leads to an overestimation of adherence. The relationship between pharmacy refills and actual ingestion of medications is not clear and it is therefore very difficult to measure adherence in the outpatient setting accurately and correctly. This is considered to be an accurate measure of overall adherence (Ostenberg & Blaschke 2005:488). However, this method requires close working relationships between the pharmacists and clinicians which might be non existent and in some cases, patients are also required to collect their ARVs at the same pharmacy which might be problematic for migrant workers.

Monitoring and evaluating adherence strategies are important components of any ART programme and can be useful in determining adherence rates and identifying the factors that influence adherence. In any HAART programme, adherence needs to be measured and adherence measurement methodology needs to be studied in a real life setting and not only in a clinical trial (experimental) setting where patients are vigorously followed up and where methodologies that are not affordable in a HAART programme with a big population, could be used. This study investigated adherence rates in a real life situation at extension 15 clinic.

Tables 4.22 and 4.23 show results of the assessment of both pharmacy refill and pill count methods in terms of the validity to predict CD4 cell counts greater than 200 cells per mm^3 and VL less than 400.

Table 4.22: Validity of pharmacy refill and pill count methods for predicting CD4 more than 200 (n=116)

		CD4 cell count		
		>200	≤200	**Total**
Adherence measure by pharmacy refills & pill counts	Adherent	74 **[A]**	11 **[B]**	85
	Non-adherent	20 **[C]**	11 **[D]**	31
	Total	**94**	**22**	**116**

Table 4.23: Validity of pharmacy refill and pill count methods for predicting VL< 400 (n=116)

		VL		
		<400	≥400	**Total**
Adherence measure by pharmacy refills & pill counts	Adherent	75 **[A]**	10 **[B]**	85
	Non-adherent	19 **[C]**	12 **[D]**	31
	Total	**94**	**22**	**116**

Results from table 4.22:

Sensitivity (A/A+C X 100) = **78.7%**, Specificity (D/B+D) = **50.0%**, Positive predictive value (A/A+B) =**87.1%**, Negative predictive value (D/C+D) =**35.5%**

Results from table 4.23:

Sensitivity (A/A+C X 100) = **79.8%**, Specificity (D/B+D) = **54.5%**, Positive predictive value (A/A+B) = **88.2%**, Negative predictive value (D/C+D) =**38.7%**

Sensitivity (true positive rate) in this study defines the percentage of CD4 cell counts greater than 200 cells per mm^3 or percentage of VL less than 400 copies per ml in respondents who were identified as adherent by both pharmacy refills and pill counts adherence measuring methods used at extension 15 clinic. The sensitivity for adherence scores predicting CD4 cell counts more than 200 cells per mm^3 and VL less than 400 copies per ml were 78.7% and 79.8^% respectively. Though these seem to be high sensitivity values, it is not as high as other validated instruments used in screening for disease conditions. However, this appears promising considering that pharmacy refill records' claims and pill counts do not necessarily measure the actual ingestion of pills.

The specificity (true negative rate) of both instruments (pharmacy refills and pill counts at extension 15 clinic) translates to the proportion of CD4 cell counts of less than or equal to 200 cells per mm^3 or proportion of VL more than or equal to 400 copies per ml. The specificity values of both instruments were 50.0% and 54.5% for CD4 cell counts and VL respectively. These values are significant and therefore confirm that a combination of both adherence measurement methodologies may be able to guide clinicians to detect early immunological or virologic failure.

Positive predictive value is the percentage of positive test results that are truly positive. The positive predictive value of the pharmacy refills and pill counts was 87.1% for predicting the percentage of CD4 cell counts, that are more than 200 cells per mm^3 and that were truly more than 200 cells per mm^3 while the positive

predictive value of both adherence measuring methods was 88.2% for predicting the percentage VL that were less than 400 copies per ml and were truly less than 400 copies per ml. This percentage is considered to be high.

In this study negative predictive value was defined as the percentage of negative test results which are truly negative. Pharmacy refills and pill counts had a negative predictive value of 35.5% for predicting the percentage of CD4 cell count results that were less than or equal to 200 cells per mm^3 and which were truly less than or equal to 200 cells per mm^3. Both adherence measurement tools had a negative predicting value of 38.7% for predicting the percentage of VL that were less than or equal to 400 copies per ml and which were truly less than or equal to 400 copies per ml. These percentages are considered to be low.

This study used changes in CD4 cell counts and VL as a measure of the validity of adherence measuring instruments. Both pharmacy refills and pill counts were able to measure adherence and predict the immunological and virological outcomes. This is similar to findings of other studies, like Paterson et al (2000:23) who found that immunological and virological failures are associated with non-adherence. There is an association between adherence as measured by pharmacy refills and pill counts, and immunologic and virologic responses, as shown by increase in the CD4 cell counts and suppression of VL of the respondents. This association was found to be strong and further confirmed that the combined use of two or more adherence measuring methods would enhance validity.

Other quantitative adherence measures exist as discussed in section 2.2.6 of chapter 2 of this dissertation, apart from pharmacy refills and pill counts such as electronic monitoring devices and self reports which can be used in various combinations to enhance the validity of the adherence measurement tools.

4.11 CONCLUSION

This chapter presented and discussed the results of the level of adherence in terms of demographic factors, respondents' clinical data including CD4 cell counts and VL, side effects experienced, and respondents' use of traditional medications.

No significant difference was found between adherence rates and gender. However, a relationship was found between adherence and age. Because the older the respondents, the more adherent they were. There was no association between respondents' marital status and adherence. Better education did not improve adherence rates among ARV users just as unemployment did not predict non-adherence. Adherence to ARVs had no correlation with cost of treatment even though about half of the respondents indicated they had incurred extra costs in general expenses as a result of taking ART. Most respondents reached the clinic using buses/taxis as a means of transportation while more than half of the respondents spent between 31-61 minutes at the clinic before getting their ARVs. However, no significant association was found between adherence and waiting time at the clinic. Almost all respondents were satisfied with the quality of health care services provided at extension 15 clinic. All respondents had adherence partners. Those supported by their spouses or partners were more adherent than those supported by buddies. It was found that the more the frequency of adherence counselling after starting HAART the better the adherence outcome. This is a very significant finding. The most common reason cited by respondents for missing ARV medicines was forgetfulness while the least cited reason was clinic inaccessibility.

A high proportion of respondents in this study had received HAART for between 6-12 months duration and were still on the first line regimen. Few respondents had their regimen changed to second line mainly due to virologic failure. There was a significant increase in CD4 cell counts and decrease in VL as noticed in the differences between the mean baseline CD4 and mean of the most recent

CD4 cell counts, and mean baseline VL and mean of the most recent VL. The most common ARV side effect reported by respondents was headache while the least experienced was skin or nail discolouring. Few respondents had reportedly not patronised traditional healers since they had started taking HAART and none of the respondents were taking ARVs and traditional medicines concurrently. The majority of the respondents had an adherence level of >95% with a mean composite adherence level of 96.2% with a SD of 4.25. The association between adherence level and CD4 cell counts was found to be strong and positive but that between adherence and VL was weak. A combination of pharmacy refills and pill counts adherence measurement methodologies scored high on sensitivity, specificity, and positive predictive values but low on negative predictive values.

A combination of the pharmacy refill records and pill counts as adherence measurement methodologies predicted immunological and virological responses in this study.

Chapter 5 presents the conclusions; limitations and recommendations of this study as well as proposed areas for possible future research.

CHAPTER 5

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The main purpose of the study was to identify the barriers and motivators for good adherence to ART. This involved determining the relationship between adherence to ART as measured by pharmacy refills and pill counts, and immunologic and virologic responses indicated by increased CD4 cell count and suppressed VL respectively, among HIV-positive adults (aged 21 years and older) on treatment at extension 15 ARV clinic.

Pharmacy refill records and pill counts adherence measurement methodologies used at extension 15 clinic were assessed for validity in predicting changes in CD4 cell counts and VL. The results have been used to recommend an appropriate adherence measurement methodology at extension 15 clinic and the possibility of recommending it for use at other public health facilities providing HAART in Botswana and possibly also in other countries.

The conclusions, based on the research results discussed in chapter 4 of this dissertation, will be used to answer the research questions which were formulated in Chapter 1 as follows:

- What are the barriers to adherence among ARV patients?
- What are the motivators of good adherence to HAART?
- Are pharmacy refill records and pill counts good predictors of CD4 cell counts and VL?

5.2. OBJECTIVES

The objectives of the study which are stated in section 1.6 of chapter 1 of this dissertation were evaluated to determine whether they have been attained. Each objective will be listed and the conclusions given in relation to that specific objective.

5.2.1 To determine the motivators of good adherence

In this study motivators of good adherence were identified as frequent adherence counselling after starting HAART, and the use of adherence partners/treatment supporters.

5.2.2 To determine the barriers to good adherence

Critical barriers to good adherence included forgetfulness, ARV side effects, and alcohol abuse.

This study did not identify many barriers and motivators of good adherence.

5.2.3 To determine if there is a correlation between adherence to ARVs (as measured by pharmacy refills and pill counts) and CD4 cell counts and VL

The results of the study indicated a positive relationship between adherence, CD4 cell counts and VL. This was evident because respondents who had adherence of equal to or greater than 95%, as measured through the pharmacy refills and pill counts, had immunological and virological responses as shown through an increase in their CD4 cell counts and a decrease in VL from baseline to the measurement after more than 6 months of HAART. However, some

respondents who were non-adherent, had CD4 cell counts and VL of more than 200 cells per mm^3 and less than 400 copies per ml respectively, after being on HAART for at least 6 months. This could be explained by the fact that these respondents had started HAART based on WHO HIV/AIDS clinical stage III or IV conditions, irrespective of their CD4 cell counts being more than 200 cells per mm^3 or VL less than 400 copies per ml.

The study concluded that pharmacy refills and pill counts adherence measurement tools, when used in combination, are reliable and can be predictive of the CD4 cell count and VL results. Both pharmacy refills and pill counts are simple and effective population tools for monitoring adherence in a large HAART programme such as the one at extension 15 clinic.

5.3 LIMITATIONS OF THE STUDY

The following limitations were identified during the course of this study.

- Participants could have been dishonest in their responses to the structured interview schedule; they might have provided the answers they thought the health care worker would like to hear.
- The research results might be limited to extension 15 clinic where the study was conducted. The sample size was small, consequently the results obtained might not be generalisable to all HAART patients receiving their treatment elsewhere in Botswana.
- Only structured interviews were used to obtain data from the respondents. More in-depth and different data might have been obtained by conducting in-dept individual qualitative interviews.
- The study used a patient sample that was currently on ART and did not include patients who had discontinued treatment. It is possible that patients who were non-adherent might not have been visiting the clinic.

- Poor documentation of data. Some data were missing in some patients' records and hence could not be used for the study. This reduced the number of eligible respondents.

5.4 RECOMMENDATIONS FOR IMPROVING ADHERENCE TO ARVS AT EXTENSION 15 CLINIC IN GABORONE

Improvements in adherence to ARVs by adults at extension 15 clinic, based on the research results, might be enhanced if the following recommendations were implemented:

- The use of composite adherence measure has been documented to be related to clinical outcomes and therefore simple and commonly used adherence measurement methodologies such as pill counts and pharmacy refills should be used at every clinic visit. These simple and practical tools could be adopted at other ARV sites in the country as a uniform adherence monitoring system and to provide further evidence of the usefulness of these combined adherence measures.
- Practical guidelines for implementing adherence management strategies should be developed, implemented and evaluated at regular intervals. These should include guidelines for: continuous adherence counselling; bringing treatment closer to patients' homes; the use of practical reminders; adherence case management; and use of medication organisers.
- Although 73.3% (n=85) of respondents had adherence rates equal to or more 95%, the finding that 26.7% (n=31) of respondents were non-adherent to ART remains unacceptably high. In view of the serious implications of non-adherence for public health, there is a critical need for targeted intervention strategies to increase the levels of adherence. Because both adherence measurement tools used in this study scored high on specificity, sensitivity and positive predictive value, it is recommended that the combined use of both tools should continue in

order to maintain and possibly increase the validity and reliability of the measurement methodology. Monitoring and evaluation of these adherence measurement tools is also recommended as an important component of ART the programme. Adherence interventions at extension 15 clinic should also include dedicated educational and collaborative time with every patient to plan for medication adherence and to maintain the necessary support and collaboration throughout the course of treatment. In this way, problems can be dealt with, side effects addressed, and medications simplified or changed when necessary

- The use of CD4 point-of-care testing services at this clinic as well as other ARV clinics, should be investigated. This will reduce the turn around time for CD4 test results, and could encourage patients to maintain higher adherence levels. Although this device is expensive, an arrangement could be made to provide a mobile team of laboratory staff. This mobile unit would provide CD4 on-site testing at extension 15 clinic two times per week and spend the other three days per week at other ARV sites.
- Virologic tests should be routinely conducted on all patients on HAART so that if the HIV is resistant to the ARVs, the regimen can be changed promptly. In view of this, the establishment of more laboratories in the country to run the VL test should be considered. This will further reduce the waiting times for VL results.
- Continuous operational research on adherence among patients receiving HAART from this clinic should be maintained.
- In order to reduce patients' travel expenses to the clinic to collect ARVs on monthly basis which has been cited to be a barrier to adherence, the patients who adhere should be given three months' supplies.
- A transport voucher scheme could be established for patients who genuinely cannot afford the cost of transport to collect their medication.
- Factors contributing to non-adherence to ART among patient at extension 15 clinic need to be explored and interventions developed to eliminate

possible barriers to adherence levels in order to improve adherence and clinical outcomes.

- Regular audits of the patients' records should be done and staff members' attention should be focused on incomplete records. The findings of these audits could be supplied to all health care workers.
- The importance of regular adherence counselling in enhancing patients' ART adherence levels was a significant finding of this study. The possibility should be investigated of training and employing more ART adherence counsellors. Unemployed adherent ART patients could be trained as counsellors.
- Initial adherence counselling of patient before initiation of HAART should be the responsibility of the social worker.
- Patients' pill counts at each clinic visit should be the responsibility of the pharmacist.

5.5 RECOMMENDATIONS FOR FURTHER STUDIES

The findings of this study suggest that future researchers could investigate the following:

- Duplicate this study at other ARV sites prior to generalisation of these research results to HAART patients receiving treatment elsewhere in Botswana.
- Conduct qualitative research to determine the knowledge, attitudes and perceptions of people in the community concerning ARVs in an attempt to get their support in reducing discrimination and stigmatisation and increase adherence among all HAART patients at extension 15 clinic.
- Conduct qualitative research to determine the knowledge, attitudes and perceptions of adults receiving ARVs at extension 15 clinic in an attempt to investigate the facilitators of and constraints to treatment adherence.
- Evaluate the quality of HIV/AIDS counselling and education provided at extension 15 clinic.

- Study the specific reason for forgetting to take medication among patients on HAART at extension 15 clinic and its link to non-adherence.
- Study the use of traditional or complementary medicines in combination with ARVs and its relations with CD4 cell counts and VL. In-depth interviews with persons whose counts do not react to ART might reveal their use of traditional medicines/herbs and/or misunderstandings of some of their instructions.
- Investigate why non-adherent patients also have increased CD4 cell count and suppressed VL results.
- Identify reasons why adherent patients also have decreased CD4 cell count results and high (unsuppressed) VL.
- Study the rate of hospital admissions among patients on HAART at extension 15 clinic and its correlation with non-adherence.

5.6 CONCLUSION

Adherence is a complex issue and multi-dimensional approaches are required to address the constraints and strengthen the key facilitators of adherence. In this study motivators of good adherence were identified as frequent adherence counselling and the use of an adherence partners/treatment supporter while barriers to adherence were forgetfulness, ARV side effects, and alcohol abuse. This research revealed that adherence to ART is closely tied to immunologic and virologic outcomes. It also showed a strong positive correlation between adherence, CD4 cell counts and VL. The combined use of pharmacy refill data and pill counts adherence measurement methodologies, predicted immunological recovery and virologic suppression as shown in changed CD4 cell counts and VL respectively. The pharmacy refills and pill counts adherence measurement methodologies are therefore recommended to be used to monitor adherence in ARV experienced adult patients at extension 15 clinic, and possibly also at other clinics throughout Botswana.

Overall adherence levels in this study were high and comparable to those seen in developed countries. Provision of free ART without adequate patient preparation and adherence support may compromise the success of ART scale up programmes (Sarna et al 2008:28). Like Machtinger and Bangsberg (2005:20) stated, near perfect adherence is required to maximise the likelihood of long-term clinical success. To help patients benefit from ART, clinicians need to take time to ask about and support medication adherence.

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Annexure A

Letter to the MoH (Botswana) requesting permission to conduct the study

Annexure A:

Letter to the MoH (Botswana) requesting permission to conduct the study

Department of Health Studies
University of South Africa
P.O. Box 329
Pretoria 0003
South Africa
27/05/08

The Chairman
Research and Ethics Committee
Health Research Unit
Ministry of Health
Gaborone

Sir,

RE: PERMISSION TO CONDUCT RESEARCH AT EXTENSION 15 ARV CLINIC

I request permission to conduct a research at Extension 15 clinic, Gaborone. This research is part of the requirements for the award of the MPH (Master's in Public Health) degree of the Department of Health Studies, University of South Africa, Pretoria. My Unisa number is 36754102.

The research will comprise a cross-sectional descriptive study aimed at identifying barriers to adherence and motivators for good adherence to antiretroviral therapy among adult patients receiving treatment at extension 15 ARV clinic in Gaborone. The study purpose is to identify correlations between patients' pill counts, their number of pharmacy refills, their CD4 and viral load counts. The time table and other details about the proposed research are contained in the accompanying research protocol.

I will gladly provide any other information or clarifications you may require concerning this proposal.

Yours sincerely,

Dr Nnamdi Ndubuka MB; BS, Dip. HIV Man (SA)
ARV Programme Coordinator
Gaborone City Council Clinics

Annexure B

Letter to extention 15 clnic management requesting permission to conduct the study

Annexure B:

Letter to extension 15 clinic management requesting permission to conduct the study

Department of Health Studies
University of South Africa
P.O. Box 329
Pretoria 0003
South Africa
04/07/08

The Chief Health Officer
Gaborone City Council
P/Bag 0089
Gaborone

Sir,

RE: PERMISSION TO CONDUCT RESEARCH IN YOUR HEALTH FACILITY [EXTENSION 15 ARV CLINIC]

I request permission to conduct research at Extension 15 clinic, Gaborone. This research is part of the requirements for the award of the MPH (Master's in Public Health) degree of the Department of Health Studies, University of South Africa, Pretoria. My Unisa student number is 36754102.

The research will comprise a cross-sectional descriptive study aimed at identifying barriers to adherence and motivators for good adherence to antiretroviral therapy among adult patients receiving treatment at extension 15 ARV clinic in Gaborone. The study purpose is to identify correlations between patients' pill counts, their number of pharmacy refills, their CD4 and viral load counts. The time table and other details about the proposed research are contained in the accompanying research protocol.

I will gladly provide any other information or clarifications you may require concerning this proposal.

Attached is a copy of letter of approval from the Health Research unit of the ministry of health, Botswana.

Yours sincerely,

Dr Nnamdi Ndubuka *MB; BS, Dip. HIV Man. (SA)*
ARV Programme Coordinator
Gaborone City Council Clinics

Annexure C

Letter of approval from the MoH Botswana granting permission to conduct the study

Annexure C:

Letter of approval from the MOH Botswana granting permission to conduct the study

TELEPHONE: 3632000
FAX:3914467
TELEGRAMS:RABONGAKA
TELEX: 2818 CARE BD

MINISTRY OF HEALTH
PRIVATE BAG 0038
GABORONE
BOTSWANA

REPUBLIC OF BOTSWANA

EFERENCE No: PPME-13/18/1 PS Vol III (32) 23 July 2008

Nnamdi Ndubuka
P.O. Box 202766
Gaborone

Dear Mr Ndubuka

Permit: FACTORS INFLUENCING TREATMENT ADHERENCE AMONG ADULT PATIENTS RECEIVING ANTI RETROVIRAL THERAPY AT EXTENSION 15 CLINIC, GABORONE, BOTSWANA

Your application for a research permit for the above stated research protocol refers. We note that you have satisfactorily revised the protocol as per our suggestions.

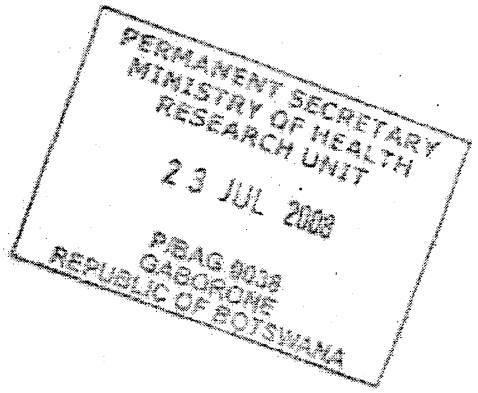
Permission is therefore granted to conduct the above mentioned study. This approval is valid for a period of 1 year effective July 23, 2008.

This permit does not however give you authority to collect data from the selected clinic without prior approval from the management. Consent from the identified individuals should be obtained at all times.

The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal must be submitted to the Health Research and Development Division in the Ministry of Health for consideration and approval.

Furthermore, you are requested to submit at least one hardcopy and an electronic copy of the report to the Health Research, Ministry of Health within 3 months of completion of the study. Approval is for academic fulfilment only. Copies should also be submitted to all other relevant authorities.

Yours sincerely



M. Kasule
For/Permanent Secretary

2

Annexure D

Letter of approval from extension 15 clinic management granting permission to conduct the study

Annexure D:

Letter of approval from extension 15 clinic management granting permission to conduct the study

GABORONE CITY COUNCIL

All correspondence should be addressed to the
TOWN CLERK
Private Bag 0089
Telephones: 3657400
Tel. Add.: 'CIVIC'
GABORONE
BOTSWANA
Fax: 3900141

Reference: GCC / H / 8

Date: 23 July, 2008

To: **Dr. Nnamdi Ndubuka**
Box 202766
Gaborone

Re: Permission to undertake research activities on Factors influencing treatment adherence among adult patients receiving ARV at extension 15 clinic Gaborone.

Reference is made to your letter dated 23 July 2008 concerning the above matter.

In view of the approval letter authorizing the study by Health Research Unit, Ministry of Health, Gaborone City Council is also hereby granting you permission to undertake the study in the above stated Clinic.

Area Matron and Nurses-in-charge of the Clinic are hereby informed and requested to allow access and give all the necessary support and cooperation to the study team.

Your adherence to the research ethics is highly appreciated.

Thank you.

.....
Dr. A.Libse
Public Health Specialist
For Town Clerk.

Annexure E

Ethical clearance from Unisa

Annexure E:
Ethical clearance from UNISA

UNIVERSITY OF SOUTH AFRICA
Health Studies Research & Ethics Committee
(HSREC)
College of Human Sciences

CLEARANCE CERTIFICATE

Date of meeting: **18 June 2008** Project No: **36754102**

Project Title: **Factors influencing treatment adherence among adult patients receiving anti-retroviral therapy at extension 15 clinic, Gaborone, Botswana**

Researcher: **Dr N Ndubuka**

Supervisor/Promoter: **Prof VJ Ehlers**

Joint Supervisor/Joint Promoter:

Department: **Health Studies**

Degree: **MA Health**

DECISION OF COMMITTEE

Approved [√] **Conditionally Approved** [ ]

Date: **30 June 2008**

Prof L de Villiers
RESEARCH COORDINATOR: DEPARTMENT OF HEALTH STUDIES

Prof SM Mogotlane
ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES

PLEASE QUOTE THE PROJECT NUMBER IN ALL ENQUIRES

Annexure F

Structured interview schedule (English version)

Annexure F:
Structured interview schedule (English version)
Factors influencing treatment adherence among adult patients receiving Anti retroviral therapy at extension 15 clinic Gaborone, Botswana

Date..... **Instrument number** | | | |

Participant's ARV number..... Pharmacy reference number.....

SECTION A: CLINICAL INFORMATION

1. **Date initiated on HAART:**

dd/mm/yyy

2. **Calculated duration of ARV treatment in months:**

6 months- 12 months	
13 months-18 months	
19 months-24 months	
25 months or longer	

3. **CD4 cell count values:**

	Value	Date (dd/mm/yyy
Baseline		
Current		

4. **Plasma Viral load:**

	Value	Date (dd/mm/yyy
Baseline		
Current		

5. **Current ARV regimen:**

First line	
Second line	
Third line	

6. **Total number of ARV pills taken per dose:**

1	
2	
3	
4	
5	

7. **Was the regimen changed?**

Yes	
No	

8. **Reason for changing regimen:**

Virologic failure (Increased VL)	
Immunologic failure (decreased CD4)	
Clinical failure	
Drug toxicity	
Others (specify)	

9. **Pharmacy refill record between 1 January 2007 and 31 July 2008**

Pharmacy refill due dates	Actual refill dates	Number of days delayed for refill	Pill count		
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10					
11.					
12.					

SECTION B: GENERAL INFORMATION

10. Gender:

M	
F	

11. Age in years

15-25	
26-35	
36-45	
46-55	
56-65	
66+	

12. Marital status:

Single	
Married	
Co-habiting	
Divorced /Separated	
Widowed	

13. Educational level completed:

None	
Primary	
Secondary	
Tertiary (please specify)	

14. **Employment status:**

Employed	
Unemployed	
Self employed (please specify)	
Volunteer	
Student	

15. **How much do you earn per month (in Pula)?**

No income	
0-999	
1000-1999	
2000-2999	
3000 and more	

16. **Do you lose any income at the time you attend this clinic?**

Yes	
No	

If "Yes", please explain how you lose income and how much income you think you lose with every visit to the ART clinic

_____

_____

How can you be helped not to lose income?

_____

_____

17. **Do you incur any other cost as a result of your taking ARVs?**

Yes	
No	

18. **Do you belong to a specific religious community/ church?**

Yes	
No	

If "Yes", what religion do you belong to?

Roman catholic	
Anglican	
Methodist	
Seventh-Day Adventist	
Jehovah Witness	
Baptist	
African Independent/ZCC	
Traditional	
Muslim	
Atheist	
Others, please specify	

19. **How do you come to the clinic?**

Walking	
Bus/taxi	
Car	
Motor bike	

20. **How long does it take you to get to the clinic?**

30 minutes or less	
31-60 minutes	
61-120 minutes	
121 minutes or more	

21. **How long do you spend at the clinic before getting your ARVs?**

30 minutes or less	
31-60 minutes	
61-120 minutes	
121 minutes or more	

22. **Are you satisfied with the services you get from the clinic**

Yes	
No	

If "No", which areas do you think should be improved?

_____

_____

23. **Are the clinic staff friendly with the patients?**

Yes	
No	

SECTION C: ADHERENCE COUNSELLING:

24. **Who is your adherence partner/ treatment supporter?**

Friend	
Father	
Mother	
Relative	
Spouse/Partner	
Son/Daughter	
Brother/Sister	
Buddy	
Others (please specify)	

25. **Were you counselled about adherence before you started treatment?**

Yes	
No	

If "Yes", by who?

Doctor	
Nurse	
Pharmacist	
Social worker	
Others, please specify	

26. **How many times did you receive adherence counselling after you started treatment?**

1	
2	
3	
4	
5 or more	

SECTION D: SELF ADHERENCE REPORT:

27. **How many appointments have you missed at this clinic since you started treatment?**

_____

28. **How many times did you miss your ARV medications in the last two days?**

_____

If you have missed your medication, what action did you take?

_____

_____

29. **Has any of the following made you miss your medications?**

Cause	Yes	No
Felt better		
Clinic was not accessible		
Lack of food to take with medicines		
Depressed		
Too many pills		
Lack of care/support		
Hospitalised		
Did not understand instructions		
Alcohol use		
Forgot		
Ran out of pills		
Side-effects		
Others (please specify)		

SECTION E: DISCLOSURE ISSUES

30. How many people have you told about your HIV status?

_____

31. Who did you tell about your status?

Friend	
Father	
Mother	
Relative	
Spouse/Partner	
Son/Daughter	
Brother/Sister	
Others (please specify)	

SECTION F: SIDE EFFECTS

32. Have you experienced any of these side effects since taking your ARVs?

Side effects	Yes	No
Nausea		
Vomiting		
Diarrhoea		
Headache		
Skin Rash		
Dizziness		
Depression		
Skin or nail discolour		
Others (please specify)		

33. Is this problem affecting your daily activities?

Yes	
No	

34. What action do you take when you experienced such side effect?

_____

_____

SECTION G: USE OF TRADITIONAL MEDICINES

35. Since you started taking ARVs have you visited any traditional healer?

Yes	
No	

if "Yes", why?

_____

_____

36. What treatment did your traditional healer give you?

_____

_____

37. What advice did your traditional healer give you about HIV/AIDS and ART?

_____

_____

38. Are you taking any traditional medicine at the moment together with your ARVs?

Yes	
No	

39. Do you think the traditional medicines work for you?

Yes	
No	

Adherence level:

Annexure G

Structured interview schedule (Setswana version)

Annexure G:

Structured interview schedule (Setswana version)

Dipatlisiso

Mabaka aa amang kobamelo ya kalafi mo bagolong ba ba tsayang kalafi ya di Diritibatsi (ARV) mo kokelwaneng ya extension 15 mo Gaborone (Botswana).

Letsatsi:..... Nomore ya sedirisiwa | | | |

Nomore ya molwetsi yo o dirisang dipilisi tsa Diritibatsi:.....

Nomore ya kokelwana ya kabo melemo:.....

KAROLO A: TSA BOTSOGO

1. **Letsatsi le o simolotseng Diritibatse ka lone:**

Letsatsi/ kgwedi/ ngwaga

2. **O na le sebaka se se kae o tsaya dipilisi tsa Diritibatsi?**

Kgwedi tse thataro – kgwedi tse lesome le bobedi	
Kgwedi tse lesome le boraro – kgwedi tse lesome le borobabobedi	
Kgwedi tse lesome le borobabongwe – kgwedi tse masome mabedi le bone	
Go heta kgwedi tse masome mabedi le bone	

3. **Masole a gago a mmele a ne a le kae**

	Dipalo	Letsatsi Letsatsi/ kgwedi/ ngwaga
ko tshimologong		
gompieno		

4. **Bokete jwa mogare**

	Bokete ja mogare	Letsatsi Letsatsi/ kgwedi/ ngwaga
ko tshimologong		
gompieno		

5. **O mo mofuteng ofe wa kalafi ya Diritibatsi?**

Tselana ya ntlha	
Tselana ya bobedi	
Tselana ya boraro	

6. **Palo ya dipilisi tse o di nwang ka nako ya dipilisi?**

1	
2	
3	
4	
5	

7. **A o kile wa fetola kalafi?**

Ee	
Nnyaa	

8. **Ke mabaka a fe a a go pateleditseng go fetola kalafi ? [Bala dikarabo]**

Mogare one o sa hokotsege	
Go wela tlase ga masole a mmele	
Botsogo jo bo sa lolamang	
Ditlamorago tsa melemo	
Tse dingwe (Tlhalosa)	

9. Bosupi ja go tsaya dipilisi le palo ya tsone magareng ga ferekgong e tlhola letsatsi ka ngwaga wa 2007 le phatwe e tlhola malatsi a le masome mararo le motso ka ngwaga wa 2008.

Letsatsi la koketso dipilisi e o e filweng	Letsatsi la koketso ya dipilisi	Malatsi a koketso dipilisi a o a tlodisitseng	Palo ya dipilisi		
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10					
11.					
12.					

KAROLO B: DINTLHA KGOLO

10. Bong:

Monna	
Mosadi	

11. Dingwaga:

15 - 25	
26 - 35	
36 – 45	
46 – 55	
56 – 65	
66+	

12. Seemo sa gago sa nyalo:

Ga ke a nyalwa / nyala	
Ke nyetswe / nyetse	
Ke nna le molekane wame mme ga rea nyalana	
Ke tlhadile / tlhadilwe / re kgaogane lobakanyana	
Ke motlholagadi/ Moswagadi	

13. O badile mang ko sekolong ? [Tshwaya e le nngwe]

Ga ke a tsena sekolo	
Ke badile lekwalo le le botlana la bosupa (1-7)	
Ke badile lekwalo la dithuto tse dikgolwane (form 1-5)	
Ke badile lekwalo la dithuto tse dikgolwane tsa bodiredi kgotsa tsa tiro ya diatla (University/ College /Technikon)	

14. Tsa khiro :

Ke a bereka	
Ga ke bereke	
Ke a ipereka	
Ke Moithaopi	
Ke Moithuti	

15. Ke sekale sefe se se tsamaelanang le dituelo tsa gago tsa kgwedi? [Bala dikarabo]

Ge ke amogele sepe	
0 - 999	
1000 – 1999	
2000 – 2999	
3000 – le gofeta	

16. **A o latlhegelwa ke dikatso dingwe fa o tla kokelwaneng ?**

Ee	
Nnyaa	

Fa karabo e le ee,tswe tswe tlhalosa gore dikatso di go latlhegela jang

_____

_____

O ka thusiwa jang gore o seka wa latlhegelwa ke dikatso?

_____

_____

17. **A go na le ditshenyegelo dingwe tsa madi tse o nang natso ka mabaka a gore o tsaya kalafi ya Diritibatsi?**

Ee	
Nnyaa	

18. **A ona le kereke kana mokgatlho wa tumelo e o ineetseng mo go one?**

Ee	
Nnyaa	

Fa karabo e le ee,ke kereke efe kana mokgatlho ofe?

Roman catholic	
Anglican	
Methodist	
Seventh-Day Adventist	
Jehovah Witness	
Baptist	
African Independent/ZCC	
Traditional	
Muslim	
Atheist	
Others, please specify	

19. **O dirisa eng go tla bongakeng**

Ke tla ka maoto	
Combi/bus	
Koloi yame	
Sekuta	

20. **O tsaya sebaka se se kae go goroga mo kokelwaneng?**

Metsotso ee lesome le boraro go ya ko tlase	
Metsotso e masome mararo go ya ko oureng	
Oura mme eseng go feta oura tse pedi	
Oura tse pedi le go feta	

21. **O tsaya lobaka lo lo kae go tsaya diritibatsi?**

Metsotso ee lesome le boraro go ya ko tlase	
Metsotso e masome mararo go ya ko oureng	
Oura mme eseng go feta oura tse pedi	
Oura tse pedi le go feta	

22. **A o kgotsofalela thuso e o e fiwang mo kokelwaneng?**

Ee	
Nnyaa	

Fa karabo e le nnya.Ke fa kae fa o tsayang gore go tshwanetse go tokafadiwa?

_____

_____

23. **A babereki ba bongaka bana le tirisanyo mmogo?**

Ee	
Nnyaa	

KAROLO C: TSA BOKGOTHATSI

24. Morotloetsi wa gago ke mang?

Tsala	
Motsadi	
Lesika	
Molekane / Mosadi kgotsa monna wame	
Morwaake / Morwadiake	
Ba bangwe (Tlhalosa)	

25. A o ne wa rutwa ka kalafi e pele ga o simolola ?

Ee	
Nnyaa	

Fa karabo e le ee, o ne o rutwa ke mang ?

Ngaka	
Mooki	
Moabi wa melemo	
Mogakolodi	

26. O amogetse kgotlhatso morago ga sebaka se se kae fa o sale o simolola kalafi?

Gangwe fela	
Gabedi	
Gararo	
Gane	
Gatlhano/go feta	

KAROLO D: SEEMO SA KOBAELO KALAFI

27. **O tlodisitse go tla kokelwaneng ga kae fa o sale o simolola kalafi?**

_____

28. **A tlodisitse go tsaya dipilisi ga kae mo malatsing a mabedi a fitileng ?**

_____

Fa o ne tlhodisitse go tsaya dipilisi,o ne wa tsaya kgato efe?

_____

_____

29. **A sengwe sa dilo tse di latelang se kile sa dira gore o tlodise go tsaya kalafi?**

Lebaka	Ee	Nnyaa
Go ikutlwa botoka		
Bokgakala ja kokelwana		
Letlhoko la dijo		
Go sa tsoga sentle mo maikutlong		
Bontsi ja dipilisi		
Go tlhoka tlhokomelo/ kgotlhatso		
Go robadiwa mo kokelong		
Go sa tlhaloganya molaetsa wa ngaka		
Tiriso botlhaswa ya dino tagi		
Go lebala		
Go felelwa ke dipilisi		
Ditlamorago		
Tse dingwe (tlhalosa)		

KAROLO E: GO TSWA PHATLALATSA KA SEEMO SA GAGO

30. **O boleletse batho ba le kae ka seemo sa gago sa mogare?**

_____

31. **O boleletse mang ?**

Tsala yame	
Ntate	
Mme	
Losika	
Mokapelo wame	
Ngwanake	
Ausi/Abuti	
Ba bangwe (tswe tswe tlhalosa)	

KAROLO F: DITLAMORAGO

32. **A o kile wa itemogela ditlamorago tse dí latelang?**

Ditlamorago	**Ee**	**Nnyaa**
Go feroga sebete		
Go kgwa		
Letshololo		
Go opiwa ke tlhogo		
Disho mo mmeleng		
Sedidi		
Go sa tsoga sentle mo maikutlong		
Go fetoga ga mmala wa letlalo / dinala		
Tse dingwe (tswe tswe tlhalosa)		

33. **A mathatha a,a go tlela malatsi otlhe?**

Ee	
Nnya	

34. **O ne wa tsaya kgato efe fa o ne o itemogela ditlamorago ?**

_____

_____

KAROLO G: TIRISO YA MELEMO YA SETSWANA

35. Ga e sale o simolola go tsaya diritibatsi, a o kile wa etela ngaka ya setso?

Ee	
Nnya	

Fa karabo e le ee,fa lebaka

_____

_____

36. Ke thuso efe e ngaka ya setso e neng ya go e neela?

_____

_____

37. Ke kgakololo efe e ngaka ya setso e neng ya go e nnela mabapi le mogare wa HIV/AIDS le diritibatsi?

_____

_____

38. A gona le melemo mengwe ya setswana e o e tsayang le diritibatsi?

Ee	
Nnya	

39. A o tsaya gore melemo ya setswana ya go berekela?

Ee	
Nnya	

Boleng jwa tsenelelo kalafi:

Annexure H:

Informed consent form (English version)

UNIVERSITY OF SOUTH AFRICA (Unisa) PRETORIA CONSENT FORM

I ..... hereby give consent to participate in this non-experimental research study: factors influencing treatment adherence among adult patients receiving anti-retroviral therapy at extension 15 ARV clinic, Gaborone. I understand that the study participants are HIV positive individuals on anti-retroviral treatment for six months or more.

The researcher has explained the purpose and objectives of the study, which I understood. The research findings may directly improve treatment adherence rates among people receiving ART.

I understand that my participation in this study is completely voluntary and my responses will be handled confidentially. Also, I have the right to withdraw from this study without giving any reason and without affecting my rights in any way.

I know that Research and Ethics Committee of the University of South Africa and Botswana ministry of health has approved this study. I am fully aware that the results obtained at the end of this study will be used for scientific purposes and may be published. I agree to this, provided my confidentiality is guaranteed.

....
Participant's signature Witness

....
Place Date

STATEMENT BY THE RESEARCHER

I provide verbal information regarding this study and I agree to answer any future questions pertaining to this study to the best of my ability. The approved research protocol will be respected.

....
Signature Place Date

NB:
1). For information related to research study, please contact:

Dr Nnamdi Ndubuka
Gaborone City Council
Department of Primary Health Care & Public Health
Phone: +267 71499919, 3956114

2). For information related to the rights of the participants in the study, please contact

Mrs. M. Kasule
Health Research Unit
Ministry of Health
Gaborone Botswana
+267 3632466

Annexure I:

Informed consent (Setswana version)

UNIVERSITY OF SOUTH AFRICA (UNISA)PRETORIA
Maitlamo ya go tsaya karolo

Ke le _____ke fa tetla ya go tsaya karolo mo tshekatshekong e tlhotlhomisang:mabaka a a rotloetsang tlhomamo mo melemong/bongakeng ga bagolo ba ba mo lenaneong la diritiba mo kokelwaneng ya Extension 15 mo Gaborone.Ke tlhaloganya gore batsaya karolo ke batho ba ba tshelang ka mogare wa HIV ebile ba na le dikgwedi di le thataro kgotsa go feta ba ntse ba le mo lenaneong la diribatsi.

Motsamaisa tshekatsheke e,o tlhalositse ka botlalo mosola le maikaelelo a tshekateheko mme ke tlhalogantse.Maduo a tshekatsheko ga ana le boleng kgotsa mosola a ka dirisiwa go tokafatsa selekanyo sa tlhomamo mo melemong kgotsa mo bongakeng ga bagolo ba ba tsayang diritibatsi.

Ke tlhaloganya gore go tsaya karolo game ke boithaopi ebile gape dikakgelo tsame di tla nna sephiri gape kena le tshwanelo ya go tswa mo tshekatshekong kwa ntle ga lebaka lepe gape kesa ame ditshwanelo tsame ka gope.

Ke tlhaloganya fa ba lekgotla la ditshekatsheko le tsamaiso (Research and Ethics Committee) ba mmadikolo ko Afica Borwa (University of South Africa) la ba Lephata la Botsogo ba file tetla ya go tsamaisa tshekatsheko e.Ke tlhaloganya ka botlalo gore maduo a tla bonwang morago ga tshekatsheko a tla dirisiwa mo go tsa maranyane.Gape a ka nna a kwalwa mo dibukeng.Ke dumalana le se, ka tsholofelo ya go sirelediwa.

---------- ----------
Motsaya karolo Mosupi

---------- ----------
Lefelo Letsatsi

BOPAKI JWA MOTSAMAISI
Kef a melaetsa ke tshekatsheko ebile ke dumalana le go araba dipotso tse di ka tlang kwa morago mabapi le tshekatsheko e ka bokgoni jotlhe jwaka.Tetlelelo ya tsamaiso e tla tlotliwa.

---------- ---------- ----------

Monwana wa Motsamaisi Lefelo Letsatsi

NB:
1) Mabapi le tlhaloso ka tshekatsheko e,tswetswe leletsa
Dr Nnamdi Ndubuka
Gaborone City Council
Department of Primary Health Care and Public Health
Phone: + 267 71499919 or 3956114

2) Mabapi le molaetsa wa ditshwanelo tsa ba tsenelela tshekatsheko, tswetswe leletsa

Mrs. M. Kasule
Health Research Unit
Ministry of Health
Gaborone Botswana
+267 3632466

Annexure J: Completed interview schedule (English version)

DATA COLLECTION INSTRUMENT: STRUCTURED INTERVIEW SCHEDULE

Factors influencing treatment adherence among adult patients receiving Anti retroviral therapy at extension 15 clinic Gaborone, Botswana

Date 06/08/08 Instrument number 008

Participant's ARV number CM75120 Pharmacy reference number VIL0003835

SECTION A: CLINICAL INFORMATION

1. Date initiated on HAART:

dd/mm/yyy
09/11/07

2. Calculated duration of ARV treatment in months:

6 months- 12 months	✓
13 months-18 months	
19 months-24 months	
25 months or longer	

3. CD4 cell count values:

	Value	Date (dd/mm/yyy
Baseline	17	10/10/07
Current	235	05/05/08

4. Plasma Viral load:

	Value	Date (dd/mm/yyy
Baseline	4580	12/11/07
Current	< 400	26/02/08

5. Current ARV regimen:

First line	✓
Second line	
Third line	

6. **Total number of ARV pills taken per dose:**

1	
2	✓
3	
4	
5	

7. **Was the regimen changed?**

Yes	
No	✓

8. **Reason for changing regimen:**

Virologic failure (Increased VL)	
Immunologic failure (decreased CD4)	
Clinical failure	
Drug toxicity	
Others (specify)	

9. **Pharmacy refill record between 1 January 2007 and 31 July 2008**

Pharmacy refill due dates	Actual refill dates	Number of days delayed for refill	Pill count CBV	Pill count NVP		
1. 02/05/07	02/05/07	0	100%	100%	=	100 %
2. 16/05/07	16/05/07	0	100%	100%	=	100 %
3. 15/06/07	15/06/07	0	100%	100%	=	100 %
4. 18/07/07	18/07/07	0	100%	98%	=	99 %
5. 22/08/07	22/08/07	0	96%	98%	=	97 %
6. 27/09/07	27/09/07	0	97%	97%	=	97 %
7. 22/10/07	22/10/07	0	95%	97%	=	96 %
8. 21/11/07	23/11/07	2	94%	99%	=	97 %
9. 21/12/07	21/12/07	0	100%	100%	=	100 %
10 23/01/08	23/01/08	0	99%	97%	=	98 %
11. 25/02/08	25/02/08	0	100%	100%	=	100 %
12. 31/03/08	31/03/08	0	99%	97%	=	98%

99%

$\frac{11}{12} \times 100 = 92\%$

- Adherence by pharmacy Refill = 92%
- Adherence by pill count = 99%

SECTION B: GENERAL INFORMATION

10. Gender:

M	
F	✓

11. Age in years

15-25	
26-35	
36-45	✓
46-55	
56-65	
66+	

12. Marital status:

Single	✓
Married	
Co-habiting	
Divorced /Separated	
Widowed	

13. Educational level completed:

None	
Primary	✓
Secondary	
Tertiary (please specify)	

14. Employment status:

Employed	✓
Unemployed	
Self employed (please specify)	
Volunteer	
Student	

15. How much do you earn per month (in Pula)?

No income	
0-999	
1000-1999	
2000-2999	✓
3000 and more	

16. Do you lose any income at the time you attend this clinic?

Yes	
No	✓

If "Yes", please explain how you lose income and how much income you think you lose with every visit to the ART clinic

How can you be helped not to lose income?

17. Do you incur any other cost as a result of your taking ARVs?

Yes	✓
No	

Transport

18. Do you belong to a specific religious community/ church?

Yes	✓
No	

If "Yes", what religion do you belong to?

Roman catholic	
Anglican	
Methodist	
Seventh-Day Adventist	
Jehovah Witness	
Baptist	
African Independent/ZCC	✓
Traditional	
Muslim	
Atheist	
Others, please specify	

19. How do you come to the clinic?

Walking	
Bus/taxi	✓
Car	
Motor bike	

20. How long does it take you to get to the clinic?

30 minutes or less	✓
31-60 minutes	
61-120 minutes	
121 minutes or more	

21. How long do you spend at the clinic before getting your ARVs?

30 minutes or less	
31-60 minutes	✓
61-120 minutes	
121 minutes or more	

22. Are you satisfied with the services you get from the clinic

Yes	✓
No	

If "No", which areas do you think should be improved?

_____

_____

23. Are the clinic staff friendly with the patients?

Yes	✓
No	

SECTION C: ADHERENCE COUNSELLING:

24. Who is your adherence partner/ treatment supporter?

Friend	
Father	
Mother	✓
Relative	
Spouse/Partner	
Son/Daughter	
Brother/Sister	
Buddy	
Others (please specify)	

25. Were you counselled about adherence before you started treatment?

Yes	✓
No	

If "Yes", by who?

Doctor	
Nurse	
Pharmacist	
Social worker	✓
Others, please specify	

26. How many times did you receive adherence counselling after you started treatment?

1	
2	✓
3	
4	
5 or more	

SECTION D: SELF ADHERENCE REPORT:

27. How many appointments have you missed at this clinic since you started treatment?

2

28. How many times did you miss your ARV medications in the last two days?

1

If you have missed your medication, what action did you take?

Nothing

29. Has any of the following made you miss your medications?

Cause	Yes	No
Felt better		✓
Clinic was not accessible		✓
Lack of food to take with medicines		✓
Depressed		✓
Too many pills		✓
Lack of care/support		✓
Hospitalised		✓
Did not understand instructions		✓
Alcohol use		✓
Forgot	✓	
Ran out of pills		✓
Side-effects		✓
Others (please specify)		

SECTION E: DISCLOSURE ISSUES

30. How many people have you told about your HIV status?

3

31. Who did you tell about your status?

Friend	✓
Father	
Mother	✓
Relative	
Spouse/Partner	
Son/Daughter	✓
Brother/Sister	
Others (please specify)	

SECTION F: SIDE EFFECTS

32. Have you experienced any of these side effects since taking your ARVs?

Side effects	Yes	No
Nausea		✓
Vomiting	✓	
Diarrhoea		✓
Headache	✓	
Skin Rash		✓
Dizziness		✓
Depression		✓
Skin or nail discolour		✓
Others (please specify)		

33. Is this problem affecting your daily activities?

Yes	✓
No	

34. What action do you take when you experienced such side effect?

Came to see the Doctor

SECTION G: USE OF TRADITIONAL MEDICINES

35. Since you started taking ARVs have you visited any traditional healer?

Yes	
No	✓

if "Yes", why?

36. What treatment did your traditional healer give you?

37. What advice did your traditional healer give you about HIV/AIDS and ART?

38. Are you taking any traditional medicine at the moment together with your ARVs?

Yes	
No	✓

39. Do you think the traditional medicines work for you?

Yes	
No	✓

Adherence level:

96%

Annexure K:Completed interview schedule (Setswana version)

Dipatlisiso

Mabaka aa amang kobamelo ya kalafi mo bagolong ba ba tsayang kalafi ya di Diritibatsi (ARV) mo kokelwaneng ya extension 15 mo Gaborone (Botswana).

Letsatsi: 13/08/08 Nomore ya sedirisiwa [0][1][7]

Nomore ya molwetsi yo o dirisang dipilisi tsa Diritibatsi: 749244

Nomore ya kokelwana ya kabo melemo: VIL00037244

KAROLO A: TSA BOTSOGO

1. Letsatsi le o simolotseng Diritibatse ka lone:

Letsatsi/ kgwedi/ ngwaga
15/10/2007

2. O na le sebaka se se kae o tsaya dipilisi tsa Diritibatsi?

Kgwedi tse thataro – kgwedi tse lesome le bobedi	✓
Kgwedi tse lesome le boraro – kgwedi tse lesome le borobabobedi	
Kgwedi tse lesome le borobabongwe – kgwedi tse masome mabedi le bone	
Go heta kgwedi tse masome mabedi le bone	

3. Masole a gago a mmele a ne a le kae

	Dipalo	Letsatsi Letsatsi/ kgwedi/ ngwaga
ko tshimologong	182	11/07/07
gompieno	311	05/05/08

4. **Bokete jwa mogare**

	Bokete ja mogare	Letsatsi Letsatsi/ kgwedi/ ngwaga
ko tshimologong	360,000	23/09/07
gompieno	2400	05/05/08

5. **O mo mofuteng ofe wa kalafi ya Diritibatsi?**

Tselana ya ntlha	✓
Tselana ya bobedi	
Tselana ya boraro	

6. **Palo ya dipilisi tse o di nwang ka nako ya dipilisi?**

1	
2	
3	✓
4	
5	

7. **A o kile wa fetola kalafi?**

Ee	
Nnyaa	✓

8. **Ke mabaka a fe a a go pateleditseng go fetola kalafi ? [Bala dikarabo]**

Mogare one o sa hokotsege	
Go wela tlase ga masole a mmele	
Botsogo jo bo sa lolamang	
Ditlamorago tsa melemo	
Tse dingwe (Tlhalosa)	

9. Bosupi ja go tsaya dipilisi le palo ya tsone magareng ga ferekgong e tlhola letsatsi ka ngwaga wa 2007 le phatwe e tlhola malatsi a le masome mararo le motso ka ngwaga wa 2008.

Letsatsi la koketso dipilisi e o e filweng	Letsatsi la koketso ya dipilisi	Malatsi a koketso dipilisi a o a tlodisitseng	Palo ya dipilisi CBV	EFV		
1. 30/10/07	30/10/07	0	90%	99%	=	99
2. 30/11/07	30/11/07	0	100%	97%	=	99
3. 28/12/07	28/12/07	0	100%	96%	=	98
4. 25/01/08	25/01/08	0	100%	99%	=	100
5. 29/02/08	29/02/08	0	100%	100%	=	100
6. 31/03/08	31/03/08	0	100%	100%	=	100
7. 25/04/08	25/04/08	0	100%	100%	=	100
8. 30/05/08	03/06/08	3	99%	99%	=	99
9. 02/07/08	02/07/08	0	100%	100%	=	100
10 05/08/08	05/08/08	0	100%	100%	=	100
11.						
12.						

90% Adherence by Pharmacy Refill

109% Adherence by pill count

KAROLO B: DINTLHA KGOLO

10. Bong:

Monna	✓
Mosadi	

11. Dingwaga:

15 - 25	
26 - 35	
36 – 45	
46 – 55	✓
56 – 65	
66+	

12. Seemo sa gago sa nyalo:

Ga ke a nyalwa / nyala	✓
Ke nyetswe / nyetse	
Ke nna le molekane wame mme ga rea nyalana	
Ke tlhadile / tlhadilwe / re kgaogane lobakanyana	
Ke motlholagadi/ Moswagadi	

13. O badile mang ko sekolong ? [Tshwaya e le nngwe]

Ga ke a tsena sekolo	
Ke badile lekwalo le le botlana la bosupa (1-7)	✓
Ke badile lekwalo la dithuto tse dikgolwane (form 1-5)	
Ke badile lekwalo la dithuto tse dikgolwane tsa bodiredi kgotsa tsa tiro ya diatla (University/ College /Technikon)	

14. Tsa khiro :

Ke a bereka	
Ga ke bereke	✓
Ke a ipereka	
Ke Moithaopi	
Ke Moithuti	

15. Ke sekale sefe se se tsamaelanang le dituelo tsa gago tsa kgwedi? [Bala dikarabo]

Ge ke amogele sepe	
0 - 999	
1000 – 1999	
2000 – 2999	
3000 – le gofeta	

16. A o latlhegelwa ke dikatso dingwe fa o tla kokelwaneng ?

Ee	
Nnyaa	

Fa k arabo e l e e e,tswe t swe t lhalosa g ore d ikatso d i g o l atlhegela jang

_____

_____

O ka thusiwa jang gore o seka wa latlhegelwa ke dikatso?

_____

_____

17. A go na le ditshenyegelo dingwe tsa madi tse o nang natso ka mabaka a gore o tsaya kalafi ya Diritibatsi?

Ee	✓
Nnyaa	

18. A ona le kereke kana mokgatlho wa tumelo e o ineetseng mo go one?

Ee	
Nnyaa	✓

Fa karabo e le ee,ke kereke efe kana mokgatlho ofe?

Roman catholic	
Anglican	
Methodist	
Seventh-Day Adventist	
Jehovah Witness	
Baptist	
African Independent/ZCC	
Traditional	
Muslim	
Atheist	
Others, please specify	

19. O dirisa eng go tla bongakeng

Ke tla ka maoto	
Combi/bus	✓
Koloi yame	
Sekuta	

20. O tsaya sebaka se se kae go goroga mo kokelwaneng?

Metsotso ee lesome le boraro go ya ko tlase	✓
Metsotso e masome mararo go ya ko oureng	
Oura mme eseng go feta oura tse pedi	
Oura tse pedi le go feta	

21. O tsaya lobaka lo lo kae go tsaya diritibatsi?

Metsotso ee lesome le boraro go ya ko tlase	
Metsotso e masome mararo go ya ko oureng	✓
Oura mme eseng go feta oura tse pedi	
Oura tse pedi le go feta	

22. A o kgotsofalela thuso e o e fiwang mo kokelwaneng?

Ee	✓
Nnyaa	

Fa karabo e le nnya.Ke fa kae fa o tsayang gore go tshwanetse go tokafadiwa?

_____

_____

23. A babereki ba bongaka bana le tirisanyo mmogo?

Ee	✓
Nnyaa	

KAROLO C: TSA BOKGOTHATSI

24. **Morotloetsi wa gago ke mang?**

Tsala	
Motsadi	
Lesika	
Molekane / Mosadi kgotsa monna wame	✓
Morwaake / Morwadiake	
Ba bangwe (Tlhalosa)	

25. **A o ne wa rutwa ka kalafi e pele ga o simolola ?**

Ee	✓
Nnyaa	

Fa karabo e le ee, o ne o rutwa ke mang ?

Ngaka	
Mooki	✓
Moabi wa melemo	
Mogakolodi	

26. **O amogetse kgotlhatso morago ga sebaka se se kae fa o sale o simolola kalafi?**

Gangwe fela	
Gabedi	
Gararo	
Gane	
Gatlhano/go feta	✓

KAROLO D: SEEMO SA KOBAELO KALAFI

27. O tlodisitse go tla kokelwaneng ga kae fa o sale o simolola kalafi?

Ga ke ise ke tlodise

28. A tlodisitse go tsaya dipilisi ga kae mo malatsing a mabedi a fitileng ?

Ga ke ise ke tlodise

Fa o ne tlhodisitse go tsaya dipilisi,o ne wa tsaya kgato efe?

29. A sengwe sa dilo tse di latelang se kile sa dira gore o tlodise go tsaya kalafi?

Lebaka	Ee	Nnyaa
Go ikutlwa botoka		✓
Bokgakala ja kokelwana		✓
Letlhoko la dijo		✓
Go sa tsoga sentle mo maikutlong		✓
Bontsi ja dipilisi		✓
Go tlhoka tlhokomelo/ kgotlhatso		✓
Go robadiwa mo kokelong		✓
Go sa tlhaloganya molaetsa wa ngaka		✓
Tiriso botlhaswa ya dino tagi		✓
Go lebala		✓
Go felelwa ke dipilisi		✓
Ditlamorago		✓
Tse dingwe (tlhalosa)		

KAROLO E: GO TSWA PHATLALATSA KA SEEMO SA GAGO

30. O boleletse batho ba le kae ka seemo sa gago sa mogare?

6

31. O boleletse mang ?

Tsala yame	
Ntate	
Mme	
Losika	
Mokapelo wame	✓
Ngwanake	
Ausi/Abuti	✓
Ba bangwe (tswe tswe tlhalosa)	

KAROLO F: DITLAMORAGO

32. A o kile wa itemogela ditlamorago tse di latelang?

Ditlamorago	Ee	Nnyaa
Go feroga sebete		✓
Go kgwa		✓
Letsholoolo		✓
Go opiwa ke tlhogo	✓	
Disho mo mmeleng		✓
Sedidi	✓	
Go sa tsoga sentle mo maikutlong		✓
Go fetoga ga mmala wa letlalo / dinala		✓
Tse dingwe (tswe tswe tlhalosa)		

33. A mathatha a,a go tlela malatsi otlhe?

Ee	
Nnya	✓

34. O ne wa tsaya kgato efe fa o ne o itemogela ditlamorago ?

te ne ka itetlodisa

KAROLO G: TIRISO YA MELEMO YA SETSWANA

35. Ga e sale o simolola go tsaya diritibatsi, a o kile wa etela ngaka ya setso?

Ee	
Nnya	✓

Fa karabo e le ee,fa lebaka

_____

_____

36. Ke thuso efe e ngaka ya setso e neng ya go e neela?

_____

_____

37. Ke kgakololo efe e ngaka ya setso e neng ya go e nnela mabapi le mogare wa HIV/AIDS le diritibatsi?

_____

_____

38. A gona le melemo mengwe ya setswana e o e tsayang le diritibatsi?

Ee	
Nnya	✓

39. A o tsaya gore melemo ya setswana ya go berekela?

Ee	
Nnya	✓

Boleng jwa tsenelelo kalafi:

95 %

Annexure H

Informed consent form (English version)

Annexure H:

Informed consent form (English version)

UNIVERSITY OF SOUTH AFRICA (Unisa) PRETORIA CONSENT FORM

I ..... hereby give consent to participate in this non-experimental research study: factors influencing treatment adherence among adult patients receiving anti-retroviral therapy at extension 15 ARV clinic, Gaborone. I understand that the study participants are HIV positive individuals on anti-retroviral treatment for six months or more.

The researcher has explained the purpose and objectives of the study, which I understood. The research findings may directly improve treatment adherence rates among people receiving ART.

I understand that my participation in this study is completely voluntary and my responses will be handled confidentially. Also, I have the right to withdraw from this study without giving any reason and without affecting my rights in any way.

I know that Research and Ethics Committee of the University of South Africa and Botswana ministry of health has approved this study. I am fully aware that the results obtained at the end of this study will be used for scientific purposes and may be published. I agree to this, provided my confidentiality is guaranteed.

....

Participant's signature Witness

....

Place Date

STATEMENT BY THE RESEARCHER

I provide verbal information regarding this study and I agree to answer any future questions pertaining to this study to the best of my ability. The approved research protocol will be respected.

....

Signature Place Date

NB:
1). For information related to research study, please contact:

Dr Nnamdi Ndubuka
Gaborone City Council
Department of Primary Health Care & Public Health
Phone: +267 71499919, 3956114

2). For information related to the rights of the participants in the study, please contact

Mrs. M. Kasule
Health Research Unit
Ministry of Health
Gaborone Botswana
+267 3632466

Annexure I

Informed consent form (Setswana version)

Annexure I:

Informed consent (Setswana version)

UNIVERSITY OF SOUTH AFRICA (UNISA)PRETORIA
Maitlamo ya go tsaya karolo

Ke le _____ke fa tetla ya go tsaya karolo mo tshekatshekong e tlhotlhomisang:mabaka a a rotloetsang tlhomamo mo melemong/bongakeng ga bagolo ba ba mo lenaneong la diritiba mo kokelwaneng ya Extension 15 mo Gaborone.Ke tlhaloganya gore batsaya karolo ke batho ba ba tshelang ka mogare wa HIV ebile ba na le dikgwedi di le thataro kgotsa go feta ba ntse ba le mo lenaneong la diribatsi.

Motsamaisa tshekatsheke e,o tlhalositse ka botlalo mosola le maikaelelo a tshekateheko mme ke tlhalogantse.Maduo a tshekatsheko ga ana le boleng kgotsa mosola a ka dirisiwa go tokafatsa selekanyo sa tlhomamo mo melemong kgotsa mo bongakeng ga bagolo ba ba tsayang diritibatsi.

Ke tlhaloganya gore go tsaya karolo game ke boithaopi ebile gape dikakgelo tsame di tla nna sephiri gape kena le tshwanelo ya go tswa mo tshekatshekong kwa ntle ga lebaka lepe gape kesa ame ditshwanelo tsame ka gope.

Ke tlhaloganya fa ba lekgotla la ditshekatsheko le tsamaiso (Research and Ethics Committee) ba mmadikolo ko Afica Borwa (University of South Africa) la ba Lephata la Botsogo ba file tetla ya go tsamaisa tshekatsheko e.Ke tlhaloganya ka botlalo gore maduo a tla bonwang morago ga tshekatsheko a tla dirisiwa mo go tsa maranyane.Gape a ka nna a kwalwa mo dibukeng.Ke dumalana le se, ka tsholofelo ya go sirelediwa.

---------- ----------

Motsaya karolo Mosupi

---------- ----------

Lefelo Letsatsi

BOPAKI JWA MOTSAMAISI

Kef a melaetsa ke tshekatsheko ebile ke dumalana le go araba dipotso tse di ka tlang kwa morago mabapi le tshekatsheko e ka bokgoni jotlhe jwaka.Tetlelelo ya tsamaiso e tla tlotliwa.

---------- ---------- ----------

Monwana wa Motsamaisi Lefelo Letsatsi

NB:
1) Mabapi le tlhaloso ka tshekatsheko e,tswetswe leletsa
Dr Nnamdi Ndubuka
Gaborone City Council
Department of Primary Health Care and Public Health
Phone: + 267 71499919 or 3956114

2) Mabapi le molaetsa wa ditshwanelo tsa ba tsenelela tshekatsheko, tswetswe leletsa

Mrs. M. Kasule
Health Research Unit
Ministry of Health
Gaborone Botswana
+267 3632466

Annexure J

Completed interview schedule (English version)

Annexure J: Completed interview schedule (English version)

DATA COLLECTION INSTRUMENT: STRUCTURED INTERVIEW SCHEDULE

Factors influencing treatment adherence among adult patients receiving Anti retroviral therapy at extension 15 clinic Gaborone, Botswana

Date 06/08/08 Instrument number 008

Participant's ARV number CM75120 Pharmacy reference number VIL0003835

SECTION A: CLINICAL INFORMATION

1. Date initiated on HAART:

dd/mm/yyy
09/11/07

2. Calculated duration of ARV treatment in months:

6 months- 12 months	✓
13 months-18 months	
19 months-24 months	
25 months or longer	

3. CD4 cell count values:

	Value	Date (dd/mm/yyy
Baseline	17	10/10/07
Current	235	05/05/08

4. Plasma Viral load:

	Value	Date (dd/mm/yyy
Baseline	4580	12/11/07
Current	2400	26/02/08

5. Current ARV regimen:

First line	✓
Second line	
Third line	

6. **Total number of ARV pills taken per dose:**

1	
2	✓
3	
4	
5	

7. **Was the regimen changed?**

Yes	
No	✓

8. **Reason for changing regimen:**

Virologic failure (Increased VL)	
Immunologic failure (decreased CD4)	
Clinical failure	
Drug toxicity	
Others (specify)	

9. **Pharmacy refill record between 1 January 2007 and 31 July 2008**

Pharmacy refill due dates	Actual refill dates	Number of days delayed for refill	Pill count CBV	Pill count NVP		
1. 02/05/07	02/05/07	0	100%	100%	=	100 %
2. 16/05/07	16/05/07	0	100%	100%	=	100 %
3. 15/06/07	15/06/07	0	100%	100%	=	100 %
4. 18/07/07	18/07/07	0	100%	98%	=	99 %
5. 22/08/07	22/08/07	0	96%	98%	=	97 %
6. 27/09/07	27/09/07	0	97%	97%	=	97 %
7. 22/10/07	22/10/07	0	95%	97%	=	96 %
8. 21/11/07	25/11/07	2	94%	99%	=	97 %
9. 21/12/07	21/12/07	0	100%	100%	=	100 %
10 23/01/08	23/01/08	0	99%	97%	=	98 %
11. 25/02/08	25/02/08	0	100%	100%	=	100 %
12. 31/03/08	31/08/08	0	99%	97%	=	98%

99%

$\frac{11}{12} \times 100 = 92\%$

- Adherence by pharmacy Refill = 92%
- Adherence by pill count = 99%

SECTION B: GENERAL INFORMATION

10. Gender:

M	
F	✓

11. Age in years

15-25	
26-35	
36-45	✓
46-55	
56-65	
65+	

12. Marital status:

Single	✓
Married	
Co-habiting	
Divorced /Separated	
Widowed	

13. Educational level completed:

None	
Primary	✓
Secondary	
Tertiary (please specify)	

14. Employment status:

Employed	✓
Unemployed	
Self employed (please specify)	
Volunteer	
Student	

15. How much do you earn per month (in Pula)?

No income	
0-999	
1000-1999	
2000-2999	✓
3000 and more	

16. Do you lose any income at the time you attend this clinic?

Yes	
No	✓

If "Yes", please explain how you lose income and how much income you think you lose with every visit to the ART clinic

How can you be helped not to lose income?

17. Do you incur any other cost as a result of your taking ARVs?

Yes	✓
No	

Transport

18. Do you belong to a specific religious community/ church?

Yes	✓
No	

If "Yes", what religion do you belong to?

Roman catholic	
Anglican	
Methodist	
Seventh-Day Adventist	
Jehovah Witness	
Baptist	
African Independent/ZCC	✓
Traditional	
Muslim	
Atheist	
Others, please specify	

19. How do you come to the clinic?

Walking	
Bus/taxi	✓
Car	
Motor bike	

20. How long does it take you to get to the clinic?

30 minutes or less	✓
31-60 minutes	
61-120 minutes	
121 minutes or more	

21. How long do you spend at the clinic before getting your ARVs?

30 minutes or less	
31-60 minutes	✓
61-120 minutes	
121 minutes or more	

22. Are you satisfied with the services you get from the clinic

Yes	✓
No	

If "No", which areas do you think should be improved?

_____

_____

23. Are the clinic staff friendly with the patients?

Yes	✓
No	

SECTION C: ADHERENCE COUNSELLING:

24. Who is your adherence partner/ treatment supporter?

Friend	
Father	
Mother	✓
Relative	
Spouse/Partner	
Son/Daughter	
Brother/Sister	
Buddy	
Others (please specify)	

25. Were you counselled about adherence before you started treatment?

Yes	✓
No	

If "Yes", by who?

Doctor	
Nurse	
Pharmacist	
Social worker	✓
Others, please specify	

26. How many times did you receive adherence counselling after you started treatment?

1	
2	✓
3	
4	
5 or more	

SECTION D: SELF ADHERENCE REPORT:

27. How many appointments have you missed at this clinic since you started treatment?

2

28. How many times did you miss your ARV medications in the last two days?

1

If you have missed your medication, what action did you take?

Nothing

29. Has any of the following made you miss your medications?

Cause	Yes	No
Felt better		✓
Clinic was not accessible		✓
Lack of food to take with medicines		✓
Depressed		✓
Too many pills		✓
Lack of care/support		✓
Hospitalised		✓
Did not understand instructions		✓
Alcohol use		✓
Forgot	✓	
Ran out of pills		✓
Side-effects		✓
Others (please specify)		

SECTION E: DISCLOSURE ISSUES

30. How many people have you told about your HIV status?

3

31. Who did you tell about your status?

Friend	✓
Father	
Mother	✓
Relative	
Spouse/Partner	
Son/Daughter	✓
Brother/Sister	
Others (please specify)	

SECTION F: SIDE EFFECTS

32. Have you experienced any of these side effects since taking your ARVs?

Side effects	Yes	No
Nausea		✓
Vomiting	✓	
Diarrhoea		✓
Headache	✓	
Skin Rash		✓
Dizziness		✓
Depression		✓
Skin or nail discolour		✓
Others (please specify)		

33. Is this problem affecting your daily activities?

Yes	✓
No	

34. What action do you take when you experienced such side effect?

Came to see the Doctor

SECTION G: USE OF TRADITIONAL MEDICINES

35. Since you started taking ARVs have you visited any traditional healer?

Yes	
No	✓

if "Yes", why?

36. What treatment did your traditional healer give you?

37. What advice did your traditional healer give you about HIV/AIDS and ART?

38. Are you taking any traditional medicine at the moment together with your ARVs?

Yes	
No	✓

39. Do you think the traditional medicines work for you?

Yes	
No	✓

Adherence level:

96%

Annexure K

Completed interview schedule (Setswana version)

Annexure K: Completed interview schedule (Setswana version)

Dipatlisiso

Mabaka aa amang kobamelo ya kalafi mo bagolong ba ba tsayang kalafi ya di Diritibatsi (ARV) mo kokelwaneng ya extension 15 mo Gaborone (Botswana).

Letsatsi: 13/08/08 **Nomore ya sedirisiwa** 0 1 7

Nomore ya molwetsi yo o dirisang dipilisi tsa Diritibatsi: 749244

Nomore ya kokelwana ya kabo melemo: VIL 000 37244

KAROLO A: TSA BOTSOGO

1. **Letsatsi le o simolotseng Diritibatse ka lone:**

Letsatsi/ kgwedi/ ngwaga
15/10/2007

2. **O na le sebaka se se kae o tsaya dipilisi tsa Diritibatsi?**

Kgwedi tse thataro – kgwedi tse lesome le bobedi	✓
Kgwedi tse lesome le boraro – kgwedi tse lesome le borobabobedi	
Kgwedi tse lesome le borobabongwe – kgwedi tse masome mabedi le bone	
Go heta kgwedi tse masome mabedi le bone	

3. **Masole a gago a mmele a ne a le kae**

	Dipalo	Letsatsi Letsatsi/ kgwedi/ ngwaga
ko tshimologong	182	11/09/07
gompieno	311	05/05/08

4. **Bokete jwa mogare**

	Bokete ja mogare	Letsatsi Letsatsi/ kgwedi/ ngwaga
ko tshimologong	360,000	23/09/07
gompieno	2400	05/05/08

5. **O mo mofuteng ofe wa kalafi ya Diritibatsi?**

Tselana ya ntlha	✓
Tselana ya bobedi	
Tselana ya boraro	

6. **Palo ya dipilisi tse o di nwang ka nako ya dipilisi?**

1	
2	
3	✓
4	
5	

7. **A o kile wa fetola kalafi?**

Ee	
Nnyaa	✓

8. **Ke mabaka a fe a a go patleditseng go fetola kalafi ? [Bala dikarabo]**

Mogare one o sa hokotsege	
Go wela tlase ga masole a mmele	
Botsogo jo bo sa lolamang	
Ditlamorago tsa melemo	
Tse dingwe (Tlhalosa)	

9. Bosupi ja go tsaya dipilisi le palo ya tsone magareng ga ferekgong e tlhola letsatsi ka ngwaga wa 2007 le phatwe e tlhola malatsi a le masome mararo le motso ka ngwaga wa 2008.

Letsatsi la koketso dipilisi e o e filweng	Letsatsi la koketso ya dipilisi	Malatsi a koketso dipilisi a o a tlodisitseng	Palo ya dipilisi CBV EFV		
1. 30/10/07	30/10/07	0	99%	99%	= 99
2. 30/11/07	30/11/07	0	100%	97%	= 99
3. 28/12/07	28/12/07	0	100%	96%	= 98
4. 25/01/08	25/01/08	0	100%	99%	= 100
5. 29/02/08	29/02/08	0	100%	100%	= 100
6. 31/03/08	31/03/08	0	100%	100%	= 100
7. 25/04/08	25/04/08	0	100%	100%	= 100
8. 30/05/08	03/06/08	3	99%	99%	= 99
9. 02/07/08	02/07/08	0	100%	100%	= 100
10 05/08/08	05/08/08	0	100%	100%	= 100
11.					
12.					

90% Adherence by Pharmacy Refill

109% Adherence by pill count

KAROLO B: DINTLHA KGOLO

10. Bong:

Monna	✓
Mosadi	

11. Dingwaga:

15 - 25	
26 - 35	
36 – 45	
46 – 55	✓
56 – 65	
66+	

12. Seemo sa gago sa nyalo:

Ga ke a nyalwa / nyala	✓
Ke nyetswe / nyetse	
Ke nna le molekane wame mme ga rea nyalana	
Ke tlhadile / tlhadilwe / re kgaogane lobakanyana	
Ke motlholagadi/ Moswagadi	

13. O badile mang ko sekolong ? [Tshwaya e le nngwe]

Ga ke a tsena sekolo	
Ke badile lekwalo le le botlana la bosupa (1-7)	✓
Ke badile lekwalo la dithuto tse dikgolwane (form 1-5)	
Ke badile lekwalo la dithuto tse dikgolwane tsa bodiredi kgotsa tsa tiro ya diatla (University/ College /Technikon)	

14. Tsa khiro :

Ke a bereka	
Ga ke bereke	✓
Ke a ipereka	
Ke Moithaopi	
Ke Moithuti	

15. Ke sekale sefe se se tsamaelanang le dituelo tsa gago tsa kgwedi? [Bala dikarabo]

Ge ke amogele sepe	
0 - 999	
1000 – 1999	
2000 – 2999	
3000 – le gofeta	

16. A o latlhegelwa ke dikatso dingwe fa o tla kokelwaneng ?

Ee	
Nnyaa	

Fa k arabo e l e e e,tswe t swe t lhalosa g ore d ikatso d i g o l atlhegela jang

_____

_____

O ka thusiwa jang gore o seka wa latlhegelwa ke dikatso?

_____

_____

17. A go na le ditshenyegelo dingwe tsa madi tse o nang natso ka mabaka a gore o tsaya kalafi ya Diritibatsi?

Ee	✓
Nnyaa	

18. A ona le kereke kana mokgatlho wa tumelo e o ineetseng mo go one?

Ee	
Nnyaa	✓

Fa karabo e le ee,ke kereke efe kana mokgatlho ofe?

Roman catholic	
Anglican	
Methodist	
Seventh-Day Adventist	
Jehovah Witness	
Baptist	
African Independent/ZCC	
Traditional	
Muslim	
Atheist	
Others, please specify	

19. O dirisa eng go tla bongakeng

Ke tla ka maoto	
Combi/bus	✓
Koloi yame	
Sekuta	

20. O tsaya sebaka se se kae go goroga mo kokelwaneng?

Metsotso ee lesome le boraro go ya ko tlase	✓
Metsotso e masome mararo go ya ko oureng	
Oura mme eseng go feta oura tse pedi	
Oura tse pedi le go feta	

21. O tsaya lobaka lo lo kae go tsaya diritibatsi?

Metsotso ee lesome le boraro go ya ko tlase	
Metsotso e masome mararo go ya ko oureng	✓
Oura mme eseng go feta oura tse pedi	
Oura tse pedi le go feta	

22. A o kgotsofalela thuso e o e fiwang mo kokelwaneng?

Ee	✓
Nnyaa	

Fa karabo e le nnya.Ke fa kae fa o tsayang gore go tshwanetse go tokafadiwa?

_____

_____

23. A babereki ba bongaka bana le tirisanyo mmogo?

Ee	✓
Nnyaa	

KAROLO C: TSA BOKGOTHATSI

24. **Morotloetsi wa gago ke mang?**

Tsala	
Motsadi	
Lesika	
Molekane / Mosadi kgotsa monna wame	✓
Morwaake / Morwadiake	
Ba bangwe (Tlhalosa)	

25. **A o ne wa rutwa ka kalafi e pele ga o simolola ?**

Ee	✓
Nnyaa	

Fa karabo e le ee, o ne o rutwa ke mang ?

Ngaka	
Mooki	✓
Moabi wa melemo	
Mogakolodi	

26. **O amogetse kgotlhatso morago ga sebaka se se kae fa o sale o simolola kalafi?**

Gangwe fela	
Gabedi	
Gararo	
Gane	
Gatlhano/go feta	✓

KAROLO D: SEEMO SA KOBAELO KALAFI

27. O tlodisitse go tla kokelwaneng ga kae fa o sale o simolola kalafi?
Ga ke ise ke tlodise

28. A tlodisitse go tsaya dipilisi ga kae mo malatsing a mabedi a fitileng ?
Go ke ise ke tlodise

Fa o ne tlhodisitse go tsaya dipilisi,o ne wa tsaya kgato efe?

29. A sengwe sa dilo tse di latelang se kile sa dira gore o tlodise go tsaya kalafi?

Lebaka	Ee	Nnyaa
Go ikutlwa botoka		✓
Bokgakala ja kokelwana		✓
Letlhoko la dijo		✓
Go sa tsoga sentle mo maikutlong		✓
Bontsi ja dipilisi		✓
Go tlhoka tlhokomelo/ kgotlhatso		✓
Go robadiwa mo kokelong		✓
Go sa tlhaloganya molaetsa wa ngaka		✓
Tiriso botlhaswa ya dino tagi		✓
Go lebala		✓
Go felelwa ke dipilisi		✓
Ditlamorago		✓
Tse dingwe (tlhalosa)		

KAROLO E: GO TSWA PHATLALATSA KA SEEMO SA GAGO

30. O boleletse batho ba le kae ka seemo sa gago sa mogare?
6

31. O boleletse mang ?

Tsala yame	
Ntate	
Mme	
Losika	
Mokapelo wame	✓
Ngwanake	
Ausi/Abuti	✓
Ba bangwe (tswe tswe tlhalosa)	

KAROLO F: DITLAMORAGO

32. A o kile wa itemogela ditlamorago tse di latelang?

Ditlamorago	Ee	Nnyaa
Go feroga sebete		✓
Go kgwa		✓
Letshololo		✓
Go opiwa ke tlhogo	✓	
Disho mo mmeleng		✓
Sedidi	✓	
Go sa tsoga sentle mo maikutlong		✓
Go fetoga ga mmala wa letlalo / dinala		✓
Tse dingwe (tswe tswe tlhalosa)		

33. A mathatha a,a go tlela malatsi otlhe?

Ee	
Nnya	1 ✓

34. O ne wa tsaya kgato efe fa o ne o itemogela ditlamorago ?

Re ne ka itetodisa

KAROLO G: TIRISO YA MELEMO YA SETSWANA

35. Ga e sale o simolola go tsaya diritibatsi, a o kile wa etela ngaka ya setso?

Ee	
Nnya	✓

Fa karabo e le ee,fa lebaka

_____

_____

36. Ke thuso efe e ngaka ya setso e neng ya go e neela?

_____

_____

37. Ke kgakololo efe e ngaka ya setso e neng ya go e nnela mabapi le mogare wa HIV/AIDS le diritibatsi?

_____

_____

38. A gona le melemo mengwe ya setswana e o e tsayang le diritibatsi?

Ee	
Nnya	✓

39. A o tsaya gore melemo ya setswana ya go berekela?

Ee	
Nnya	✓

Boleng jwa tsenelelo kalafi:

95%

Annexure L

Letter from bilingual expert

Annexure L: Letter from bilingual expert

University Of Botswana

Private Bag 0022

Gaborone

Botswana

14th October 2008

To Whom It May Concern:

I, Moemedi Nthapelelang, have translated the structured interview instrument for the research entitled "Factors influencing treatment adherence among adult patients receiving ARV at extension 15 clinic in Gaborone" and I certify all the translations are correct.

Yours sincerely

Moemedi Nthapelelang

Annexure M

Bilingual expert's curriculum vitae

Annexure M: Bilingual expert's curriculum vitae

CURRICULUM VITAE

NAME : MOEMEDI R. NTHAPELELANG

ADDRESS :

University of Botswana

French Departement

Private Bag 00703

Gaborone

Botswana

Tel: 00267 355 4120 (Office)

Home: 00276 3166566

Mobile: 00 267 7184 8623

Email: nthaps@yahoo.com or

nthapele@mopipi.ub.bw

I. PERSONAL DETAILS

I.1. **SURNAME** : NTHAPELELANG

I.2. **FIRST NAMES** : MOEMEDI RONALD

I.3. **SEX**: MALE

I.4. **DATE OF BIRTH**: 05/05/69

I.5. **PLACE OF BIRTH**: MAHALAPYE

I.6. **NATIONALITY**: MOTSWANA

I.7. **MARITAL STATUS**: MARRIED

I.8. **CURRENT JOB**: FRENCH LECTURER (UNIVERSITY OF BOTSWANA) (NOVEMBER 1995-2007)

II. ACADEMIC RECORD

YEAR	EDUCATION	GRADE
1976-1982	Mmatshumo Primary School (Primary School Leaving Examination)	2nd Class/ B
1983- 1985	Letlhakane Secondary School (Junior Certificate)	2nd Class/ B
1986- 1987	Lotsane Senior Secondary School (Cambridge O' level School Certificate)	1st Class/ A
1988- 1989	Tirelo Sechaba (National Service)	
1989- 1993	University Of Botswana Barchelor of Arts Humanities Major Subjects: History and English Minor Subject: French	2 (ii)
1993- 1994	Université de Franche-Comté: France Licence de Français Langue Etrangère (BA French Major)	2 (i)

1994- 1995	Université de Franche-Comté: France 2(ii) Maîtrise de Sciences du Langage : Mention Français Langue Etrangère (Master's Degree in Language Sciences)
2001- 2002	Université de Paul Valéry Montpellier III France Mphil Sciences du Langage : Sociolinguistique (Mphil Language Sciences : Sociolinguistics) **Title** : « Le rôle de l'aspect culturel dans l'enseignement/ apprentissage des langues étrangères : Le cas du Botswana ».
2003- 2008	Université de Paul Valéry Montpellier III Thèse : Sciences du langage Currently making the final corrections on my Phd Thesis. **Title**: "Politiques Linguistiques et Représentations des langues et des cultures en présence dans les systèmes éducatifs au Botswana, en Afrique du Sud et en Namibie : De la Colonisation à la Mondialisation ».

III. RESEARCH AND PUBLICATIONS

III.1. MA Dissertation
Nthapelelang M.R., « L'analyse morpho-syntaxique des erreurs commises à l'écrit par des étudiants Botswanais à l'Université du Botswana : Niveau Intermédiare. » (Université de France-Comté, Besançon , October 1995).

III.2. Book Chapter : Chebanne Andy and Nthapelelang Moemedi, « The sociolinguistic survey of the eastern Khoe in the Boteti and Makgadikgadi Pans Areas of Botswana »pp79-94, in Batibo H.M. and Smieja B. (eds.), (2000), **Botswana: The future of the Minority Languages**, Peter Lang, Paris.

III.3. A chapter in Botswana Atlas entitled "Languages in Botswana". Botswana government printers, 2000.

III.4. A Book Chapter entitled "Language planning and policy in Botswana: A cause or solution for language conflict?" and accepted for publication by Cambridge Scholars Press in a Collection of Essays to be entitled "English Language and Literature Cross Cultural Currents". (To be published sometime in 2008).

III.5. A journal article :
Nthapelelang M., (2004), « Le Botswana et les relations qui existent entre ses langues depuis l'Indépendance », in French Studies in Southern Africa, N°. 33. pp 61-74.

III.6. A journal article submitted for publication in the "Journal of French Studies" edited at the Rand Afrikaans University, South Africa:
Nthapelelang Moemedi Ronald, "Problems encountered in foreign language learning: the case of students learning French at the University of Botswana."

III.7. Departmental seminar paper:
Nthapelelang Moemedi Ronald, (8th March 2000), « Comment enseigner la grammaire en Français langue étrangère. »

III.8. Departmental seminar paper for Alliance Française of Gaborone
Nthapelelang Moemedi Ronald, (October 2003), "Grammaire et civilisation en classe de Français langue étrangère."

III.9. Departmental seminar paper :
Nthapelelang Moemedi Ronald, (October 2006), « Cohabitation des langues indigènes et des langues d'origine européenne en Afrique : un mariage impossible et un défi majeur pour l'enseignement / apprentissage des langues étrangères dans les pays africains. »

III.10. Departmental seminar paper :
Nthapelelang Moemedi Ronald, (April 2007), "Faut-il enseigner la grammaire en Français Langue Etrangère, si oui laquelle et comment ? »

IV. ON-GOING RESEARCH:

IV.1. "The relevance of the concept of "Interferences" in bilingual and multilingual communities."

IV.2. "A critical analysis of "communicative" French textbooks and manuals used for teaching French as a foreign language in non French speaking Africa."

IV.3. "La minorisation linguistique et ses effets pervers: le cas de la Francophonie."

V. CONFERENCES, WORKSHOPS AND SHORT COURSES ATTENDED:

V.1. 1990 : Cours d'été (Linguistics) Strasbourg: France

V.2. 1996: Workshop on strategies of teaching French to non-French adults and adolescents.
Umaruru: Namibia (1996 and 1998)

V.3. 1997: BELC course. A course designed to foster teaching skills in French.
University of Caen: France

V.4. 1997: A course designed to improve the French teachers' competence and skills in using modern technology to teach French and another course on simultaneous translation.
Centre de Linguistique Appliquée de Besançon : France
(Centre for Applied Linguistics in Besançon : France)

V.5. 1997: HEDU induction course
University of Botswana

V.6. 1997: Attended a WIPO conference (World Intellectual and Property Organisation) on "Copyrights and neighbouring rights"
Gaborone Botswana: Boipuso Hall

V.7. 1997: Represented Botswana at a regional conference on "the teaching and learning of French in Southern Africa: Problems and way forward" in my capacity as the then President of the French teachers Association of Botswana.
Maputo: Mozambique

V.8. 2006: Trained and awarded a certificate as an examiner and corrector of the DELF and DALF French International examination.

VI. SERVICE TO THE UNIVERSITY OF BOTSWANA

VI.1. DEPARTMENATL DUTIES

1997- 2001 Departmental board secretary

1998- 2001 Departmental representative: Language laboratory committee

1998- 2001 Departmental Examination coordinator

1997- 2001	Departmental time-table representative
1996- 1998	University of Botswana French Club coordinator
2006-	Departmental Board Secretary
2007	Appointed chairperson of the FAPRC's (Faculty Academic Programme Review Committee) sub-committee on language, linguistics and translation courses.

VI.2. PROFESSIONAL SERVICE

1. I did translation for various University of Botswana departments, for example, the University Library, the former National Institute of Research (NIR), the University of Botswana administration and many others.

2. Translator and interpreter at the SWAA conference (Society for Women and AIDS in Africa) held at the Gaborone sun in December 1996.

3. Translator and interpreter at the 2nd CAF (Confederation of African Football) games held in Gaborone: Botswana in May 1997

4. Translator and interpreter at the "Global Summit for the Black Nurses" held at the Grand Palm, Gaborone: Botswana in 1998.

5. Translator and interpreter for His Excellency the President of the Republic of Botswana, Mr Gontebanye Mogae and His Excellency the President of the Republic of Mali, Mr A.O. Konare during the latter's state visit to Botswana in August 1999.

6. Translator and interpreter at SADC's Extraordinary Inter-State Defence and Security Council meeting held in Mbabane Swaziland. (25th- 27th October 1999)

7. Translator and interpreter at the regional meeting on "The prevention of mother to child HIV / AIDS transmission" jointly organised by UNICEF and WHO in Gaborone (Botswana) from the 27th to the 31st March 2000.

8. Translator and interpreter at the SADC's Attorney Generals' meeting on Protocols held in Gaborone May 2001

9. Translated several documents for the Inter-Congolese Dialogue Office based in Gaborone (Botswana) and headed by His Excellency the former President of the Republic of Botswana, Sir Ketumile Masire (from 2000 to 2001).

10. Translator at SADC's Integrated Committee of Ministers meeting held in Johannesburg (Sandton Convention Centre) from the 21st to the 24th of June 2006.

11. Interpreter at SADC's TNF, Senior Officials and Ministers's meeting held in Gaborone (Gaborone Sun) from the 10th to the 14th of July 2006.

12. Interpreter at SADC's Ministers of Justice and Attorney's General meeting held in Gaborone (Boipuso Hall) from the 1st to the 4th of August 2006.

13. Translation of SADC document entitled "SADC Trade Document" 31st July 2006.

14. Translation of SADC SUMMIT documents at the SADC secretariat from the 6th to the 8th August 2006.

15. Translator at SADC's Summit held in Maseru (The Convention Centre) from the 10th to the 18th of August 2006.

16. Interpreter at the Regional Workshop – Strengthening River Basin Organisations for Transboundary Water Resource Management in SADC held at the Gaborone Sun (Botswana) from the 11th to the 12th September 2006.

17. Interpreter at the SADC regional Cross Border HIV and AIDS Pilot Project Handover Conference held in Mbabane (Swaziland) from the 18th to the 23rd September 2006.

18. Interpreter at the SADC malaria managers's meeting held at the Gaborone Sun (Botswana) from the 24th to the 26th September 2006.

19. Interpreter at the 13th SADC's Sub-Committee on Customs Cooperation's (SCCC) Meeting held in Maun (Botswana) from the 30th October to the 1st November 2006.

20. Translator at the SADC Ministers of Health Meeting held in Windhoek (Namibia) from the 13th to the 17th November 2006.

21. Translator at the SADC Council of Ministers's Meeting held in Maseru (Lesotho) from the 17th to the 23rd March 2007.

22. Translation of a SADC document entitled, "SADC EU development cooperation: Report on the implementation of the 8th and 9th Regional Indicatif Programmes" March 2007.

23. Translation of document: "Directorate of Human and Social Development and Special Programmes: Annual activities and Expenditures for 2007-2008 from

English to French: 4th to the 5th December 2006.

24. Interpreter at the meeting of the SADC's Customs Union Task Force held in Maputo (Mozambique) from the 14th to the 15th December 2006.

25. Translator at the SADC's Council of Ministers meeting held in Maseru Sun Cabanas from the 17th to the 23rd of March 2007.

26. Interpreter at the meeting of the Defence Sub-Committee on Special Operations held in Dar es Salaam (Tanzania) from 29th of April to the 3rd of May 2007.

26. Interpreter at SADC's HIV & AIDS meeting "Training of Trainers for HIV mainstreaming" held in Maputo (Mozambique) from the 28th of May to the 1st of June 2007.

27. Interpreter at SADC's Industrial development Forum held in Gaborone (Botswana) from the 7th to the 8th of June 2007.

28. Interpreter at the meeting of the Technical Committee on Open and Distance learning held in Gaborone (Botswana) from the 28th to the 29th of June 2007.

29. Translator at SADC's Integrated Committee of Ministers' meeting held in Windhoek (Namibia) from the 13th to the 16th June 2007.

30. Translator at the 27th SADC Ordinary Summit of the Heads of State and Government held in Lusaka (Zambia) from the 5th to the 18th of August 2007.

31. Interpreter at SADC's Indirect Tax Working Group Meeting held in Johannesburg (South Africa) from the 5th to the 6th of October 2007.

32. Interpreter at the IAEA international conference on nuclear materials and additional protocols held in Gaborone (Botswana) from the 8th to the 12th of October 2007.

33. Translator at SADC's extraordinary Council of Ministers' meeting held in Lusaka (Zambia) from the 8th to the 9th November 2007.

34. Translator at SADC's Ministers of Health meeting held in Victoria Falls (Zimbabwe) from the 19th to the 24th of November 2007.

VI.3. COMMUNITY SERVICE

1998- 2000 President of the French teachers' Association of Botswana

1999- 2001 President of the Alliance Française of Gaborone

2000 Representative of the University of Botswana's French department and chairman of the Task force that developed the French syllabus for Botswana Junior Secondary schools.

Conductor of several social choirs in Botswana. Composer and arranger of chorale music. Led the University of Botswana chorale in many occasions during its campaign against the spread of HIV/ AIDS pandemic in Botswana in my capacity as its conductor. Amongst the community groups that benefited from some of the funds that we raised during our campaigns are, COSEPWA based in Gaborone and the Ghanzi home based care group in 2000.

Annexure N

Letter from statistician

Annexure N:

Letter from statistician

University of Botswana
DEPARTMENT OF STATISTICS,
FACULTY OF SOCIAL SCIENCES

Private Bag 00705 Gaborone, Botswana
Telephone: (267) 355-2706/2366 Fax: (267) 318-5099
Telex: (267) 2429 BD Telegraph: University Gaborone

OCTOBER, 07, 2008

TO WHOM IT MAY CONCERN

RE: **Factors influencing treatment adherence among adult patients receiving Anti retroviral therapy at extension 15 clinic Gaborone, Botswana**

This is to write that I was involved in the data collection and data analysis stages in respect of the above named research. Aforementioned stages of the research took place between June, 01, 2008 and September, 30, 2008.

Sincerely yours,

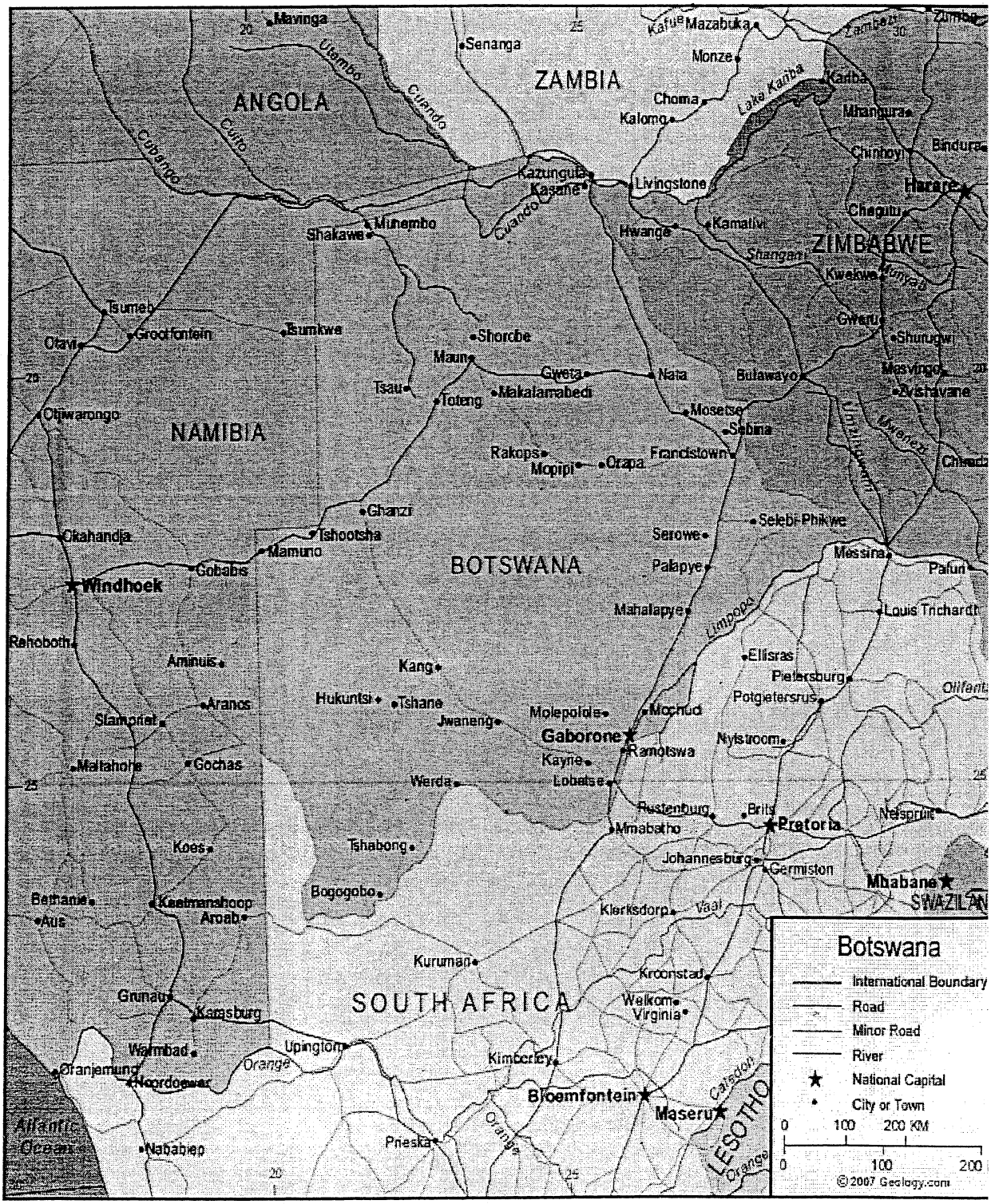
D K Shangodoyin, PhD, Miiis (USA)

Consultant Statistician

Annexure O

Map of Botswana

Annexure O: **Map of Botswana**



http://geology.com/world/botswana-satellite-image.shtml