ADHERENCE TO HIGHLY ACTIVE ANTIRETROVIRAL THERAPY AND ITS MAJOR DETERMINANTS AMONG ADULT PATIENTS AT RUNDU HOSPITAL, NAMIBIA

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KEY WORDS

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ART adherence

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Namibia

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ABSTRACT

Background: The introduction of Antiretroviral Therapy (ART) and especially Highly Active Antiretroviral Therapy (HAART) has led to an improvement in both quality and length of life among patients with HIV/AIDS. However, studies have shown that HAART requires adherence levels of 95% and above in order to achieve therapeutic success. Sub-optimal adherence, which has been associated with treatment failure and emergence of drug resistant HIV strains, has been cited as a major concern with the scaling up of ART programs in resource limited sub-Saharan Africa. Thus monitoring adherence rates and identifying factors that influence adherence to HAART are essential components of HAART programmes. However, since the inception of the programme in 2003, no studies have been conducted in Namibia to measure the adherence or identify factors that affect adherence among the patients on HAART.

Aim: To obtain baseline data on adherence levels and the major determinants of adherence among patients on HAART at Rundu Hospital, Namibia.

Methodology: A cross-sectional descriptive study of adult patients on first line HAART regimen attending Rundu Hospital, Namibia, was conducted. An administered structured questionnaire was used to collect data on the socio-demographic characteristics, adherence rates and magnitude of barriers and facilitators of adherence among patients on HAART.
Three adherence measuring strategies were used: 2 day recall, 30 day self report and pill counts. Data was analysed using Epi-info (CDC, 2004) programme and means, medians, standard deviation, range and frequency distribution were computed for the variables. Mean adherence

levels and the proportion of patients achieving adherence levels of 95% and above were measured. Adherence was analysed categorically as dichotomous: optimal (>or = 95%) and sub optimal (< 95%) and also as three categories: high (> or = 95%), medium (85 - < 95%) and low (< 85%). Association between adherence as the outcome variable and predictor variables was tested using prevalence ratio and Chi squared test, or Fischer exact tests when expected cell size was less than 5.

Results: Seventy-eight percent of the 97 participants included in the study were female, resulting in a female to male ratio of 4 :1. The mean age of the participants was 36.7 (SD: 9.00) years with 80% of the participants being in the 20-44 age group. The mean duration on ART treatment was 20 (SD: 10.3) months with 76% of the participants being on ART for 24 or less months. The average adherence rate reported by mean composite of the three measures was 95.1%, while the proportion of patients who achieved adherence levels of 95% and above was 64%. The main barriers to adherence to HAART reported by participants were forgetfulness (28%), lack of food (13%) and being away from the pills (11%): facilitators reported included counselling (19%) and treatment supporters (11%). Having knowledge of the consequences of failing to take HAART as prescribed was significantly associated with adherence (p = 0.03), as was being female (p = 0.04) while living further than 6 km from the hospital was significantly associated with non adherence (p = 0.018).

Conclusion: The adherence rates reported in this study indicate an urgent need to design intervention measures to enhance adherence among patients on HAART in this setting.

DECLARATION:

I declare that **Adherence to Highly Active Antiretroviral Therapy and its major determinants among patients at Rundu Hospital, Namibia** is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Full name: **PATRICIA WANGUI KOMU**

Date: **13th May 2008.**

Signed.....

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ACRONYMS

AIDS	Acquired Immuno Deficiency Syndrome
ART	Antiretroviral Therapy
CDC Clinic	Chronic Disease Control Clinic, Rundu
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
MOHSS	Ministry of Health and Social Services, Namibia
NRTI	Nucleoside Reverse Transcriptase Inhibitor
NNRTI	Non Nucleoside Reverse Transcriptase Inhibitor
PI	Protease Inhibitor
UNAIDS	United Nations Joint Programme on AIDS
WHO	World Health Organization

CHAPTER 1

1. INTRODUCTION

1.1 BACKGROUND

Human Immunodeficiency Virus (HIV), which leads to Acquired Immunodeficiency Disease (AIDS,) continues to present major challenges to medical practitioners, public health practitioners and even development policy makers. The prevalence of the disease continues to increase and it was estimated that over 33 million people were living with HIV globally in 2007 with 68% of these in sub-Saharan Africa (UNAIDS, 2008).

The introduction of Antiretroviral Therapy (ART) and especially Highly Active Antiretroviral Therapy (HAART) has led to an improvement in both the quality and length of life of patients with HIV/AIDS (Pallela et al, 1998). Ironically, these drugs have not been accessible to most patients in sub-Saharan Africa where more than 79% of global AIDS deaths occurred in 2005 (UNAIDS 2006).

However, global advocacy, availability of generic drugs and drug price reductions have resulted in increased access to ARTs in low and middle income countries in recent years with an estimated 1.3 million people in these resource poor settings gaining access to treatment by December 2005 (WHO, 2006).

Adherence to treatment is considered the most important determinant for therapeutic success of HAART. Studies have indicated that a minimum adherence level of 95% is required for viral suppression and consequent improved immunologic response (Paterson

et al, 2000). The consequences of sub-optimal adherence are treatment failure and emergence of drug resistant strains of HIV that that would require more complex and expensive treatment regimens (Bangsberg et al, 2001). The emergence of HIV drug resistant strains and the consequent requirement of expensive second line drugs would not only impact on access to ARTs, but would also result in negating the established and intended cost benefits of scaling up of ART provision in sub- Saharan Africa. This premise is also supported by Gill, Hamer, Simon, Thea & Sabina (2005) , who point out that the need for adherence monitoring and support in sub-Saharan Africa is greatly underscored by the increasing access to ARTs in sub- Saharan Africa and the large number of people whose disease would progress with sub optimal adherence in the region.

Namibia is situated in south western Africa and is one of the fourteen countries that comprise the Southern African Development Community (SADC). In 2007, Namibia had a population of 2.0 million people with an estimated 230,000 people, living with HIV/AIDS and approximately 61% of them women (UNAIDS, 2008). A sentinel survey on pregnant women attending antenatal clinics in 2006, reported a HIV prevalence rate of 19.9% (MOHSS, 2007b). The same survey reported the highest age- specific prevalence ratio as being among those aged 30 to 34 years.

The Ministry of Health and Social Services in Namibia, launched the Anti Retroviral Treatment Programme in six public health facilities in 2003 and the national target was that, 30,000 people would be on HAART by 2008 (MOHSS, 2004: UNAIDS,2008).

However, a UNAIDS Report published in 2008 , showed that, by December 2006, over 30,000 people with advanced HIV infection, 66% of them women, were receiving free antiretroviral therapy from the 34 public hospitals in Namibia (UNAIDS, 2008). This is an illustration of the rapid scaling up of the ARV program in Namibia. According to the same UNAIDS Report, 84% of the patients who enrolled for the HAART Programme were alive and still on treatment, 5% had died, 2% had defaulted and 9% were unknown. These reported outcomes underscore the need for programme monitoring as more patients are enrolled for HAART in Namibia.

In 2003, Namibia produced and adopted National Guidelines for Anti – retroviral therapy (MOHSS, 2003). These guidelines outline: provider, regimen and health related measures to promote and ensure continuous adherence to HAART. The guidelines also outline the social criteria which the patients should meet so as to be eligible for HAART in Namibia. Similarly, the guidelines recommend ongoing patient education and continuous monitoring of adherence among patients on HAART.

However, from 2003 to date, no official studies on adherence levels or factors affecting adherence have been conducted in Namibia. Thus, since the introduction of ART in the public health sector in 2003, there is no baseline data on adherence levels or the correlates of adherence to ART in Namibia.

Rundu Hospital, which is situated in North Eastern Namibia, is the setting of this study. Rundu Hospital was one of the six sites that started the provision of ART in Namibia in

2003. The ART Programme commenced at Rundu Hospital in September 2003 and by May 2007, about 1300 patients were registered on HAART at the hospital. Approximately 10% of these were lost to follow up and the adherence levels of the remaining 90% were unknown (MOHSS, 2007a). In addition the factors affecting adherence to HAART among these patients on HAART have not been determined. This highlights a gap in the monitoring of the programme as measuring levels of adherence and identifying correlates of adherence is essential for promoting interventions that ensure continuous optimal adherence among patients on HAART.

This study aims to obtain baseline data on adherence levels and the factors that affect adherence among adult patients on HAART at Rundu Hospital. This information could then be used to develop practical interventional strategies to enhance adherence among patients on HAART at this hospital.

1.2. SUMMARY

In this report, literature on the challenges of measuring adherence, achieving optimum levels of adherence and identifying the correlates of adherence among patients on HAART in a resource limited setting, will be reviewed. Then, the aims and the objectives and the methodology used for the study will be outlined. Thereafter, the results obtained from the study will be presented and discussed. Finally, the conclusion and recommendations from the study will be presented.

CHAPTER 2

LITERATURE REVIEW

Adherence to long term therapy has been a topic of research for more than three decades (Yach, 2003, as cited by WHO, 2003 a). However, the introduction of Antiretroviral Therapy (ART) and especially Highly Active Antiretroviral Therapy (HAART) has pushed treatment adherence into a high priority agenda for medical and behavioural researchers. The challenges of HAART are the requirement of "near perfect" adherence in a complicated regimen involving long term treatment , with suboptimal adherence being associated with treatment failure and emergence of HIV drug resistant strains (Chesney, 2000: Patterson et al, 2000 : Bangsberg et al 2001). The emergence and transmission of a drug resistant virus would require more expensive drug regimens and impact negatively on the established and intended benefits of ART programmes especially in sub- Saharan Africa where the scaling up of ART programs is considered essential to counter the devastating effects of HIV/AIDS in the region (Harries et al, 2001).

In this chapter, the main concepts of the study which were: importance of adherence in HAART, measurement of adherence, adherence levels in sub - Saharan Africa and correlates of adherence are reviewed.

2.1 ADHERENCE AND HAART

Adherence has been defined as "… the extent to which a person's behaviour – taking medication, following a diet and or executing lifestyle changes corresponds with agreed recommendations from a health care provider ..."(Sabate, 2001, as cited by WHO, 2003a:18). Adherence therefore encompasses the concept of an informed patient actively and accurately participating in a plan of care.

HAART is a multidrug regimen, composed of different classes of ARV drugs, whose goal is maximal and durable viral suppression, and restoration of immune response so as to halt the progression of AIDS. According to WHO recommendations, HAART normally consists of two nucleoside reverse transcriptase inhibitors (NRTI), a non nucleoside reverse transcriptase inhibitor (NNRTI) and, or a protease inhibitor (PI) (WHO, 2003b). Currently in Namibia, recommended first line regimens consist of a combination of two NRTIs and a NNRTI while second line regimens replace the NNRTI with a PI (MOHSS, 2003). The NRTIs currently used for first line treatment are lamivudine, stavudine, zidovudine and tenofovir while NNRTIs used are nevirapine and efavirenz and the PI used is boosted lopinavir.

HAART, therefore, is a complicated regimen which has proven to be efficacious in inhibiting HIV replication and consequently reducing HIV associated morbidity and mortality (Chesney, Morin & Sherr, 2000). However, to achieve these treatment benefits, an unprecedented high level of adherence for an indefinite time period is required (Boden, Hurley& Zang, 1999: Rabkin & Chesney, 1999).

The direct association between adherence to HAART and viral suppression has been confirmed by studies whereby sub optimal adherence is associated with poor virological and immunological responses characterized by progression to AIDS, detectable viral loads and low CD4 cell counts. For instance, Patterson et al, (2000), in a prospective observational study involving HIV infected patients on Protease Inhibitor therapy, reported that in patients with adherence rates of 95% and above, only 22% had virological failure in contrast with 61% in the patients with adherence rates of 80-94%.

Similarly, findings from a cross-sectional analysis of HIV positive homeless patients on Protease Inhibitor therapy showed that none of the individuals with adherence levels greater than 90% progressed to AIDS while 38% and 8% of those with adherence rates of greater or equal to 50% and 51-89% respectively progressed to AIDS (Bangsberg et al, 2001). Common to these two studies is the use of protease inhibitors which raises the question whether the 95% optimal adherence rate is also required in other HAART treatments.

However, in a prospective cohort study over 12 months of HIV infected patients on HAART treatment involving both protease inhibitor therapy and non protease inhibitor therapy, Mannheimer, Friedland, Matts, Child & Chesney (2002), reported a strong association between HAART adherence, virologic suppression and immune recovery. In this study, the percentage of patients with undetectable viral loads at 12 months was 66%, 47% and 17% among the groups with 100%, 80-99% and 0-79% adherence rates

respectively. Similarly, the mean increase in CD4 cell count was 179, 159 and 53 cells /mm³ among the groups with 100%, 80-99% and 0-79% adherence rates respectively.

Although these studies do not fully define effective adherence levels, they highlight the relationship between adherence and treatment outcomes and suggest that adherence levels of near 100% are critical in order to achieve treatment benefits with HAART, irrespective of the regimen.

2.2. MEASUREMENTS OF ADHERENCE

The studies mentioned above suggest that a high level of adherence to treatment is required to achieve the full treatment benefits of HAART which include prevention of viral resistance, reduced destruction of CD4 cells, maximum and durable suppression of viral replication and slowed disease progression. This relationship between adherence and treatment outcomes underscores the need to measure adherence in clinical settings.

2.2.1. STRATEGIES USED TO MEASURE ADHERENCE

Adherence is an individual, complex and dynamic human behaviour presenting unique challenges which make accurate measurement very difficult. While adherence can be ensured by direct observed treatment, this is impractical in regimens involving more than once daily doses and lifelong treatment like HAART. Consequently, adherence behaviour is measured using indirect methods. Currently, there is no gold standard to measure adherence to HAART, thus a variety of strategies are employed. Surrogate markers that are used to quantify adherence include plasma drug level monitoring, electronic drug

monitoring, patient self reports, pill counts and pharmacy records (Vitolins et al ,2000: Bangsberg et al 2001: Liu et al,2001)

Plasma drug level monitoring measures the drug concentration in the blood to ascertain whether the patient has ingested the drugs. The limitations of this method include the lack of indication of the time the drug was taken and the fact that other factors like plasma binding, affect plasma drug levels. Another limitation is the cost involved which would influence the use of this method in resource limited settings.

Electronic drug monitoring involves an electronic device being fitted to pill containers which record the time and date when the medication bottle is opened. Thus removal of the cap provides a proxy for the removal of a dose (Bangsberg et al, 2001). However, this method is expensive and makes the assumption that recorded bottle openings represent actual pill ingestion which could result in overestimation of adherence.

Pharmacy records are used to monitor prescription refills whereby collecting the medication on the due date is assumed to be adhering to treatment. This strategy is considered an objective approach to quantify adherence and due to its low cost, it is a practical method in resource limited settings (Nachega et al, 2006). However, for pharmacy records to be an effective proxy of adherence, an effective record system is essential and may require the use of only one pharmacy for refills. A limitation of this method is the assumption that prescription refilling corresponds to taking medication which could again result in overestimation of adherence.

Pill counts are another method used to assess adherence. Pills are counted after a certain period and the excess pills considered evidence of non adherence. Pill counts can either be announced whereby the patient is aware that the pills will be counted on a specific day: or unannounced whereby pill counts are done without prior warning (Liu et al, 2001). Unannounced pill counts may reduce pill dumping which is a limitation generally associated with this approach. Pill counts are a strategy that is considered objective and also inexpensive thus making it favourable in resource limited settings. However, it is labour intensive especially in a clinical setting and the assumption that the missing pills were ingested could result in overestimation of adherence.

Self report involves the patient reporting on their adherence behaviour. The tools used to collect information include questionnaires and visual analogue scales. Questionnaires are used to ask the patients on their adherence behaviour for instance on specific days. A visual analogue scale is a measurement instrument that tries to measure a characteristic that ranges across a continuum of values (Crichton, 2001). For the measure of adherence, a patient is asked to report on their adherence behaviour using a scale, for instance a line marked 1 to 10 (Walsh, Mandalia & Gazzard, 2002). In the current study, the visual analogue scale used was a container with beads marked with a scale of 1 to 10. The beads represented the pills that were supposed to be taken in a month and the participants were asked to empty beads that represented the pills they had ingested in the last 30 days, and thereafter, the remaining beads were then measured using a line scale of 1 to 10. A similar visual analogue scale was used in an ART adherence study in Tanzania (Irunde, Temu, Maridadi, Nsimba & Comoro, 2006). Self report as a strategy has the advantage of

low cost, ease of administration and can help to determine reasons why patients fail to adhere, which increases the strategy's practicability in resource limited settings. However it is vulnerable to recall bias and social desirability and therefore tends to overestimate adherence.

2.2.2. CHALLENGES OF MEASURING ADHERENCE

The challenge to accurately assess adherence in both clinical and research settings is demonstrated by studies that use different adherence measuring strategies. In most of these studies, the HIV viral load is used as an external criteria, whereby the strength of association between viral load and the surrogate measure is used to demonstrate construct validity of the individual measure (Grossberg, Zhan & Gross,2004: Fairley, Permane & Read,2005).

A study by Arnsten, Demas, Grant, Gourevitch, Farzedegan & Howard (2001) compared self report and electronic drug monitoring and found adherence levels of 79% with self report in contrast to only 53% by electronic drug monitoring. The study further validated these findings through viral loads whereby it was found that patients whose electronic drug monitoring data indicated adherence levels of more than 90% were more likely to achieve undetectable viral loads than patients self reporting the same level of adherence.

A similar study by Liu et al (2001) concurrently compared three measures of adherence to HAART against patients' undetectable viral load rates. The study found mean adherence levels of 63% (SD 0.31) by electronic drug monitoring, 83% (SD 0.17) by pill count and 93% (0.14) by self report. Moreover, the mean difference in adherence

between patients who had detectable viral loads and those with undetectable viral loads after 8 weeks were statistically significant using electronic drug monitoring ($p = 0.02$) and using pill counts ($p = 0.01$) but were not statistically significant when using self report ($p > 0.2$). Findings from these studies showed a lack of correspondence between the different adherence measures and undetectable viral loads which suggested overestimation of adherence by these adherence measures.

However, the choice of strategy is often influenced by financial and logistic factors. For instance, despite the tendency to overestimate adherence, self report is the most commonly used method in both resource rich and resource constrained settings, due to ease of administration and low cost. This popularity is observed in a meta analysis by Mills et al (2006 a) which reported 71% of North American studies and 66% of sub - Saharan African studies included in the meta-analysis used self report to measure adherence.

An observation from the same meta-analysis is the use of multiple measures to assess adherence by 6% of North American included studies and 22% of sub - Saharan African studies. In the present study, three adherence measures were used to assess adherence: 2 day self report, 30 day report using a visual analogue scale and pill counts. Multiple strategies to measure adherence have been used in studies to ensure accuracy of adherence estimates as strengths of one method compensate for the weaknesses of the other while at the same time collecting data on different dimensions of adherence (Liu et al 2001: Arnsten, et al, 2001). Multiple measures to assess HAART adherence, similar to

those used in the current study, have been validated in studies conducted in sub-Saharan Africa (Oyugi et al, 2004: Steel, Nwokike & Joshi, 2007). Thus the use of multiple measures in this study was aimed at increasing the accuracy of the reported adherence levels.

2.2.3. MEASURES OF ADHERENCE LEVELS

Considering the importance of adherence in HAART, adherence should be monitored at both individual and programme levels thus two measures are frequently used to report adherence to HAART. The first one records adherence as the proportion of doses taken correctly and is reported as the mean adherence level of a given population while the second reports the proportion of the patients taking at least 95% of their HAART medication correctly which reflects adherence on a programme level.

Thus the first measure is an indication for the clinical evaluation of individual patients which is relevant for counselling purposes. The second measure, on the other hand, is a population measure and therefore is essential for programme evaluation and planning. Laing & Hodgkin (2006), argue that both adherence levels, which are collected using the same strategies, should be used as outcome measures. This is on the premise that average adherence levels may appear high, but if only a fraction of users are achieving optimal adherence , there is still a danger of poor health outcomes for most of the ART users.

An illustration of this discrepancy is a cross-sectional study by Irunde et al (2006) in Tanzania, which reported a mean adherence rate of 90%. However, only 21% were reported to have achieved adherence levels of 95% and above. Thus despite high mean adherence levels, most of the patients were not obtaining the full benefits of their treatment.

Thus, in addition to improving access to ARVs to more patients living with HIV/AIDS in sub - Saharan Africa, ART programme goals should also include achieving and sustaining optimal treatment outcomes.

Evolving evidence shows that the relationship between adherence levels and virologic suppression varies among different classes of ARVs. Indeed emerging data indicates that ARV classes may have different adherence relationships with some classes manifesting virus resistance at low adherence levels and others at high to moderate adherence levels (Walsh et al , 2002: King,Brun,Tschampes,Mosley &Kempf, 2003). This additional dimension in adherence levels indicates that categorizing adherence purely into optimal and sub optimal levels is not adequate as further exploring of adherence is required in order to understand the dynamics of the different components of HAART. Accordingly, adherence should be categorized into high, medium and low levels during statistical analysis. Bangsberg, Moss & Deeks (2004) propose that categorizing adherence this way facilitates the exploring of patients' adherence behaviour. Thus analysing adherence in this categorization may be useful in studies aimed at designing interventions to support adherence to HAART as is the case with the present study.

2.3. ADHERENCE LEVELS IN SUB -SAHARAN AFRICA

The consequences of sub optimal adherence to HAART have both individual and public health implications (Chesney, 2000). For the individual, drug resistance and emergence of resistant strains would result in an uncertain prognosis and the requirement of more toxic and complex drugs. From a public health perspective, the emergence and transmission of a drug resistant virus would not only impact negatively on the benefits intended by the ART programmes but would also result in increasingly more people requiring more expensive drugs thus increasing the costs of the ART programme. This public health perspective has been a major concern on the impact and feasibility of increasing accessibility of HAART to more patients in resource limited sub- Saharan Africa (Harries et al, 2001: Liechty & Bangsberg,2003).

This concern however, is not supported by studies conducted so far. Indeed, studies seem to suggest that adherence may be higher in sub- Saharan Africa than in developed countries (Weiser et al, 2003: Orrel, Bangsberg, Badri & Wood 2003: Nachega et al, 2004). Similarly, findings from a meta analysis by Mills et al (2006a) involving 37 studies conducted in North America and 27 in sub - Saharan Africa reported significantly higher levels of ART adherence in sub - Saharan Africa compared to North America ($p < 0.001$). The meta analysis, which controlled selection bias by including only studies that involved mixed populations so as to best reflect the general populations in the respective regions, reported an estimate of 55% (95% CI 49% - 62%) of North

American ART users achieving optimal adherence compared to 77% (95% CI 68% - 85%) of sub - Saharan African ART users.

Though these findings suggest that more patients were achieving adequate levels of adherence in sub- Saharan Africa, it should be noted that these patients who were in early treatment programmes, may have been on uncomplicated regimens and with early access to limited therapy regarded ART as a precious resource unlike their North American counterparts. Other studies conducted in sub - Saharan Africa have shown that adherence reduces with time (Laurent et al, 2002: Akam, 2004). These observations support the hypothesis by Gill, Hamer, Simon, Thea & Sabina (2005) that maintaining these high adherence levels in sub- Saharan Africa may prove to be challenging with time and the increasing access to ART by patients living with HIV/AIDS.

With increasing accessibility to ART in sub - Saharan Africa, a number of studies have been conducted in routine health settings similar to this study. For instance, a cross-sectional study by Nwokike (2005) used 7 day recall self report and pill count to measure adherence in 176 participants receiving free ART from a general hospital in Botswana. The study reported an average adherence rate of 83%, however, only 57.4% patients had achieved adherence levels of 95% and above.

In contrast, another cross-sectional study in Botswana, involving 514 ART users in four district hospitals reported that 77% (95% CI 73.1 – 80.9) patients had achieved adherence levels of 95% and above. The study which used 2 day self report, 30 day recall using a

visual analogue and pill counts to measure adherence in ART users in four district hospitals in Botswana also reported a mean adherence rate of 94% (Kgatlwane , Ogenyi , Ekezie, Madaki, Moyo, & Moroka, 2006).

In Zambia, a cross-sectional study used pill counts and pharmacy records to measure adherence among 424 patients receiving HAART at a rural hospital and reported that 83.7% of the patients achieved adherence levels of 95% and above (Carlucci et al, 2008).

These studies show that adherence levels in sub - Saharan Africa vary which underscores the need to measure adherence as more patients gain access to HAART in the region. The focus of these studies was quantification of adherence rates and identification of facilitators and barriers of adherence which were similar to the aims of the present study. Similarly, the use of low cost multiple measures of adherence to obtain more accurate adherence levels in these resource limited settings were pertinent to this study. However, due to high cost, viral load testing was not routinely performed on ART patients in resource limited settings thus lack of validation of reported adherence levels with viral loads was a limitation in these sub- Saharan African studies and also in this study.

2.4. CORRELATES OF ADHERENCE

While adherence is important in any treatment, the critical nature of high levels of adherence HAART in order to achieve the treatment benefits have already been emphasized (Boden, Hurley, Zang, 1999: Patterson et al, 2000). Hence having a clear understanding of both the barriers and facilitators of adherence will assist clinicians in

identifying patients who need assistance with their pill taking and to design and evaluate interventions that enhance adherence. Several studies have classified barriers to adherence into the following categories: as related to patient, regimen, disease and the health care system variables (Murphy, Roberts, Martin, Marelich & Hoffman, 2003: Powell-Cope, White, Henkelman & Turner, 2003).

2.4.1. PATIENT VARIABLES

Patient variables comprise socio-demographic factors and psychosocial issues. Socio-demographic factors include age, gender, education level and economic status while psychosocial factors include mental illness such as history of substance abuse or depression, social support, knowledge and beliefs about HIV (Chesney, Ickovics, Chambers, 2000 : Murphy, Wilson, Durako, Muenz & Belzer, 2001).

Some, studies conducted in developing countries show that other socioeconomic factors seem to affect adherence to HAART. Mills et al (2006 b), in a systematic review of 84 studies on patient reported factors affecting adherence in both developed and developing settings, lists financial constraints and insufficient knowledge about HAART as barriers to adherence in developing nations.

Financial constraints have also been reported as barriers in other studies in sub- Saharan Africa (Weiser et al, 2003; Ndayanga et al, 2004: Akam, 2004). These financial costs are mostly related to transport costs to the hospital and food costs rather than the costs of buying the ARVs. Transport costs were also reported as barriers of adherence in recent

studies in Rwanda, Uganda and Botswana (Mukabatera, et al, 2004: Nakiyemba et al, 2006: Kgatlwane et al, 2006).

Beliefs and knowledge about HIV have also been associated with adherence to ARVs. Studies included in the systematic review by Mills et al (2006 b) report difficulties in understanding both the treatment instructions and the importance of adherence in HAART, as barriers to adherence in developing nations. In addition, difficulties in understanding the importance of adherence in HAART, may be linked to having insufficient knowledge on HAART that was reported as a barrier to adherence in studies in Burkina Faso and Rwanda (Traore et al, 2004: Mukabatera et al, 2004).
On the other hand, knowledge on HIV and HAART may also be linked with beliefs which impact on adherence. For instance, use of alternative treatments to HIV, was reported to be associated with non adherence in studies in sub - Saharan Africa (Eholie et al, 2004: Ndayanga et al, 2004: Akam, 2004). This may be due to lack of belief in the effectiveness of HAART that may be a result of having insufficient knowledge on HIV or HAART.

Other patient characteristics that have been associated with adherence to HAART are age and gender but these have not been consistent across studies. For instance Diabate, Alary & Koffi (2007), in a prospective study in Cote d'Ivoire reported that being older than 35 years was associated with non adherence. However, another study in Nigeria reported that female gender was associated with adherence but found no significant association between adherences and age (Abah et al, 2006).

Stigma and disclosure of HIV status are other patient characteristics that have been associated with non adherence in studies across Sub - Saharan Africa (Mukabatela, 2004: Nakiyemba, et al, 2006). A study in South Africa by Nachega et al, (2004), reported that fear of stigmatization by sexual partners was associated with non adherence. Stigma and disclosure are closely linked as patients may not disclose their status for fear of stigmatization by family members or the community which could result in lack of social support and consequently non adherence.

2.4.2. REGIMEN CHARACTERISTICS

HAART involves a regimen of three or more ARVs, resulting in a complicated regimen that is also lifelong (Chesney, Morin & Sherr, 2000). These regimens involve a high pill burden of different drugs that require either different timing of doses or different food requirements. These are all factors that could contribute to non adherence. However, the more recent introduction of fixed doses has greatly reduced the pill burden as two or sometimes three drugs are incorporated in one pill (Oyugi et al, 2004).

Other regimen characteristics that might affect adherence are dosing schedules for instance Patterson et al (2000) reported that twice daily doses were associated with better adherence than three times daily dosing. Adherence levels were found to be higher with certain ARV combinations within the same study in Senegal and Botswana (Laniece et al, 2003: Nwokike, 2005). This could be due to different dosing schedules among the drugs in an ARV combination. For instance one ARV combination may have drugs that require

twice daily dosing and others that require once daily dosing which would complicate the combination and lead to non adherence.

These multiple daily doses may sometimes be accompanied by extensive toxicity and side effects which further influence the patient's ability and willingness to adhere to HAART (Chesney, 2000: Orrell et al ,2003). HAART is associated with a range of different side effects, some of which are temporary like nausea while others may be longer lasting like lipodostrophy. However, a number of studies have reported that the occurrence of side effects did not affect adherence to HAART (Weiser et al, 2003: Nakiyemba et al, 2006). This may suggest that the individuals' perception of the need for medication in relation to its adverse effects largely depends on that individual's context.

2.4.3 DISEASE CHARACTERISTICS

The stage and duration of HIV infection, severity of symptoms, level of disability, rate of progression of disease and opportunistic infections could all potentially impact on adherence to HAART. Whilst, there has been inconsistent findings regarding CD4 cell count and clinical stage of HIV as correlates of adherence (Amassari et al, 2002: Orrell et al, 2003), little is known of the effect of other disease factors on adherence.

In Namibia, the recommendations are to commence HAART in HIV positive patients with a CD4 cell count of less or equal to 200cells/mm^3, irrespective of the WHO staging or WHO AIDS clinical stage 3 or 4 irrespective of the CD4 cell count (MOHSS, 2003). The existence of other clinical conditions like tuberculosis is common among these

patients which in turn affect the clinical condition of the patient (MOHSS, 2007a). Such co- morbidity determines the choice of regimen for the patient and also increases the pill burden which might further impact on adherence.

2.4.5. HEALTH CARE SYSTEM VARIABLES

Health care system variables include patient- provider relationship and the specific characteristics of the health care setting. Studies in resource limited settings have identified health care settings as an important factor in adherence to ARVs.

For instance, intervals of more than 6 months between medical visits and insufficient medical counselling were found to be barriers to adherence in patients initiating HAART in Brazil (Bonolo et al, 2005). Counseling was also associated with adherence to HAART in some studies in sub - Saharan Africa. For instance, adherence partners and pharmacy adherence counseling were reported as adherence promoters in Botswana (Nwokike, 2005). Similarly, the number of counseling sessions before commencing HAART was identified as a predictor of adherence in Uganda (Muganzi, Bondo, Drana & Biryeni, 2004). Counselling impacts on patients' knowledge and information on HIV and HAART which could address some patient variables like beliefs, regimen characteristics like dealing with side effects and disease characteristics such as opportunistic infections. In addition, adherence supporters provide some level of social support which could help address stigma and disclosure issues while also acting as reminders to enhance adherence.

Other health care systems issues including long distances to hospitals, long waiting times, insufficient counselling on HAART and lack of confidentiality in health facilities were also identified as barriers to adherence to HAART in studies in sub - Saharan (Irunde et al , 2006: Nakiyemba et al, 2006). Similarly, long distances to health facilities were also identified as a barrier to adherence to HAART in Botswana, (Weiser et al, 2003: Kgatlwane et al, 2006). Long distances to hospital and long waiting times are issues associated with accessibility to ARV services and should be addressed during scaling up of ART programmes.

Exploring these different variables shows that they are interrelated in complex ways in their impact on adherence whereby the health care system provides an interface between most of the factors that affect adherence. For instance, health care systems determine the medication distribution systems and continuity of care which directly or indirectly affect adherence. Similarly, health care systems allocate human and drug resources consequently affecting accessibility, quality of counselling, intervals between appointments, all which impact on patients' adherence behaviour.

Whilst all these factors highlight the key role of the health care system in supporting adherence, it is widely recognized that, targeting the health system alone is not sufficient. Hence adherence promoting interventions should address the full range of contextual factors that affect adherence in order to enhance adherence to HAART. This argument is echoed by the WHO Report which acknowledged the complexity of the factors that affect

adherence and recommended a multifaceted approach to improve adherence (WHO, 2003a).

2.5. SUMMARY

Adherence has been identified as a key element in reducing the likelihood of the emergence of drug resistant virus. Hence, the recent global efforts towards increasing access to ARV in resource limited settings, should match availability of ARV with successful treatment outcomes to avoid the emergence of drug resistant strains. Though earlier apprehension of low levels of HAART adherence in resource limited settings has been proven unfounded, adherence may still be a concern in the region. Identifying contextual factors that affect adherence to HAART is an important process in designing interventions aimed at sustaining optimal adherence levels.

The next chapter outlines the specific objectives of the present study and the methodology used to achieve these objectives.

CHAPTER 3

3. AIM AND OBJECTIVES

3.1. AIM OF THE STUDY

The aim of this study was to obtain baseline data on adherence levels and to identify the major determinants of adherence among adult patients on HAART at Rundu Hospital, Namibia.

3.2. OBJECTIVES OF THE STUDY

1. To measure the adherence rates among adult patients on first line HAART regimens at Rundu Hospital

2. To measure barriers to optimal adherence among adult patients on first line HAART regimens at Rundu Hospital.

3. To measure factors that facilitate optimal adherence among adult patients on first line HAART regimens at Rundu Hospital.

4. To analyse the association between the identified factors and adherence among adult patients on first line HAART regimens at Rundu Hospital.

3.3. SIGNIFICANCE OF STUDY

This study is the first of its kind in Namibia and hence the findings may be useful in developing appropriate intervention strategies to improve and sustain optimal adherence in patients on HAART in similar settings in Namibia. This is particularly important given the ongoing countrywide roll-out of the ART programme in Namibia. In addition, the study may provide baseline adherence data that could facilitate the comparison of the

ART programme in Namibia with other similar programmes in the sub - Saharan Africa region.

CHAPTER 4

4. METHODOLOGY

4.1. STUDY DESIGN

A cross-sectional survey with both descriptive and analytical components was undertaken. The descriptive component aimed to describe the socio-demographic characteristics, adherence rates and magnitude of barriers and facilitators of adherence among adult patients on HAART in Rundu Hospital whilst the analytic part aimed to identify the barriers and facilitators of adherence.

The design was selected to enable measurements of adherence and exploration of associated factors at the same time for a baseline measure.

4.2. STUDY SETTING

Rundu is a peri-urban district in the Kavango Region located in the North East of Namibia. The catchment population is 117,000 and the major source of income is subsistence farming. Rundu Hospital is a 200 bed hospital which functions both as a district hospital and a referral hospital for three other district hospitals: two in the Kavango region and one in the Caprivi region.

Rundu Hospital commenced its ART programme in 2003 and by June 2007, 1300 adult patients were receiving HAART at the hospital, with an average monthly uptake of 50 patients (MOHSS, 2007). Approximately 95% of these HAART patients were on first line regimens which comprised two nucleoside reverse transcriptase inhibitors (NRTI) and a non nucleoside reverse transcriptase inhibitor (NNRTI). Patients on second line

regimes receive two nucleoside reverse transcriptase inhibitors (NRTI) and a protease inhibitor (PI) in place of the nucleoside reverse transcriptase inhibitors (NRTI) (MOHSS 2003). The NRTIs currently used for first line are Lamivudine, Stavudine, Zidovudine and Tenofovir. NNRTIs used are Nevirapine and Efavirenz while the PI used is boosted Lopinavir. The NRTIs are available as fixed combined doses as Lamivudine and Stavudine or Lamuvudine and Zidovudine so as to simplify regimens.

Patients on HAART receive treatment free of charge at the hospital. Adult patients for follow up appointments are seen at the Chronic Disease Clinic (CDC) daily and the names of patients due for follow up on a particular day are obtained from the computer at the clinic. On arrival, patients are received at the reception area where their files are retrieved by the data clerk and then seen by the nurse. The nurse checks the vital parameters like temperature, blood pressure and weight and then directs the patients to the doctor who prescribes the drugs and determines the next follow-up appointment dates which are usually after two months. Thereafter the patients go to the pharmacy where their remaining pills are counted and new ones dispensed. The total number of pills that the patient takes home is either recorded in the patients' health cards or on the pill container labels. Since the patients take their health cards home, the records at the hospital only reflect the number of pills that are dispensed to the patient and not the total number that the patient takes home.

4.3. STUDY POPULATION

The study population was patients aged 18 years and above who were on first line regimen of HAART and attending Rundu Hospital at the time of the study. Inclusion criteria were:

- Patients aged 18 and above
- Patients on first line regimens of HAART
- Patients who had been receiving HAART at Rundu Hospital for at least 6 months prior to the commencement of the study
- Patients who gave informed consent to participate in the study
- Patients who attended follow up appointments during the study period

The study population was estimated to be 1,300 based on CDC data (MOHSS, 2007a).

The rationale for selecting the study population was that adherence measures in patients under 18 years of age, may on average, be more likely to be influenced by factors related to supervision of medication by caregivers' rather than particular choices made by the patients themselves. Patients on first line regimen were chosen, because second line treatment was reserved for patients who had failed on first line treatment and this may have confounded the study. The choice of the duration on treatment was based on the assumption that patients on treatment for six months or less were given one month of follow up while the rest were given follow up appointments of two months.

4.4. SAMPLING

The sample size was determined using survey Epi Info version 3.3 (CDC, 2004) for calculation of sample size for a population survey. The study population was estimated to be 1,300 based on CDC data (MOHSS, 2007a) and the expected prevalence of patients achieving optimal adherence (taking $\geq$ 95% of medication) was between 84% as the best acceptable rate and worst acceptable estimate was 75% (Personal communication with Mano: 12 September 2007). The estimates were based on two provider estimates using pill count records at the pharmacy. Using 95% confidence levels, the required sample size was 61 patients. In this study, it was decided to include 100 participants to account for those who might decline to participate. A list of names of patients due to attend scheduled follow up to CDC for the period between 4th December 2007 to 7th Dec 2007 was obtained from the clinic. From this list, patients who did not meet the inclusion criteria were excluded to form a sampling frame of 347 patients. From this sampling frame, every third patient was selected resulting in a sample of 115 patients. This was done to cover for patients who might not turn up since the list was drawn beforehand and some selected patients might miss their appointments.

4.5. DATA COLLECTION TOOL

The data collection tool used was a structured adherence questionnaire in English. The questionnaire was adapted from the adherence measurement tools used in similar studies in Botswana and Tanzania to suit the Namibian setting (Kgatlwane et al, 2006: Irunde et al, 2006). The adherence measurement methods used were 2 day recall using a sun and moon chart, 30 day recall using a visual analogue scale and pill count. The administration

of the questionnaire was preceded by providing participants with an information sheet and an informed consent form; both of which were in English and Rukwangali, the local language, in order to facilitate understanding of the contents.

The questionnaire which was composed of seventeen questions was divided into three parts (appendix 5). The first part collected socio- demographic data, the second part collected data related to treatment and the third part comprised the adherence measurement tools.

4.5.1. SOCIO-DEMOGRAPHIC DATA.

The socio-demographic data included age, sex, and marital status, level of schooling and place of residence. Age was obtained using month and year and then computed later. Similarly, distance to hospital was computed from data obtained on the place of residence of the participant and the nearest health facility. Collecting data in this manner ensured its accuracy and facilitated verification of socio-demographic data the data from the patients' health cards.

4.5.2. TREATMENT DATA

The data collected on treatment included duration on treatment, experience with side effects and knowledge of consequences of failing to take medication as prescribed. Like age, duration on treatment was collected as month and year while all the other questions were in a multiple choice format. The questions on reasons for missing doses and appointments were phrased in a nonjudgmental manner. The question on treatment

regimens required verification of the patients' pill containers with the patients' health cards to ensure accuracy.

4.5.3. ADHERENCE MEASUREMENT TOOLS

The third part of the questionnaire collected adherence data using three different measures: a 30 day self report using a visual analogue scale, 2 day recall using a sun and moon chart and a pill count. The 30 day visual analogue scale required participants to pour beads from one container representing the pills they were supposed to have taken in a period of 30 days, into another container representing the pills actually taken in the same period. The pills left in the first container therefore represented the pills missed and adherence was then measured using a line marked 1-10 on the first container. This was done for each drug in the regimen. The use of beads in the visual analogue scale instead of a single line provided a more demonstrative and relevant measure to participants especially those with low education levels.

The 2 -day recall used a sun and moon chart that also indicated time in one hour intervals. The participants were required to state the time when the dose of each drug in the regimen was taken starting from the previous day to two days prior. Adherence was then calculated as a percentage of the interval between the doses in relation to the interval required. The use of a sun and moon chart was selected as it illustrated time in a concept that was relevant to patients in this study setting.

The pill count was obtained by determining the number of pills returned, the number of pills dispensed in the previous refill and the number supposed to have been taken in a given period. This information was obtained from the pill containers and the patients' cards. Adherence was then calculated as the number of pills supposed to have been taken minus the number of pills missed in a given period as the numerator and the total number of pills supposed to have been taken in the same period as the denominator. This was calculated for each drug in the regimen and the average computed. Adherence rates that were over 100% using this adherence measure were recorded as 100%.

4.6. PILOT STUDY

A pilot test was conducted on patients receiving HAART at the CDC in Rundu Hospital in November 2007. Prior to data collection, the hospital pharmacist and the medical superintendent of Rundu Hospital were informed about the study and were provided with copies of the information sheet, consent form and questionnaire. The research team comprised of the chief researcher and four research assistants. The chief researcher was the author while the research assistants were one trainee pharmacist and three trainee nurses. The exercise was used to test the data collection tool for clarity, cultural sensitivity and the suitability of the questions to capture the relevant data. The pilot study also acted as a practical training session for the research assistants and in particular to introduce them to the concepts of adherence measures that would be used in the study. The pilot study was also used to test the applicability of the standard procedure code for the questionnaire.

Thirty patients, who were representative of the proposed sample for the main study, were selected from a list of those attending the clinic on three days using a systemic sampling method. The pilot study resulted in changes in the study inclusion criteria and also to the questionnaire. In respect to the inclusion criteria, it was discovered that patients who had been on treatment for six months and less were given a one month follow up while patients on longer treatment duration were given a follow up appointment of two months. Consequently, the inclusion criterion was changed from patients being on HAART for at least three months to being on HAART for at least six months.

In the case of the questionnaire, it was found that due to lack of reliable transport, many modes of transport including bicycles and donkey carts were used. Thus, the cost of travelling to Rundu hospital varied even for patients from the same place resulting in the question on travel costs not being a very sensitive indicator of transport costs. In addition, participants found it difficult to estimate the distances from home to the hospital and the question was changed to collect the place of residence and the nearest health facility. The distance from the health facility to the hospital was then used to calculate a proxy measure of the distance from home to the hospital. This strategy was utilized because some inland areas were not reflected in the local maps which would be used to compute the distance. The questions on missed doses and appointments were found to require more probing in order to elicit effective response and this instruction was included in the data collection procedures for the research assistants.

It was observed that patients tended to respond that they had not missed any doses when the chief researcher administered the questionnaire or was present during the interview but were more open with the research assistants. A possible reason was that there were issues of social desirability because unlike the rest of the research team, the chief researcher was a former pharmacist at Rundu Hospital and was known to most of the patients. Subsequently, it was decided that the chief researcher would not participate in the interviews. In addition the current hospital pharmacist gave input on the data collection process relative to the patient flow and as a result it was decided that the pill count should be conducted at the waiting room as the space in the pharmacy was not adequate. Finally, by piloting, it was discovered that HAART patients were seen at CDC four days a week (Tuesdays to Friday) and not two as earlier stated. Consequently data collection was done in four days in one week and not over two weeks as originally planned.

4.7. DATA COLLECTION PROCEDURE

Four research assistants conducted the interviews with patients on HAART at Rundu hospital between the 4th and 7th December 2007. The research assistants, who were divided into two teams, both stationed in the waiting area where the patients waited prior to seeing the doctor.

The first team of research assistants used the list to identify the selected patients using ARV numbers and thereby proceeded to introduce themselves, the information sheet and consent form to the participants. Only after the participants had signed the consent form, did the interviews commence with questions from the first and second parts of the

questionnaire covering socio-demographic and treatment related issues. The completed questionnaire was then coded using the patients' ARV number before being passed on to the second research team.

This second team first checked the questionnaire for completeness of information collected by the first team and then confirmed that the ARV number on the questionnaire corresponded to the ARV number on the patients' health card and that on the patient's pill containers. Next, the research assistants filled in details of the patient's treatment regimen on the questionnaire by confirming that the pills prescribed on the patients' passport were the same as the pills or containers presented by the patient. The research assistants then proceeded with the 30 day and 2 day adherence self report using the pill containers to ensure that adherence was reported for each drug in the regimen. This second team also obtained pill count data from the patients' cards, pill containers and actual counting of the returned pills. Finally the questionnaire was checked for completeness by the chief researcher before the patient left the CDC clinic. Double checking was carried out in order to ensure accuracy and completeness, while at the same time maintaining a smooth flow of participants.

4.8. DATA MANAGEMENT AND ANALYSIS

All answers to questions requiring computing were entered on the questionnaire in a distinct color and then double checked by the chief researcher for completeness and accuracy at the end of each day. A written code book detailing standard procedures,

which was developed by the chief researcher after the pilot study, was used to code the questionnaires which were then double entered into Excel files by two different research assistants. The two files were then compared and any anomalies or missing data between the two entries were checked using the questionnaires. The entered data was then scrutinized for invalid values and impermissible combinations and counterchecked with the questionnaires. This data was then exported into Epi Info version 3.3 (CDC, 2004).

Means, medians, standard deviation, range and frequency distributions were computed for all continuous variables. The three measures of adherence were evenly weighted to obtain a composite adherence. Two measures of adherence were computed: one measure established the overall patient adherence rate while the second measure determined the proportion of patients in each of the two or three adherence categories.

Adherence was analysed both as a categorical variable expressed as high (≥ 95%), moderate (85%-94%) and low adherence (< 85%**)** level; and also as a dichotomous variable as optimal (> 95%) and sub optimal levels (95%). Categorizing adherence into high, medium and low levels during statistical analysis facilitated the exploring of patients' adherence behaviour which is relevant in intervention studies (Bangsberg, Moss & Deeks, 2004). On the other hand, categorizing adherence into optimal and suboptimal adherence defines a clinically relevant cut off that has been shown to be linked with treatment outcomes (Patterson et al, 2000). Since the main objective of this study was to provide baseline data, adherence was categorized as dichotomous and also in the three levels for analysis.

Bivariate analysis was done to test the association between outcome variables (2-day recall: 30 day recall: pill count and composite measure) and predictor variables (age: sex: marital status: education level: disclosed status: regimens: ART knowledge: and reported side effects) separately. The Chi-squared test with a 95% confidence level was used except in cases where the expected cell size counts were less than 5 when the Fischer exact test was used instead. The Prevalence Ratio and 95% confidence interval were used as the measure of effect, in preference to Odds Ratio. The justification for this being that this was a cross-sectional study and as such, lacked longitudinal data, hence Prevalence Ratio was a more relevant measure than the Odds Ratio which would have tended to underestimate or overestimate the effect (Thompson, Myers & Kriebel, 1998).

4.9. VALIDITY AND RELIABILITY

The issues of validity and reliability in the study were addressed in a number of ways. Selection bias was addressed by using the list of patients expected to attend the CDC clinic at the hospital on the data collection days as the sampling frame, and using a systematic sampling process. Chance was further reduced by increasing the sample size. Measurement bias was reduced by the use of multiple adherence measures to ensure accuracy of adherence estimates, as strengths of one method compensate for the weaknesses of the other (Liu et al 2001: Arnsten, et al, 2001). Moreover, the use of the different measures facilitated the measurement of different dimensions of adherence thus addressing content validity.

The piloting, training of research assistants and the coding procedures ensured a standardised questionnaire which further minimized measurement bias. The data collection tool was adapted from a questionnaire that used in other studies in similar settings (Kgatlwane et al, 2006: Irunde et al 2006). The visual analogue scale and 2 day recall methods were found to be valid instruments for measuring adherence in Uganda (Oyugi et al, 2004). Similarly, four day recall, visual analogue and pill count as methods for estimating adherence were also validated using MEMS in a study in a clinical setting in South Africa (Steel, Nwokike & Joshi, 2007). Moreover, the use of measurement tools like the beads for visual analogue scale and sun and moon chart ensured that the measures were relevant to the study population which further increased the sensitivity of the collection tool. Social desirability usually associated with self reporting was minimized by phrasing the adherence questions in a non threatening manner; and by the use of research assistants to administer the questionnaire to the participants, rather than the chief researcher, who as a former pharmacist at the hospital was known to the participants.

4.10. GENERALISABILITY

The sampling method ensured that the participants were representative of the study population attending CDC clinic at Rundu Hospital in one week of the year. As there is no reason to believe that this population is any different from the total population of adult patients on the first line HAART regimens at Rundu Hospital, the results of this study may be generalisable to the study population.

4.11. LIMITATIONS

This study had a number of limitations. Firstly, with respect to sampling, the systematic sample of adult HAART patients was drawn from patients attending the CDC clinic in one week period rather than from the whole population on HAART. This was due to practicalities in data collection however there was no reason to believe that the week chosen was any different from the other weeks in the year.

Secondly, the study population included patients still on treatment at the time of the study and so patients who had discontinued therapy for any reason were excluded from the study which may have meant that poor adherers were missed. Additionally, patients who missed their appointment would also not have been included in the study. Both these factors may result in overestimating adherence levels.

Finally, there were limitations due to the adherence measures used in this study. The use of self report could have overestimated adherence although a number of recent studies have shown the reliability of self report as an adherence measure (Simoni et al, 2006: Nwokike, Steel & Joshi, 2006). The announced nature of the pill counts could have resulted in pill dumping which would have resulted in overestimation of adherence. However, the use of composite adherence measures could have mitigated the overestimation of adherence effects of these measures. Validating the adherence levels obtained with viral loads is ideal in adherence studies, however, at the time of the study, viral load testing was not done at Rundu Hospital and any patients requiring viral loads

were referred to Windhoek. Thus the unavailability of viral loads in this study as in similar studies in resource poor settings is a limitation.

4.12. ETHICAL CONSIDERATIONS

Prior to the study**,** ethical approval was obtained from the University of Western Cape and the Ministry of Health and Social Services, Namibia. In addition, permission was obtained from the Medical Superintendent of Rundu Hospital.

Participants were informed of the purpose of the study and the procedures to be taken to ensure confidentiality of personal information. Similarly, participants were informed that participation in the study was voluntary and that they could terminate their participation at any time without giving reasons and with no recriminations against them. They were also informed that there were no benefits or risks associated with this study and were encouraged to seek clarification on any aspects of the study. The information sheet and the consent form were available in both English and Rukwangali and were read to those who were unable to read.

Only after participants had understood this information were they invited to sign the consent form which was then obtained from each participant before commencing the interview. The information obtained was password protected and was only available to the chief researcher.

CHAPTER 5

RESULTS

5.1. DESCRIPTIVE PARTICIPANT CHARACTERISTICS

5.1.1. PARTICIPANT SOCIO-DEMOGRAPHIC CHARACTERISTICS

Ninety- seven participants were included in the study, a response rate of 84.3%. Out of a total of one hundred and fifteen participants that met the eligibility criteria, eleven did not turn up for their follow up appointment during the study period, five declined to participate in the study and two did not personally collect their treatment as they had been admitted at the hospital. Of the ninety seven ARV patients that participated in the study, 78 % (76) were female, the mean age was 36.7 (SD: 9.00) years and 80% (77) of the participants were in the 20-44 age group. Approximately half (49/97) of the participants were married or cohabiting and just less than half (48/97) had secondary school education and above while 14% (14) reported having received no formal schooling at all. Table 1 summarises the socio-demographic characteristics of the participants.

Table 1: Participant Characteristics (n=97)

VARIABLE		No (%)
GENDER	Male	21 (22)
	Female	76 (78)
AGE (Years)	20-24	8 (8)
	25-29	16 (17)
	30-34	21 (22)
	35-39	13 (13)
	40-44	19 (20)
	45-49	13 (13)
	50-54	4 (4)
	55-59	1 (1)
	60+	2 (2)
MARITAL STATUS	Married /cohabiting	49 (51)
	Divorced	11 (11)
	Single	13 (13)
	Widowed	24 (25)
EDUCATION LEVEL	None /incomplete primary	17 (18)
	Primary	32 (33)
	Secondary	46 (47)
	Tertiary	2(2)

5.1.2. DISTANCE TO HOSPITAL

Most participants (63%; 61/97) travelled between three and ten kms from their home to the hospital, while 13% (13) reported that they had to travel over 50 kms. The median distance was 6.0 (IQR: 5-19) kms while the maximum distance travelled by one participant was 163kms. Table 2 shows the distances travelled by the participants to the hospital.

Table 2: Distances travelled by participants to the hospital (n=97)

DISTANCE (km)	No. (%)	95% CL
≤10	61 (63)	52.5 - 72.5
11-20	16 (17)	9.7 - 25.4
21-30	4 (4)	1.1 - 10.2
31-40	2 (2)	0.3 - 7.3
41-50	1 (1)	0.0 - 5.6
> 50	13 (13)	7.3 - 21.8

5.1.3. ART TREATMENT REGIMENS

Most of the participants (83%: 80/97) were on treatment combinations that contained nevirapine and a combination of either stavudine and lamivudine or zidovudine and lamivudine which had the same daily dosing of twice daily. The remainder were on treatment combinations that contained efavirenz which requires a once daily dose and as a result, these drug combinations had components that required different daily doses which complicated the dosage. Table 3 shows the patients ART regimens and their daily dosing.

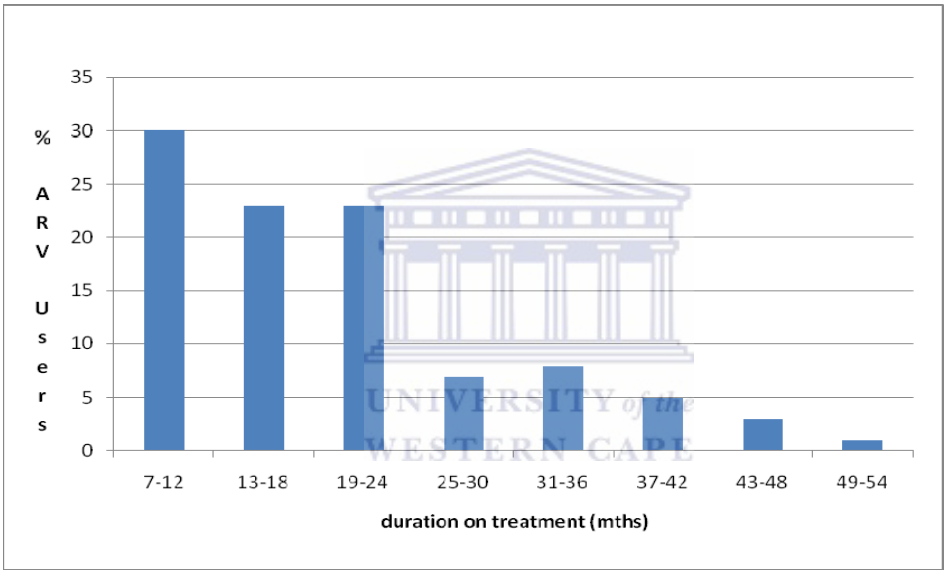
Table 3: Participants ART regimens (n = 97)

ART REGIMEN S	Daily dosing	No. (%)
Stavudine + Lamivudine (combined Pill) & Nevirapine	bd & bd	59(61%)
Zidovudine + Lamivudine (combined Pill) & Nevirapine	bd & bd	21(22%)
Stavudine + Lamivudine (combined Pill) & Efavirenz	bd & od	9(9%)
Zidovudine + Lamivudine (combined Pill) & Efavirenz	bd & od	1(1%)
Tenofovir & Lamivudine & Efavirenz	od & bd & od	7(7%)

5.1.4. DURATION ON ART TREATMENT

Figure 1 shows the length of time participants had been on ART treatment. The mean duration that participants had been on ART treatment was 20 (SD: 10.3) months while the median was 17 (IQR: 17 – 24) months. Approximately 76% (73) of the participants had been on ART for 24 or less months.

Figure 1: Duration on ART treatment (n =97)



5.1.5. SIDE EFFECTS REPORTED AND DISCLOSURE OF STATUS

About a third (32/97) of the participants reported having experienced some side effects with ART medication. In addition, 83% (81) reported having disclosed their HIV status to somebody else apart from the mandatory treatment supporter.

5.1.6. ART KNOWLEDGE

When asked the consequences of failing to take ART medication as prescribed, 45% (n = 44) of the participants answered that their health would deteriorate while 24% (n= 23) of the participants answered that the viral load would increase. A further 4% (n = 4) answered that the virus would become drug resistant. Approximately 27 % (n = 26) of the participants answered that they did not know. Any of the first three answers was considered as ART knowledge while a "don't know answer" was considered no ART knowledge.

5.1.7. RATES OF ADHERENCE

The mean adherence rates obtained using 30 day self report (visual analogue), 2 day self recall (sun and moon chart) and pill count were 91%, 99% and 94% respectively. The mean composite adherence of the three measures gave an adherence rate of 95%. The mean adherence rates are shown in Table 4.

Table 4: Mean Adherence rates

ADHERENCE MEASURE	% MEAN ADHERENCE (SD)
30 day SR visual analogue (n = 97)	91.3 (11.23)
2 day SR sun & moon chart (n= 93)	99.4 (2.26)
Pill count (n= 95)	94.8 (7.51)
Composite adherence of the 3 measures (n = 97)	95.1 (4.94)

The proportion of ARV patients who achieved optimal adherence levels (95% and above) was 55%, 94% and 74% using 30 day visual analogue, 2 day recall and pill count

respectively. Using the mean composite of the three adherence measures, it was found that 64% of the ARV users had achieved optimal adherence levels. The adherence level categories of the ARV users obtained by each adherence measure are shown in Table 5.

Table 5: Proportion of ARV participants per adherence category

	CATEGORY OF ADHERENCE		
ADHERENCE MEASURE	High (95-100)	Moderate (85-< 95)	Low (< 85)
30 day SR visual analogue n=97	53(55%) (95% CI: 44.2-64.8%)	24 (25%) (95% CI :16.5-34.5%)	20 (20%) (95% CI: 13.1-30.0 %)
2 day SR sun & moon chart n=93	87 (94%) (95% CI: 86.5-97.6%)	6 (6%) (95% CI: 2.4- 13.5%)	0%
Pharmacy Pill count n=95	70(74%) 95% CI: 63.6-82.2 %)	16(17%) (95% CI: 9.9-25.9 %)	9(9%) (95%CI: 4.4-17.2%)
Composite adherence of the 3 measures n=97	62 (64%) (95% CI: 53.5-73.4 %)	31 (32%) (95% CI: 22.9-42.2%)	4 (4%) (95% CI: 1.1-10.2%)

5.1.8. REASONS GIVEN FOR MISSING DOSES

Half of the participants (49/97) reported that they had not missed any doses and thus could not give reasons. The most common reasons given by the participants for missing doses were forgetfulness (28%), lack of food (13%) and not having the pills with them (11%). Participants were allowed to give a maximum of three reasons.

Table 6: Reasons given for missing doses (n = 48)

REASONS	NO. CITED REASON	%
Forgot	27	28
Lack of food	13	13
Being away from pills	11	11
Alcohol use	1	1
Reacted to medication	1	1
Instructions not understood	1	1

5.1.9. FACILITATORS FOR TAKING DOSES CORRECTLY

Fifty eight percent (n = 56) of the participants reported using reminders like cell phones and radio to remember to take their medication on time. In addition, 19% reported that having treatment supporters was a facilitator, while a further 11% cited counselling as the main factor that facilitates them in taking their medicines correctly.

5.1. 10. REASONS GIVEN FOR MISSING ARV CLINIC APPOINTMENTS

Similar to missing doses, 61% (n = 59) of the participants reported that they had not missed any appointments. The most common reasons mentioned for missing refill appointments were lack of transport money (22%) and forgetfulness (6%). Other reasons given were feeling ill (3%) and not being able to have time off from work (2%).

5.2 FACTORS AFFECTING ADHERENCE TO ANTIRETROVIRALS

Associations were tested between adherence and categorical variables. In the analysis, 2X2 tables were set up to test the associations between outcome variables (2-day recall; 30-day recall; pill count; and composite measure) and predictor variables (sex; marital status; educational level; disclosed status; ART regimens; ART knowledge; and reported side effects) separately. Association was tested using high, medium and low adherence and also using the dichotomous categories of optimal and suboptimal levels of adherence in the sensitivity analysis. For the 2 day recall, only the dichotomous categories were used as there were no participants in the low adherence category. Association was tested using 95% significance level ($p \leq 0.05$), and using the Fischer exact test when expected cell size counts were less than 5.

Having ART knowledge was found to be significantly associated with being highly adherent (p value=0.03) while being male was found to be significantly associated with being optimally adherent (p=0.04). Marital status and education level were not found to be significantly associated with adherence. Other categorical predictor factors that were found not to be significantly associated with adherence were ART regimens, disclosed HIV status and reported side effects. (See tables 1 to 12 in appendix 6).

In addition, association between the different measures of adherence was tested by dichotomising the numerical variables (distance, age and duration on treatment) using either the median or the mean as the cut off point. These analyses were done with

adherence as a dichotomous variable as the values of low adherence (< 85%) were almost nil for the three numerical variables. Association was tested using Chi-squared test with 95% confidence level, and using the Fischer exact test when expected cell size value was than 5.

Living within a distance of 6km from the hospital was significantly associated with being optimally adherent (p = 0.018) while participant's age and duration on ART were no found to be significantly associated with adherence. (See tables 13 to 15 in appendix 6).

5.2.1 ART KNOWLEDGE

Having knowledge of consequences of failing to take medication as prescribed was found to be significantly associated (p=0.03) with being highly adherent ≥95 when using composite adherence with the 3 categories of adherence. This association, however, was not observed when composite adherence was in dichotomous categories. Similarly, no significant association was observed with the other measures of adherence. Tables 7 and 8 show the bivariate analysis of ART knowledge using - adherence in the three categories and dichotomous categories respectively.

Table 7: Bivariate analysis of ART knowledge using adherence in three categories

		Adherence Category				
Adherence Measure	ART Knowledge	Low < 85%	Medium 85 - < 95 %	High ≥95%	χ^2	p value
30 day recall adherence n = 97		n (%) 20 (20)	n (%) 24 (25)	n (%) 53 (55)		
	Yes	14 (20)	20 (28)	37 (52)	1.67*	0.43
	No	6 (23)	4 (15)	16 (61)		
Pill count n = 95		n (%) 9 ((9)	n (%) 16 (17)	n (%) 70 (74)		
	Yes	6 (9)	15 (21)	49 (70)	4.04*	0.13
	No	3(12)	1 (4)	21 (84)		
Composite adherence n= 97		n (%) 4 (4)	n (%) 31(32)	n (%) 62 (64)		
	Yes	1 (1)	26 (37)	44 (62)	6.69 *	0.03
	No	3 (12)	5 (19)	18 (69)		

* Fischer Exact Test used

Table 8: Bivariate analysis of ART knowledge using adherence in dichotomous categories

		Adherence Category				
Adherence measure	ART Knowledge	Sub optimal <95 %	Optimal ≥95%	Prevalence Ratio (95% CI)	χ^2	P value
30 day recall adherence n = 97		n (%) 44 (45)	n (%) 53(55)			
	Yes	34 (48)	37 (52)	1.11 (0.87 - 1.44)	0.35	0.55
	No	10 (39)	16 (61)			
2 day recall adherence n = 93		n (%) 6 (6)	n (%) 87(94)			
	Yes	4 (6)	64 (94)	0.74 (0.14 - 3.77)	0.14*	0.65
	No	2 (8)	23 (92)			
Pill count n = 95		n (%) 25 (26)	n (%) 70 (73)			
	Yes	21 (30)	49 (70)	1.20 (0.95 - 1.51)	1.21*	0.27
	No	4 (16)	21 (84)			
Composite adherence n = 97		n (%) 35(36)	n (%) 62 (64)			
	Yes	27 (39)	44 (61)	1.09 (0.85 - 1.38)	0.43	0.50
	No	8 (31)	18 (69)			

*Fischer exact test used

5.2.2 GENDER

Being male was found to be significantly associated (p = 0.04) with being optimally adherent when using the 30 day visual analogue in the dichotomous categories. No significant association was observed with the other adherence measures when tested either in the three or dichotomous categories. Tables 9 and 10 show the bivariate analysis of gender using adherence in the three and dichotomous categories respectively.

Table 9: Bivariate analysis of Gender using adherence in the three categories

		Adherence Category				
Adherence measure	Gender	Low < 85%	Medium 85 - <95 %	High ≥95%	χ^2	P Value
30 day recall adherence n = 97		n (%) 20 (21)	n (%) 24 (25)	n (%) 53(54)		
	Female	17(22)	22(29)	37(49)	5.31*	0.07
	Male	3(14)	2(10)	16(76)		
Pill count n = 95		n(%) 9 (9)	n(%) 16(17)	n(%) 70(74)		
	Female	9(12)	13(18)	52(70)	3.19*	0.2
	Male	0	3 9(14)	18 (86)		
Composite adherence n = 97		n(%) 4 (4)	n(%) 31(32)	n(%) 44(45)		
	Female	4 (5)	27(36)	45(51)	2.41*	0.12
	Male	0	4	17		

*Fischer Exact test used

Table 10: Bivariate analysis of Gender using adherence in dichotomous categories

		Adherence Category				
Adherence measure	Gender	Sub-optimal <95 %	Optimal ≥95%	Prevalence Ratio (95% CI)	χ^2	P value
30 day recall adherence n=97		n (%) 44 (45)	n (%) 53 (55)			
	Female	39 (51)	37 (49)	1.27 (1.03 - 1.56)	3.97	0.04
	Male	5 (24)	16 (76)			
2 day recall adherence n= 93		n (%) 6 (6)	n (%) 87 (94)			
	Female	5 (7)	68 (93)	1.07 (0.73 - 1.55)	0.05*	1.00
	Male	1(5)	19(95)			
Pill count n = 95		n (%) 25 (26)	n (%) 70 (74)			
	Female	22 (30)	52 (70)	1.18 (0.97 - 1.45)	1.29*	0.25
	Male	3 (14)	18 (86)			
Composite adherence n = 97		n (%) 35 (36)	n (%) 62 (64)			
	Female	31 (41)	45 (59)	1.22 (1.01 -1.48)	3.37*	0.06
	Male	4 (19)	17 (81)			

*Fischer exact test used

5.2.3. MARITAL STATUS / EDUCATION LEVEL

No significant association was found between marital status and adherence using any of the three adherence measures or composite adherence as high, medium and low categories (p-values: 0.82: 0.54: 0.12 for 30 day recall, pill count and composite adherence respectively). This lack of significant association was also observed when adherence as dichotomous categories of optimal and sub optimal adherence (p-values

0.67: 0.91: 0.45: 0.31 for 2day recall, 30 day recall, pill count and composite adherence respectively).

Similarly, no significant association was found between education level and any of the adherence measures when analysed as high, medium and low categories resulting in p-values of , 0.33: 0.23: 0.76 for 30 day recall, pill count and composite adherence respectively. Likewise, no significant association was observed between education level and adherence in dichotomous categories of optimal and sub optimal adherence with p-values of 1.00: 0.48: 0.14: 0.47 for 2day recall, 30 day recall, pill count and composite adherence respectively. The complete analysis data is presented on Tables 6 and 7 in appendix 6.

5. 2.4. ART TREATMENT REGIMENS/DISCLOSED STATUS

No significant association was found between ART treatment regimens of using any of the three adherence measures or composite adherence when analyzed as high, medium and low categories giving p-values of 0.25: 0.87: 0.11 for 30 day recall, pill count and composite adherence respectively. Similarly, no significant association was observed when adherence was analyzed as dichotomous categories of optimal and sub optimal adherence (p-values,0.24: 0.50: 1.00: 0.52 for 2day recall, 30 day recall, pill count and composite adherence respectively).

This lack of significant association was also observed with disclosure of HIV status and adherence. When adherence was analyzed as optimal and sub optimal categories, p-values were 0.65: 1.00: 0.33: 0.75 with 2 day recall, 30 day recall, pill count and

composite adherence respectively. Correspondingly, when adherence was analyzed as three categories of low, medium and high, resulting p-values were 0.45, 0.36 and 0.64 for 2 day recall, 30 day recall and composite adherence. The complete data is also presented on Tables 6 and 7 in appendix 6.

5.2.5. DISTANCE TO HOSPITAL

Distance to the hospital was dichotomised using the median (6 km) as the cut off point. Living within a distance of 6km from the hospital was significantly associated with being optimally adherent when using composite adherence (p=0.018) as the adherence measure. No significant association was observed when using adherence with the other adherence measures. Table 11 shows the bivariate analysis of adherence with median distance as the cut off.

Table 11: Bivariate analysis of adherence with median distance as the cut off

		Median distance = 6 km				
		Adherence Category				
Adherence measure	distance	Suboptimal <95	Optimal ≥ 95	Prevalence Ratio (95%CI)	χ^2	p value
2 day recall n=93		n (%) 6 (6)	n (%) 87 (94)			
	≤ 6km	4 (8)	45 (92)	1.79 (0.34 -9.33)	0.497*	0.39
	> 6km	2 (4)	42 (92)			
30 day recall adherence n=97		n (%) 44 (45)	n (%) 53 (55)			
	≤ 6km	27 (53)	24 (47)	1.43 (0.90 – 2.26)	2.46	0.116
	>6 km	17 (37)	29 (63)			
Pill count n = 95		n (%) 25 (26)	n (%) 70 (74)			
	≤ 6km	19 (38)	31 (62)	2.85 (1.24 – 6.50)	7.353	0.006
	> 6 km	6 (13)	39 (87)			
Composite adherence n = 97		n (%) 35 (36)	n (%) 62 (64)			
	≤ 6km	24 (47)	27(53)	1.96 (1.08 – 3.55)	5.56	0.018
	> 6km	11 (24)	35 (76)			

* Fischer exact test used

5.2.6. AGE / DURATION OF ARV TREATMENT

Age was dichotomised by using the mean age (36 years) as the cut off point. There was no significant association between age and adherence with any of the adherence measures was not significant at p = 0.05 level of significance. Similarly, no significant association was observed between duration of ARV treatment when dichotomised using the mean (20 months) as the cut off point and any of the adherence measures.

5.3. SUMMARY

Ninety –seven participants were included in this study, of which 75% were female. The mean composite adherence rate was found to be 95.1% while the proportion of the patients who achieved adherence of 95% and above was 64%. Identified barriers to adherence included forgetfulness, lack of food and patients being away from their pills. The facilitators identified were counselling and treatment supporters. Having knowledge of the consequences of failing to take HAART as prescribed (p = 0.03) was found to be significantly associated with adherence. In addition, increasing distance from home to the hospital was found to be significantly associated with non adherence (P = 0.018).

The next chapter will discuss the key findings within the context of the study setting.

CHAPTER 6

DISCUSSION

The aim of this cross-sectional study was to provide baseline data on adherence levels and factors associated with adherence among patients receiving HAART from Rundu Hospital, a public health facility in Namibia. To the author's knowledge, this study is the first to attempt to measure adherence levels and identify factors affecting adherence among patients on HAART in Namibia since the inception of the ART program in 2003. It is expected that this information will be useful in facilitating the development of appropriate intervention strategies to enhance adherence to HAART in this and similar settings in Namibia.

6.1. SOCIO – DEMOGRAPHIC CHARACTERISTICS

A total of ninety – seven patients on HAART participated in the study with a female to male ratio of 4:1. This is almost similar to the female to male ratio of 3: 1 of the 1300 patients on HAART at Rundu Hospital (MOHSS, 2007). This ratio is notably higher than the female to male HIV prevalence ratio in Namibia which is 2: 1 (UNAIDS 2008). However, the female to male ratio found in this setting is consistent with other studies in Southern Africa where relatively high female to male ratio of patients on HAART in comparison to the gender HIV prevalence ratio have been observed in Zambia, Malawi and South Africa (Stringer et al, 2005: Zacharia et al, 2005: Coetzee et al, 2002). This situation may be attributed to women gaining more access to HIV testing as part of antenatal care in the Prevention of Mother to Child Programme (PMTCT). In addition, other women friendly services like family planning and the general greater use of health

facilities by women might also impact on women accessing HIV testing and subsequent HAART. Obviously, there are other societal factors related to accessing HAART which also need to be taken into consideration. The current situation at Rundu Hospital, however, points to the fact that further work needs to be done to explore the reasons for the low uptake of HAART by men in this area and to look at ways of bringing them into ARV treatment programmes.

6.2. ADHERENCE LEVELS

The results found a mean composite adherence of 95.1% using the three adherence measures: two day self report, 30 day self report with visual analogue scale and pill counts. This means that 95% of all the pills that should have been taken by the patients were taken. However, this seemingly high mean adherence rate should not give rise to complacency as it was not matched by the proportion of patients who achieved 95% and above adherence levels. Indeed, the proportion of patients achieving optimal adherence ($\geq$ 95%) was only 64%. This finding highlights the disturbing fact that more than a third of the patients on HAART at Rundu Hospital had sub optimal adherence rates and approximately 4% of these patients had adherence levels of less than 85%. The implications for this are that a large number of patients on HAART may not be getting the full benefits of their treatment and might even be facing the risk of developing drug resistant forms of HIV.

The adherence rates found in the present study were considerably lower than those reported by Mills et al (2006), in a meta-analysis of studies in Sub Saharan Africa. This

meta- analysis found that 82% (95% CI 73-90) of the patients on ARVs in the region had achieved optimal adherence levels in studies that defined optimum adherence as 95% and above. However, the clinical settings of the studies reported in the meta- analysis were not stated and so might have been clinical trials or clinical settings that were different from those of the current study which might account for the higher adherence levels reported from these studies.

However, a number of studies conducted in Sub-Saharan Africa in similar clinical settings to the present study, reported higher proportions of optimally adherent patients than the current study. For instance, a study conducted in a public hospital in Nigeria reported that 85.1% patients achieved adherence levels of 95% and above (Abah et al, 2006). A similar study conducted in a public hospital in Cote d'Ivoire reported that 74.3% of the patients were optimally adherent (Diabate, Alary & Koffi, 2007). In southern Africa, a study conducted in a rural hospital in Zambia reported that 83.7% of the patients achieved adherence levels of 95% and above (Carlucci et al, 2008).
These findings suggest that higher adherence levels than those achieved in the current study are possible in similar clinical settings in the region.

One of the reasons for the relatively low proportion of patients on HAART who achieved optimal adherence at Rundu Hospital may be related to lack of measuring adherence at the hospital. Although pill counts are conducted at the hospital, they are usually announced so adherence measurement may not be accurate due to pill dumping. In addition, the pharmacy usually has no records of the pills taken home as this information

is recorded on the patients; cards or pill containers. This indicates lack of proper monitoring of adherence which could result in non adherent patients not being identified and consequently not receiving any adherence support. The findings of this study certainly emphasize that there is an urgency to improve adherence among the patients on HAART at Rundu Hospital.

6.3. ADHERENCE MEASUREMENT TOOLS

The challenges of measuring adherence are compounded by the lack of a gold standard, resulting in the use of a number of different strategies to assess adherence. This study used three measures: 2 day recall using a sun and moon chart, 30 day self report using a visual analogue scale and pill counts, and then a mean composite score was computed. The adherence measures were similar to those used in other recent studies conducted in Sub- Saharan Africa (Irunde et al, 2006: Kgatlwane et al, 2006). Although each of the three methods had advantages and limitations, overestimation of adherence was associated with all the three methods.

However, the use of the three methods together, facilitates the measurement of different dimensions of adherence and are also useful in identifying patients who might be less adherent over longer periods of time. The brief period of the two day recall allowed the measurement of dosing interval adherence which may not have been accurate with longer reporting periods (Wagner & Miller, 2004). The 30 day self report and the pill counts on the other hand, had longer reporting periods which provided room for sufficient variability in adherence. These two characteristics demonstrate the

effectiveness of these adherence measuring tools in helping to identify the non adherent patient in a clinical setting. In addition, some studies conducted in Sub Saharan Africa have validated the use of these three adherence measures (Oyugi et al, 2004: Steel, Nwokike & Joshi, 2007). The use of the beads as the visual analogue scale might be time consuming and a line could be a more practical scale for routine use. Nonetheless, the simplicity, relative ease of administration and the low cost of these adherence measurement tools in this study illustrate their utility in measuring adherence in a clinical setting in a resource limited environment.

6.4. BARRIERS OF ADHERENCE TO HAART

As a very high level of adherence is required in order for HAART to achieve the intended treatment benefits, it is critical to have a clear understanding of the factors that influence the patient's ability to comply with the treatment requirements so as address them and thus enhance adherence to HAART (Chesney, 2000: Bangsberg et al ,2000).

The present study explored some factors that impede or facilitate optimal adherence to HAART among the patients at Rundu Hospital. Although all the ninety- seven participants mentioned the factors that facilitated them to take their medication as prescribed, only 49% gave reasons for missing doses as the rest self reported 100% adherence. Thus a quantitative study involving a larger sample of participants would be required to explore the barriers to adherence further.

The three main reasons that participants gave for missing doses of medication were forgetfulness (28%), lack of food (13%) and being away from their pills (11%). The most common reason, forgetfulness was also mentioned by 6% of the participants as a reason for missing their doctors' or pharmacy refill appointments. Forgetfulness has been cited as a barrier to adhering to HAART in both resource limited and resource rich settings (Mills et al, 2006b). However, the reasons associated with forgetting might be different in different settings and need to be explored further.

6.4.1. FORGETFULNESS AND KNOWLEDGE OF ART

Forgetfulness may be related to being away from pills, which was another reason given for missing doses. This barrier, which was cited by11% of the participants, was associated with the patients being from home and thus finding themselves without their medication when the dose was due. This barrier to adherence in HAART has also been reported by other adherence studies in the region (Weiser et al, 2003: Nwokike, 2005). Underlying reasons for not taking medication with them may have been forgetfulness, failure to incorporate adherence into personal schedules or avoiding taking medication in front of other people. Some of these issues could be explored further and could be addressed by patient counseling.

In this study, knowledge of the consequences of failing to take HAART medication as prescribed was found to be significantly associated with being highly adherent and is consistent with the findings reported in Botswana (Kgatlwane, et al, 2006). A possible reason is that knowledge of HIV and ARVs reinforces the patients' belief in the effectiveness of HAART which in turn may be a motivation for high adherence.

The Namibian ART guidelines recommend continuous counseling to patients on HAART in order to support their adherence behavior. This recommendation can be supported by adherence studies conducted in the region that identified counselling as a correlate of adherence (Muganzi,Bondo, Drana & Biryeni, 2004 : Nwokike 2005). However the findings of the study suggest that the counselling provided to patients on HAART at the hospital may be inadequate as demonstrated by the fact that counseling was reported as an adherence facilitator by only 11% of the participants. In addition, the finding that more than a quarter of the participants did not know the consequences of failing to take their HAART as prescribed , may be an indicator of the quality of adherence counseling given to the participants as knowledge of HAART is imparted to the patient through counseling. It is important to note that counselling should not just be provided at the commencement of HAART but should be conducted continuously, so as to identify and address factors that affect adherence with time.

A surprising finding was that, although thirty two participants reported having experienced side effects, only one cited missing doses due to side effects, which may suggest that adequate counseling on side effects is provided. This finding which was consistent with reports from other studies in Sub Saharan Africa (Weiser et al, 2003: Akam, 2004) and may be either due to the side effects being temporary, or to the participants' perception that the severity of the side effects was less in relation to the treatment benefits, which in turn may be as a result of counseling.

6.4.2. LACK OF FOOD

Lack of food was also given as a reason for missing doses by 13% of the participants in the present study. This barrier has been cited by adherence studies in Botswana, Tanzania and Uganda (Weiser et al 2003: Irunde et al, 2006: Nakiyemba et al, 2006). This barrier may be due to an increased appetite as patients improve with HAART use or to non availability of food because the patient is too weak to work, an issue related to poverty. HAART and nutrition are closely related and this study has again highlighted that provision of adequate nutrition is an area that needs attention in patients attending Rundu Hospital

6.4.3. LACK OF TRANSPORT MONEY

The finding that none of the participants cited running out of medication as a reason for missing doses suggests a regular drug supply at the hospital. Lack of transport money as a barrier was reported by 22% of the participants who missed their appointments and the finding that more than one in every ten of the participants lived over 50 kilometers away from the hospital are aspects that are related to costs of obtaining HAART.

Costs and travelling long distances were barriers that were reported in studies from developing countries by the meta-analysis by Mills et al (2006 b). In addition, transport costs were also cited as a barrier to adherence in other studies in sub-Saharan Africa (Mukabatera, 2004: Nakiyemba et al, 2006). A possible reason is the lack of reliable transport to the hospital which could impact on the travelling costs. This suggestion is supported by the findings during the pilot study that reliable transport was a constraint among the participants.

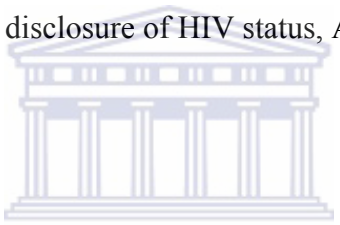
The implication of this barrier is that despite the availability of HAART free of charge, some other cost factors still impede adherence to HAART in sub- Saharan Africa. This barrier highlights the fact that both availability and accessibility issues should be addressed to ensure adherence to HAART with the scaling up of ART programs in resource limited settings.

6.5. FACILITATORS OF ADHERENCE TO HAART

Over half of the participants reported that they used devices like cell phones and radios to remind them to take their doses which is consistent with findings from other studies in the region (Kgatlwane, et al, 2006: Irunde et al ,2006: Nakiyemba et al , 2006). Treatment supporters were also mentioned as an adherence facilitator by the participants in the present study. The value of treatment supporters as an adherence facilitator has been reported in other studies in the region (Nwokike, 2005: Nachega, 2006). However, the finding that less than 20% of the participants reported their treatment supporters as adherence facilitators was disappointing. This is despite the fact that the Namibian ART guidelines require every patient on HAART to have a treatment supporter and raises the question of the role of the mandatory treatment supporter in adherence. A possible explanation for this finding is that most patients identify a supporter only for the purposes of presenting someone to the hospital so that they can be started on treatment. This raises the importance of clearly defining the on-going role of the treatment supporter in adherence to both the treatment supporter and the patient.

6.6. FACTORS ASSOCIATED WITH ADHERENCE

In addition to measuring the barriers and facilitators of adherence to HAART, the study also analyzed the association between these factors and adherence to HAART. Knowledge of the consequences of failing to take HAART medication as prescribed was found to be significantly associated with adherence (p-value = 0.03), while increasing distance to the hospital was found to be associated with non adherence (p- value = 0.018). In addition, being male was found to be significantly associated with adherence (p= 0.04). Conversely, marital status, education level and age were not significantly associated with adherence. Other factors that were found not to be significantly associated with adherence were disclosure of HIV status, ART regimen and duration on ART.



The finding that having knowledge of the consequences of failing to take HAART medication as prescribed was significantly associated with being highly adherent is consistent with the findings reported in Botswana (Kgatlwane, et al, 2006). A possible reason is that these reported consequences could be an indication of belief in the effectiveness of the ARVs which subsequently may be motivation for high adherence.

Similarly, the finding that increased distance was significantly associated with non adherence is consistent with findings from other studies in Sub Saharan Africa (Weisser et al , 2003: Nakiyemba et al, 2006). A possible reason is that transport costs are likely to be directly proportional to distance which may present a constraint to travel to the hospital for medication refills. In addition, the lack of reliable transport to the hospital as

reported during the pilot study may increase as the distance from the hospital increases. These suggestions may be supported by the finding that more than 10% of the participants had to travel more than 50kms to the hospital.

The finding that being male was significantly associated with adherence despite the fact that the proportion of males among the participants was much lower than that of females may suggest that the few males on ART had strong motivation to be on the programme and as such were motivated to be adherent. However a qualitative research could provide more clarity on this finding.

The findings that marital status, age and education level were not significantly associated with adherence are consistent with other studies in Sub Saharan Africa (Diabate, Alary & Koffi ,2007). Correspondingly, the findings that reported side effects were not significantly associated with adherence were consistent with findings from other studies in the region (Weiser et al, 2003: Nakiyemba et al, 2006). On the other hand, the findings that ART regimens are not significantly associated with adherence are not consistent with other studies in the region, (Laniece et al, 2003: Nwokike, 2005). A possible reason is that the study participants were all on first line regimens and such may not have had complicated dosing requirements.

SUMMARY

As this is the first study to attempt to measure adherence and identify factors that affect adherence among patients on HAART in Namibia, the findings of this study provide baseline data that could be useful in designing practical interventions to enhance adherence in Rundu Hospital and other similar settings in Namibia. In addition, the methodology used in this study can also be used to measure adherence to HAART in other similar hospitals in Namibia. The study also provides groundwork for qualitative and quantitative studies to explore and quantify these factors further.

STUDY LIMITATIONS

The low response rate on the question on barriers to taking medication as prescribed is a limitation in this study and thus a quantitative study would be required to explore the barriers in depth. In addition, further qualitative studies would be beneficial to explore the barriers and facilitators related to adherence and the ways that they interact to influence adherence.

CHAPTER 7

7.1. CONCLUSIONS

This study is the first study of its kind in Namibia and the findings have provided useful baseline data on the adherence rates and some insights into the major factors that affect adherence among patients on HAART at Rundu Hospital. However further qualitative and quantitative studies are required to explore the factors influencing adherence further.

The study found that the mean adherence level among patients on HAART at Rundu Hospital was 95.1%, while the proportion of patients who achieved adherence levels of 95% and above was 64%. Despite the reported high average adherence level, just less than two thirds of patients achieved optimum adherence levels; consequently more than a third of the patients on HAART at Rundu Hospital run the risk of poor health outcomes and also developing drug resistant forms of HIV.

Thus, in view of the individual and public health implications of non adherence, these findings indicate an urgent need to improve adherence levels among patients on HAART at Rundu Hospital. This may in part be achieved by measuring adherence levels of patients on HAART, in order to identify both non adherent patients and provide targeted adherence support, and also identify ART Programmes that need further investigation. The higher adherence levels reported in similar clinical studies in other sub- Saharan African settings point to the feasibility of achieving greater adherence in this setting.

Similarly, in light of the scaling up of the ART program in Namibia, there is need to not just monitor the levels of adherence, but also to identify and address factors that affect adherence so that the increasing number of patients receiving HAART can achieve the full intended benefits of HAART. The main barriers to adherence identified in this study were forgetfulness, lack of food and transport costs. The study found that more than one in every ten people had to travel a distance of 50 kilometers or more to the hospital. In addition, distance from home to the hospital was found to be significantly associated with adherence, with adherence decreasing with increasing distance. This barrier indicates that although HAART is available at Rundu Hospital free of charge, there are still issues of accessibility to many patients in terms of transport costs. These barriers have been cited in other studies in Sub-Saharan Africa (Mills et al, 2006b: Kgatlwane et al, 2006: Nakiyemba et al, 2006). Another cost related barrier to adherence among the patients on HAART at Rundu was the lack of food. As patients on HAART improve, so does their metabolism, resulting in more demand for food. In addition, good nutrition is required for the restoration of the immune system, and so addressing a regular supply of food to patients on HAART was also found to be an important aspect of the ART Programme.

The role of treatment supporters and counseling were found to have a positive impact on adherence to HAART in this setting. Knowledge of consequences of not taking HAART as prescribed, which is closely linked with counseling, was found to be significantly associated with adherence in this study. These facilitators to HAART have been identified in other studies in Sub Saharan Africa and further developments in these

services would add value to the ART Programme in Rundu Hospital (Nwokike, 2005: Mukabatera et al, 2004.

7.2. RECOMMENDATIONS

In accordance with the findings of this study, the following recommendations should be considered to assist in improving adherence among patients on HAART at Rundu Hospital.

- Programmes that target men for HIV testing and ARV treatment should be developed. Similarly, the factors that impede men taking up testing and treatment either at health system or society level should be explored.
- A system to measure adherence levels should be instituted at Rundu Hospital.
- The capacity of health facilities located more than 6 kilometers away from the hospital should be increased to facilitate provision of HAART.
- The on-going supportive role of the treatment supporter in adherence should be defined to both the patients and the treatment supporters before commencement of HAART
- A counseling protocol should be instituted at the hospital.
- The provision of food to patients on HAART who require such assistance should be investigated with relevant stakeholders
- Further studies, involving both quantitative and qualitative methods, should be conducted to quantify and further explore the factors that influence adherence in this setting.

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APPENDIX 1

INFORMATION SHEET

Adherence to HAART and its major determinants in adult patients in Rundu Hospital, Namibia.

I am Patricia Komu, a student studying at the University of the Western Cape. I am getting information from patients on HAART.I am collecting information related to adherence to HAART in Rundu. I would like to ask you some questions, which will take about 20 minutes of your time and I would like you to participate in the study.

What is the study about?

Adherence to HAART is the most important aspect of this treatment because if the patients do not take their medication properly, the medicines do not work. However, HAART is a complicated regimen that is life long and sometimes it is difficult for patients to take their medications as required due to some factors. This study will identify factors that affect adherence in our community. This will assist in providing quality adherence support to patients on HAART so that they can take their medications as required in order to achieve the benefits of their treatment.

Who are the participants?

The participants are patients on HAART in Rundu Hospital in Namibia. These patients should be 18 years and above and should have been on HAART for more than three months.

What will I be asked to do if I agree to participate?

The researcher will ask questions about yourself and experiences you have had with taking your HAART medication. You will also be asked about your ability to take medication as prescribed by the doctor and any problems or benefits you have experienced with the HAART medication. Information on number of pills and type of drugs will be obtained from your patients' health passports and then the pills remaining will be counted

.

Would my participation in this study be kept confidential?

We will keep your personal information confidential. To help protect your confidentiality, all the information collected will be confidential and your name will not be included on the surveys and other collected data. A code will be used in the survey and the collected data and only the researcher will have access to it. If I write a report or article about this research project, your identity will be protected

What are the risks of this research?

There are no known risks associated with participating in this research project

What are the benefits of this research?

This research is not designed to help you personally, but the results may help the investigator learn more about factors affecting adherence to HAART so as to provide better adherence support to patients on HAART. We hope that, in the future, other people

might benefit from this study through improved understanding of adherence issues to HAART.

Do I have to be in this research and may I stop participating at any time?

The study is completely voluntary. You may withdraw from the study at any time, without having to give a reason or may refuse to answer a question should you wish to. Your treatment will not be influenced in any way by your decision to participate or not.

Is any assistance available if I am negatively affected by participating in this study?

Yes, if you require assistance, you will be referred to a counselor or a clinician who will assist you.

What if I have questions?

This research is being conducted by Patricia Komu of the School of Public Health at the University of the Western Cape. If you have any questions about the research study itself, please contact _ Mrs. Patricia Komu *at*: Rundu Hospital Flats Tel 066 256327

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact: Hazel Bradley at Tel : 27219592630 cell 0722979932

Head of Department:

Dean of the Faculty of Community and Health Sciences:

University of the Western Cape

Private Bag X17

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APPENDIX 2

INFORMED CONSENT FORM

Title of Research Project: Adherence to HAART and its major determinants in adult patients in Rundu Hospital, Namibia.

I freely and voluntarily agree to participate. My questions about the study have been answered. I understand that my identity will not be disclosed and that I may withdraw from the study without giving a reason at any time and this will not negatively affect me in any way.

Participant's name……..

Participant's signature…….

Date……

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact the study coordinator:

Study Coordinator's Name: Patricia Komu

Rundu State Hospital

P.O Box 47 Rundu.

Telephone: (066) 256327-

Cell: 0812776274

APPENDIX 3

INFORMATION SHEET (RUKWANGALI TRANSLATION)

Esikiso –somo lyo kunwa mutji go HIV (HAART) ntani kwakara sininke so sinene so kudidilikira mo vaveli w ova kurona mo sipangero za Rundu, mo Namibia.

Ame nyame Patricia Komu, mu nasure ani lirongere ko nkure sure zo nene ezi ava tumbura asi Western Cape. Ame kua hara ku gwana mapukururo ko vaveli ava vana kara po no mutji do HIV ndi po HAART. Ame kuna ku ponga yika mapukururo go ku haena esikisomo lyo kunwa mutji go HIV (HAART)mo Rundu. Ame kuna hara kukupura mapuro , aga naga kwata siruwosoku sika ko no minute no murongo mbali so ru veze rweni, ntani □ ova□ hara olihae sermo me konakono.

Ekonokono lyo ku hamena ko sinke?

Esikisomo lyo kunwa mutji go HIV (HART) yiso sininke po so mulyo unene ko wowu uhaku, morwa nsene asi vaveli kpi vana kunwa no mutji dawo nawa, no mutji kapi tadi rugana. Nampili ngoso,no mutji do HIV ndi HAART kwa kara no udigu wago ado de paru mudima. Ntani hena udigu ko vaveli kunwa mutji dawo nomu va heap ku dinwa ,morwa po dili no kondo dimwe. Ekunakono eli nail dimurura no konda dimwe edi adi ninkisa asi mbunga mponganasa ndi nkarapamwe vapire kusikisano kunwa no mutji.Eyi nayi tu vatera mo ku gava mulyo ge sikisomo, mo kuvatera vaveli ava vana kara po no mutji do HIV (HAART)yip ova new no mutli dawo momu ya wapera, yipovagwanesepo mauwa nsi go wa haku wawo.

Wolye va lihamesilimo?

Valihasilemo va veli ava vakara po no mutji do HIV (HAART) womo sipangero za Rundu mo Namibia. Ava va veli va kona ku gwa nesa no mvhura murongo nah ambo tatu (18) si kwadwise ntani awe hena kwa kara po no mutji do HIV (HAART)kupita kana makwedi gatatu.

Yisinke na va vhura kupurange eyi na nirugana nseneame nina pura kulihameserano?

Mukonakoni na vhura kuku pura epuro lyo kuhamena kwa nyamoge. Ntani enongonono eliwa kara nalyo po kunwa no mutji do (HAART). Ntani nava kupura udivi woge po kunwa mo mutji mo mu adi tjanga ndokotora ntani nkenye udigu ndi mauwa aga wa nongononamo yokuhamena mutji go HIV (HAART). Mapukururo go kuhamena asi "nopera dingapi ntani marudi go no mutjimusinke. Oyo kuvhura kuyigwana mo no mbapira do sipangero do vaveli woge ntani no pera dina hupuko da ov kudi varura.

Kuvhura Elihamesere molyange Mekonakono eli valiture likare mehoramo ndi?

Ose natu gatura mapukururo goge gakare gana horama. Kwatu ogu natuga tantera, mo kuvhura kuvantantera ehoromano lyoge, mapukururo nagenye aga nakuponganyika, tagakara ge horamo ntani Edina lyoge kapi natuli ruganesa mekonakono eli ndi makonakono gamwe. Nomora yizo ngava ruganesa me konakono eli ntani maponganyiko aga tunapura apa, ko mukonakoni gelike yige go kuvhura kukara no mpito zoku vhura

kugatara. Nsene ame tani tjanga siparatjangwa so kuhamena ekonakono lyo proyeka. Edina lyoge nganiligamen / kulipoperea.

Siponga musinke sakaramo mweli ekonakono?

Kutupu siponga sa divikwa se lihameseremo, momakonakono go proyeka ezi.

Uwa musinke wakaramo me konakono eli?

Ekonakono eli kapi valitulisilapo asi, likuvatere pa untu woge, nye yitundamo kuvhura yivatere mukonakoni mokudiva yo yinzi yo kuamena n konda edi adi ninkisa asi epiro ku sikisamo lyo kunwa no mutji do HIV (HAART) yipo tugave esikisomo lyo hasa, no kuvatera vaveli ava vanakara po no mutji do HIV (HAART). Ose twasi huguvara asi; “ko meho oko vantu vamwe kuvhura vaka gwanenemo ma uwa me konakono eli. Kupitira mo kuwapukurura no kuzuvhako yoku hamena esikisomo kunwa no mutji do HIV (HAART).

Kuvhura nikare me konakono eli, ndi kuvhura nihageke mokulihame seramo nkenye ruveze?

Ekonakono eli lya gogu ana hara kulihameseramo. Kuvhura otundemo mekonakono eli nkenye ruveze, wa hana kugava konda ndi kuvhura o nyoke kulimburura epuro nsene ono yihara nyamoge. Kapi tayizona gura uhaku woge morwa asi ove onotokora asi ove to hameno ndi kapi ono kuhame namo.

Pozili mbatero za karapo nsene asi “ame tayi gumunge momudona mokulihameseramo me konakono eli ndi?

Nhi, nsene ono □ ov mbatero, kuvhura vakutume □ ova ehungomwenyo ndi kwa ndokotora ogo na vhura kuku vatera.

Ngapi nsene nina kara nepuro?

Konakono eli kwali rugana Patricia Komu goko sure zo nkarapamwe zou uhaku ko nkuru sure za Western Cape. Nsene ona kara no mapuro nkenye goku hamena ekonakono eli nakanderere gwanekera no mugolikadi (Mrs) Patricia Komu ko sipangero za Rundu ko nzugo ndi ngodi ezi 066 256327.

Kuvhura una kara no mapuro nkenye go kuhamena eknakono eli ntani wa kara no no nkondo asi “Omu konakoni, mu lihamesilimo ndi nsene ono hara kugava nkenye maudigu aga wa gwanekera nago, go kuhamena kekonakono, nakanderere gwanekera na Hazel Bradley ko ngodi ezi; +27219592630 funguna zoko mahoko +27 722979932,

Mukurona go ruha,

Mukurona go nkuru sure zo nkarapamwe no uhaku nowu nkurungu Nkuru sure za Western Cape, Nsako zo Posa x17 Bellville 7535.

APPENDIX 4

INFORMED CONSENT FORM (RUKWANGALI TRANSLATION)

Ntumbiso ze konakono proyeka: Esikoso lyo kunwa mutji go HIV (HAART) ntani kwakara sininke sosinene so ku didilikira mo vaveli wova kurona mo sipangero za Rundu, mo Namibia.

Ame ya mahukire nge no kulizambera ku hamenamo. Mapuro gange go ku hamena ekonakono eli vana ga limburura. Ame nasi huguvara asi Edina lyange kapi ngava. Lipwagesa ntani ame kuvhura ku hageka mo makonakonoaga. Kupira kugava nkenye konda pwa nkenye ruveze ntani kapi nayi gumange mo udona mo ruhapeke.

Edina lyo Muhamenimo…….

Edina supipiko lyo Muhamenimo……

Ezuva ……

Kuvhura ono kara na mapuro nkenye goku hamena ekonakono eli, ndi nsene ono hara kugava nkenye maudigu aga wa gwanekera nago go kuhamena kekonakono. Nakanderere gwanekera no mu kwatakanesi ekonakono.Nakanderere gwanekera no mu kwatakanesi ekonakono:

Edina lyo mukwatakanesi ekonakono: Patricia Komu

Sipangero za Rundu

Simbangu posa 47 Rundu

Ngodi: (066)256327

Ngodi zoko mahoko: 0812776274

APPENDIX 5

Adherence Measurement for ART users questionnaire

Date _____ **Respondent No**._____ **ARV NO**:----------

1. Date of birth M_____Y_____

2. Sex
a). Male b). Female

3. Marital Status

a). Single b). Married /cohabiting

c) Divorced d) Widowed

4. What is the highest standard that you have passed at school?

a) No schooling b). Grade 4 and below

c). Grade 5 to 7 e). Grade 8 to 12

f) Tertiary

5. Where do you live? ---------- nearest clinic/ health centre-------

6. When did you start HAART? M_____ Y_____
Interviewer should countercheck answer with records from patients' passport

7. Have you experienced any side effects with this medication?

a). Yes b). No

8. What do you think would happen in your body if you skipped your ARV medicine? (pls tick one)

a). Viral load increases b). Virus becomes resistant (drugs don't work)

c). Health deteriorates d) Don't know

e). other (pls specify)

9. Apart from your treatment supporter, have you disclosed your HIV status to anybody else ?

a). Yes b). No

10. If yes to Q9 who?

a). Brother/sister b). Parent c).Partner

d) Child e). other (pls specify)

11. **Many people find it hard to take all their HIV medicine exactly as prescribed. Which of the following reasons has caused you to skip your medicines or take them later than required ? please feel comfortable o answer this question truthfully (tick Max 3)**

a).Forgot b). No food c) Medicine exhausted

d). Tired with the medicine e) Did not have pills with you

f). Reacted to the medicine g). Shared pills

h).Feeling you had to hide medication from those around you

i). Did not understand instructions

j). Alcohol use k) Lack of care/support

l). Others (specify pls)
……

12. What is it that helps you to take your HIV medicine regularly as prescribed? (Tick maximum 2)

a). Treatment supporter b).counselling

c). reminders (radio, cellphone, etc)

d). other (pls specify)

13. Many people find it difficult to collect their medicines or attend appointment on the date given by the doctor. Which of the following reasons has caused you to miss an appointment or not to collect your medicines ? (tick max 3)

a.). Forgot b). Ill/ not feeling well enough c). still had medicines left

d). no money for transport e). tired with medicine f). did not have anyone to travel with me

g). Could not have time off work h). did not want to lose a days pay

i). other (pls specify)

14. Can I see your medicine please? Complete names of the medicines. Interviewer should check containers and patients health passport

a). D4T/3TC + NVP b). AZT/3TC + NVP c). D4T/3TC + EFV

d)AZT/ 3TC + EFV e). TDF + 3TC + EFV f). TDF+ 3TC + NVP

15. 30 day recall using visual analogue.

Ask patient to pour out one lot of beads (**representing all the pills they would take in any give month . Note: separately for each drug**). A glass full of beads is marked with a 0-10cm line. After pouring beads to an empty glass, estimate pills not taken by looking at the mark of beads remaining in the glass.

Drug A_____cm Drug B_____cm Drug C_____cm

Composite_____cm

16. 2 day recall using sun and moon chart

Mark "**X**" on each line the time when you took your Medicine **Yesterday?**	6 am	7 am	8 am	9 am	10 am	11 am	12	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12
	 Morn						 Midday						 Eve						 Night
Drug A																			
Drug B																			
Drug C																			
Drug D																			

Mark "**X**" on each line the time when you took your Medicine the **Day before Yesterday?**	6 am	7 am	8 am	9 am	10 am	11 am	12	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12
	 Morn						 Midday						 Eve						 Night
Drug A																			
Drug B																			
Drug C																			
Drug D																			

17. PHARMACY REFILL RECORD pill counts

	Example	Drug A	Drug B	Drug C	DrugD
Drug name(as in Q11)	D4t				
a).Previous date issued	2aug				
b). Qty taken home (total)	66				
c). Qty returned	11				
d). Date returned	1sept				
e). Days since last issue	30				
f). Doses per day	2				
g). Total supposed to take	60				
h). Should have returned	b-g 66-60= 6				
i). Pills missed	c-h 11-6=5				
j). Percent adherence	g-i/g x 100 60-5/60 x100				

……

Thank you very much for sharing your experience with us

APPENDIX 6

BIVARIATE ANALYSIS TABLES

Table 1: Bivariate analysis of ART Knowledge using adherence in three categories

		Adherence Category				
Adherence measure	ART Knowledge	Low < 85%	Medium 85 - <95 %	High ≥95%	χ^2	p value
30 day recall n = 97		n (%) 20 (21)	n (%) 24 (25)	n (%) 53(54)		
	Yes	14(20)	20(28)	37(52)	1.67	0.43*
	No	6	4	16		
Pill count n = 95		n (%) 9	n (%) 16	n (%) 70		
	Yes	6	15	49	4.04	0.13*
	No	3	1	21		
Composite adherence n = 97		n (%) 4	n (%) 31	n (%) 44		
	Yes	1	26	44	6.69	0.03*
	No	3	5	18		

*Fischer exact test

Table 2: Bivariate analysis of ART Knowledge using adherence in dichotomous categories

		Adherence Category				
Adherence measure	ART Knowledge	Sub optimal <95 %	Optimal ≥95%	Prevalence Ratio (95% CI)	χ^2	p value
30 day recall adherence n=97		n (%) 44(45)	n (%) 53(55)			
	Yes	34 (45)	37(55)	1.11 (0.87 - 1.44)	0.35	0.55
	No	10 (39)	16 (61)			
2 day recall adherence n= 93		n (%) 6 (6)	n (%) 87 (94)			
	Yes	4 (6)	64 (94)	0.74 (0.14 - 3.77)	0.14*	0.65
	No	2 (8)	23(92)			
Pill count n = 95		n (%) 25 (26)	n(%) 70 (74)			
	Yes	21 (30)	49 (70)	1.20 (0.95 - 1.51)	1.21*	0.27
	No	4 (16)	21(84)			
Composite adherence n = 97		n (%) 35 (36)	n (%) 62 (64)			
	Yes	27(38)	44(62)	1.09 (0.85 - 1.38)	0.43	0.50
	No	8 (30)	18 (70)			

- Fischer Exact Test used

Table 3: Bivariate analysis of Gender using adherence in the three categories

		Adherence Category				
Adherence measure	Gender	Low < 85%	Medium 85 - <95 %	High ≥95%	χ^2	p value
30 day recall adherence n = 97		n (%) 20 (21)	n (%) 24 (25)	n (%) 53(54)		
	Female	17(22)	22(29)	37(49)	5.31*	0.07
	Male	3(14)	2(10)	16(76)		
Pill count n = 95		n(%) 9 (9)	n(%) 16(17)	n(%) 70(74)		
	Female	9(12)	13(18)	52(70)	3.19*	0.2
	Male	0	3 9(14)	18 (86)		
Composite adherence n = 97		n(%) 4 (4)	n(%) 31(32)	n(%) 44(45)		
	Female	4 (5)	27(36)	45(51)	2.41*	0.12
	Male	0	4	17		

*Fischer Exact test used

Table 4: Bivariate analysis of Gender using adherence in dichotomous categories

		Adherence Category				
Adherence measure	Gender	Sub optimal <95 %	Optimal ≥95%	Prevalence Ratio (95% CI)	χ^2	p value
30 day recall adherence n=97		n (%) 44 (45)	n (%) 53 (55)			
	Female	39 (51)	37 (49)	1.27 (1.03 - 1.56)	3.97	0.04
	Male	5 (24)	16 (76)			
2 day recall adherence n= 93		n (%) 6 (6)	n (%) 87 (94)			
	Female	5 (7)	68 (93)	1.07 (0.73 - 1.55)	0.05*	1.00
	Male	1(5)	19(95)			
Pill count n = 95		n (%) 25 (26)	n (%) 70 (74)			
	Female	22 (30)	52 (70)	1.18 (0.97 - 1.45)	1.29*	0.25
	Male	3 (14)	18 (86)			
Composite adherence n = 97		n (%) 35 (36)	n (%) 62 (64)			
	Female	31 (41)	45 (59)	1.22 (1.01 -1.48)	3.37*	0.06
	Male	4 (19)	17 (81)			

*Fischer exact test use

Table 5: Bivariate analysis of adherence with median distance as the cut off

		Median distance = 6 km				
		Adherence Category				
Adherence measure	distance	Suboptimal <95	Optimal ≥ 95	Prevalence Ratio (95%CI)	χ^2	p value
2 day recall n=93		n (%) 6 (6)	n (%) 87 (94)			
	≤ 6km	4 (8)	45 (92)	1.79 (0.34 -9.33)	0.497 *	0.39
	> 6km	2 (4)	42 (92)			
30 day recall adherence n=97		n (%) 44 (45)	n (%) 53 (55)			
	≤ 6km	27 (53)	24 (47)	1.43 (0.90 – 2.26)	2.46	0.116
	>6 km	17 (37)	29 (63)			
Pill count n = 95		n (%) 25 (26)	n (%) 70 (74)			
	≤ 6km	19 (38)	31 (62)	2.85 (1.24 – 6.50)	7.353	0.006
	> 6 km	6 (13)	39 (87)			
Composite adherence n = 97		n (%) 35 (36)	n (%) 62 (64)			
	≤ 6km	24 (47)	27(53)	1.96 (1.08 – 3.55)	5.56	0.018
	> 6km	11 (24)	35 (76)			

*Fischer exact test

Table 6: Bivariate analysis using composite adherence in 3 adherence categories

	Composite adherence n=97				
	Adherence Category				
Variable	Low < 85	Medium 85 - <95	High ≥ 95	χ^2	p value
	n (%) 4 (4)	n (%) 31 (32)	n (%) 62 (64)		
Marital status					
married/cohabiting	4 (8)	15 (31)	30 (61)	4.09*	0.12
divorced/single/widowed	0	16 (33)	32(67)		
Education level					
≥ secondary	2 (4)	17 (36)	29 (60)	0.54*	0.76
< secondary	2 (4)	14 (29)	33(67)		
Disclosed status					
Yes	4 (5)	26 (32)	51 (63)	0.86*	0.64
No	0	5 (31)	11(69)		
Regimens					
same dosing	2 (3)	28 (35)	50 (62)	4.38*	0.11
different dosing	2 (12)	3 (18)	12 (70)		
ART knowledge					
Yes	1 (1)	26 (37)	44 (62)	6.69*	0.03
No	3 (12)	5 (19)	18 (69)		
Reported Side Effects					
Yes	2 (6)	13 (41)	17 (53)	2.52*	0.28
No	2 (3)	18 (28)	45 (69)		
Gender					
Female	4 (5)	27(36)	45 (59)	2.41*	0.12
Male	0	4 (19)	17 (81)		

*Fischer Exact test

Table 7: Bivariate analysis using composite adherence in dichotomous adherence categories

	Composite adherence n=97				
	Adherence Category				
Variable	Suboptimal <95	Optimal ≥ 95	Prevalence ratio (95%CI)	χ^2	p value
	n (%) 35 (36)	n (%) 62 (64)			
Marital status					
married/cohabiting	19 (39)	30 (61)	1.12 (0.75-1.67)	0.31	0.5
divorced/single/widowed	16 (33)	32 (67)			
Education level					
≥secondary	19 (40)	29 (60)	1.16 (0.78-1.74)	0.5	0.47
< secondary	16 (33)	33 (67)			
Disclosed status					
Yes	30 (37)	51(63)	1.04 (0.87-1.24)	0.19	0.65
No	5 (31)	11(69)			
Regimens					
same dosing	30 (38)	50 (62)	1.06 (0.89-1.28)	0.40	0.52
different dosing	5 (29)	12 (71)			
ART knowledge					
Yes	27 (38)	44(62)	1.09 (0.85-1.38)	0.43	0.50
No	8 (31)	18 (69)			
Reported Side Effects					
Yes	15 (47)	17 (40)	1.56 (0.90 -2.73)	2.41	0.12
No	20 (31)	45(69)			
Gender					
Female	31 (41)	45 (59)	1.22 (1.01-1.48)	3.37*	0.06
Male	4 (19)	17 (81)			

*Fischer exact test

Table 8: Bivariate analysis using 2 day recall adherence in dichotomous adherence categories

	2 day recall n=93			
	Adherence Category			
Variable	Suboptimal <95	Optimal ≥95	Prevalence Ratio (95%CI)	p value 2 tailed
	n (%) 6 (6)	n (%) 87 (94)		
Marital status				
married/cohabiting	4 (8)	45 (92)	1.29 (0.71-2.35)	0.67
divorced/single/widowed	2 (5)	42 (95)		
Education level				
≥ secondary	3(6)	44 (94)	0.99 (0.43 -2.26)	1.00
< secondary	3 (7)	43(93)		
Disclosed status				
Yes	5 (6)	72 (94)	1.01 (0.70- 1.46)	1.00
No	1 (6)	15 (94)		
Regimens				
same dosing	4 (5)	74 (95)	0.38 (0.08 -1.91)	0.24
different dosing	2 (13)	13 (87)		
ART knowledge				
Yes	4(6)	64 (94)	0.74 (0.14 -3.77)	0.65
No	2 (8)	23 (92)		
Reported Side Effects				
Yes	0	31(100)	Undefined	0.17
No	6 (10)	56 (90)		
Gender				
Female	5 (7)	68 (93)	1.07 (0.73 – 1..55)	1.00
Male				

Table 9: Bivariate analysis using 30 day recall adherence in 3 adherence categories

	30 day recall adherence n=97				
	Adherence Category				
Variable	Low < 85	Medium 85 - <95	High ≥95	χ^2	p value
	n (%) 20	n (%) 24	n (%) 53		
Marital status					
married/cohabiting	11 (22)	11(22)	27(56)	0.38	0.82
divorced/single/widowed	9 (19)	13(27)	26 (54)		
Education level					
≥ secondary	9 (24)	15(31)	24 (45)	2.16	0.33
< secondary	11(22)	9 (18)	29 (59)		
Disclosed status					
Yes	18 (22)	21(26)	42 (52)	1.59	0.45
No	2 (13)	3(19)	11(68)		
Regimens					
same dosing	19 (24)	19 (24)	42(52)	2.73*	0.25
different dosing	1(6)	5(29)	11(65)		
ART knowledge					
Yes	14 (20)	20 (25)	37 (45)	1.67	0.43
No	6 (23)	4 (15)	16 (62)		
Reported Side Effects					
Yes	11(50)	6 (27)	5 (23)	5.6	0.06
No	9 (14)	18 (28)	38(58)		
Gender					
Female	17 (22)	22 (29)	37 (49)	5.31*	0.07
Male	3 (14)	2(10)	16 (76)		

*Fischer exact test

Table 10 Bivariate analysis using 30 day recall adherence in dichotomous adherence categories

	30 day recall adherence n=97				
	Adherence Category				
Variable	Suboptimal <95	Optimal ≥ 95	Prevalence ratio (95%CI)	χ^2	p value
	n (%) 44 (45)	n (%) 53(55)			
Marital status					
married/cohabiting	22 (45)	27 (55)	0.98 (0.66 -1.46)	0.01	0.91
divorced/single/widowed	22 (46)	26 (54)			
Education level					
≥ secondary	24 (50)	24(50)	1.23 (0.79-1.90)	0.5	0.48
< secondary	20 (40)	29(60)			
Disclosed status					
Yes	39 (48)	42 (52)	1.12(0.94-1.33)	0.42	0.5
No	5(31)	11(69)			
Regimens					
same dosing	38 (48)	42 (52)	1.66(0.50-5.65)	0.93	0.3
different dosing	6 (35)	11 (65)			
ART knowledge					
Yes	34 (48)	37 (52)	1.11(0.87-1.44)	0.35	0.55
No	10 (38)	16 (62)			
Reported Side Effects					
Yes	17 (53)	15 (47)	0.86(0.64-1.14)	0.74	0.38
No	27 (42)	38 (58)			
Gender					
Female	39 (51)	37(49)	1.27(1.03-1.56)	3.97	0.04
Male	5 (24)	16 (76)			

Table 11: Bivariate analysis using pill count adherence in 3 adherence categories

	Pill count adherence n=95				
	Adherence Category				
Variable	Low < 85	Medium 85-<95	High ≥95	χ^2	p value
	n (%) 9 (9)	n (%) 16 (16)	n (%) 70 (74)		
Marital status					
married/cohabiting	6 (12)	9 (18)	34 (70)	1.21*	0.54
divorced/single/widowed	3 (7)	7 (15)	36 (78)		
Education level					
≥ secondary	6 (13)	10 (21)	31(76)	2.90*	0.23
< secondary	3 (6)	6 (12)	39 (82)		
Disclosed status					
Yes	3 (19)	2 (13)	11(68)	2.03	0.36
No	6 (8)	14 (18)	59 (74)		
Regimens					
same dosing	8 (10)	13 (16)	58(74)	0.26*	0.87
different dosing	1(6)	3 (19)	12 (75)		
ART knowledge					
Yes	6 (9)	15 (21)	49 (70)	4.04*	0.13
No	3 (12)	1(4)	21 (84)		
Reported Side Effects					
Yes	4(13)	6 (24)	21 (63)	0.96	0.61
No	5 (7)	10 (16)	49 (77)		
Sex					
Female	9 (12)	13 (18)	52 (70)	3.19*	0.2
Male	0	3 (14)	18 (86)		

*Fischer exact test used

Table 12: Bivariate analysis using pill count adherence in dichotomous adherence categories

	Pill count adherence n=95				
	Adherence Category				
Variable	Suboptimal <95	Optimal ≥95	Prevalence Ratio (95%CI)	χ^2	p value
	n (%) 25 (26)	n (%) 70 (74)			
Marital status					
married/cohabiting	15 (31)	34 (69)	1.24 (0.83-1.84)	0.56	0.45
divorced/single/widowed	10 (22)	36 (78)			
Education level					
≥ secondary	16 (34)	31(66)	1.45(0.97-2.14)	2.13	0.14
< secondary	9 (19)	39 (81)			
Disclosed status					
Yes	5 (31)	11 (69)	1.27(0.49-3.30)	0.03	0.75
No	20 (25)	59 (75)			
Regimens					
same dosing	21 (27)	58 (73)	1.01(083- 1.24)	0.03*	1.00
different dosing	4 (25)	12 (75)			
ART knowledge					
Yes	21 (30)	49(70)	1.20(0.95-1.51)	1.21*	0.27
No	4 (16)	21 (84)			
Reported Side Effects					
Yes	15(42)	21(58)	0.86(0.60-1.22)	0.44	0.5
No	10 (17)	49 (83)			
Gender					
Female	22 (30)	52(70)	1.18(0.97-1.45)	1.29*	0.25
Male	3(14)	18 (86)			

*Fischer exact test used

Table 13: Bivariate analysis of adherence with median distance as the cut off

		Median distance = 6 km				
		Adherence Category				
Adherence measure	distance	Suboptimal <95	Optimal ≥ 95	Prevalence Ratio (95%CI)	χ^2	p value
2 day recall n=93		n (%) 6 (6)	n (%) 87 (94)			
	≤ 6 km	4(8)	45 (92)	1.79 (0.34 -9.33)	0.497*	0.39
	> 6 km	2 (5)	42 (95)			
30 day recall adherence n=97		n (%) 44 (45)	n (%) 53(55)			
	≤ 6 km	27 (52)	24 (48)	1.43 (0.90 – 2.26)	2.46	0.116
	> 6 km	17(37)	29 (63)			
Pill count n = 95		n (%) 25 (26)	n(%) 70 (74)			
	≤ 6 km	19 (38)	31(62)	2.85 (1.24 – 6.50)	7.353	0.006
	> 6 km	6 (13)	39 (87)			
Composite adherence n = 97		n (%) 35 (36)	n (%) 62 (64)			
	≤ 6 km	24 (48)	27(52)	1.96 (1.08 – 3.55)	5.56	0.018
	> 6km	11 (24)	35 (76)			

*Fischer exact test used

Table 14: Bivariate analysis of adherence with age.

		Mean age = 36years				
		Adherence Category				
Adherence measure	age band	Suboptimal <95	Optimal ≥95	Prevalence ratio (95%CI)	χ^2	p value
2 day recall n=93		n (%) 6 (6)	n (%) 87(94)			
	≤ 36	2 (4)	48 (96)	0.43 (0.08 - 2.23)	1.06*	0.26
	> 36	4 (9)	39 (91)			
30 day recall adherence n=97		n (%) 44 (45)	n (%) 53(55)			
	≤ 36	25(50)	25(50)	1.23 (0.79 -1.92)	0.88	0.34
	> 36	19 (40)	28 (60)			
Pill count n = 95		n (%) 25 (26)	n (%) 70 (74)			
	≤ 36	14 (29)	35 (71)	1.19 (0.60- 2.35)	0.26	0.6
	> 36	10 (26)	28(74)			
Composite adherence n = 97		n (%) 35(36)	n (%) 62 (64)			
	≤ 36	20 (40)	30 (60)	1.25 (0.73 - 2.14)	0.67	0.4
	> 36	15(31)	32 (69)			

*Fischer exact test used

Table 15: Bivariate analysis of adherence with duration on treatment

		Mean duration on treatment = 20 months				
		Adherence Category				
Adherence measure	duration	Suboptimal < 95%	Optimal ≥95%	Prevalence Ratio(95%CI)	χ^2	p value
2 day recall n=93		n (%) 6 (6)	n (%) 87 (94)			
	≤ 20	2(4)	47 (96)	0.44 (0.08-2.33)	0.32*	0.28
	> 20	4 (9)	40 (91)			
30 day recall adherence n=97		n (%) 44 (45)	n (%) 53(55)			
	≤ 20	24 (45)	29 (55)	0.99 (0.64-1.54)	0.0003	0.57
	> 20	20 (45)	24 (55)			
Pill count n = 95		n(%) 25 (26)	n (%) 70 (74)			
	≤ 20	14 (26)	39 (74)	1.01 (0.51-1.98)	0.0006	0.98
	> 20	11 (26)	31(74)			
Composite adherence n = 97		n (%) 35(36)	n (%) 62 (64)			
	≤ 20	19 (36)	34 (64)	0.98 (0.57-1.67)	0.003	0.96
	> 20	16 (36)	28 (64)			

*Fischer exact test used