

UNIVERSITY OF LIMPOPO
MEDUNSA CAMPUS
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF FAMILY MEDICINE

PREVALENCE AND CHARACTERISTICS OF ADOLESCENT HIV/AIDS CASES SEEN
AT THE WELLNESS CLINIC OF BERNICE SAMUEL HOSPITAL IN DELMAS,
MPUMALANGA (2009)

BY

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DECLARATION

I hereby declare that the work presented in this study for the degree of Master of Medicine in Family Medicine has not been presented either wholly or in part for any other degree.

Signed: _____

Candidate

Signed: _____

Supervisor

STATEMENT

I hereby certify that this study is entirely the result of my own independent investigation. The various sources to which I am indebted are clearly indicated and acknowledged in the report and references.

Signed: _____

Candidate

Signed: _____

Supervisor

DEDICATION

I dedicate this work to all my teachers and mentors past and present,

My family members and friends who have been a source of emotional stability over the years,
My parents The late Chief Oyeniya Oladejo and Mrs Alice Oladejo without whom I wouldn't even be here in the first instance,

My Spiritual teacher, Sri Harold Klemp for spiritual support and balance and finally, The ancient one, SUGMAD.

Olatayo

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LIST OF ABBREVIATIONS

| | |
|--------|---|
| HIV | Human Immunodeficiency Virus |
| AIDS | Acquired Immunodeficiency Syndrome |
| UNAIDS | Joint United Nations Program on AIDS |
| HAART | Highly Active Anti-Retroviral Therapy |
| NGO | Non Governmental Organizations |
| VCT | Voluntary Counseling and Testing |
| WHO | World Health Organization |
| CD4 | Antigen of T-helper lymphocytes |
| STI | Sexually Transmitted Infections |
| ART | Antiretroviral Treatment |
| PMTCT | Prevention of Mother-To-Child-Transmission of HIV |
| GPS | Global Positioning System device |
| TB | Tuberculosis |
| ADRs | Adverse reactions |
| ARV | Antiretroviral |
| ART | Antiretroviral therapy |
| VL | Viral Load |
| RTI | Respiratory tract infection |
| HB | Hemoglobin |
| BSH | Bernice Samuel Hospital |
| STI | Sexually transmitted infection |
| OML | Oral mucosal lesions |

ABSTRACT

Background. The study was aimed at showing the prevalence, clinical and demographic characteristics of HIV positive adolescents attending the Wellness clinic of the Bernice Samuel Hospital in Delmas.

Design. The study was a retrospective, cross-sectional study.

Methods. A non-probability sampling (criterion sampling) was used. All patients between the ages of 11years to 19 years who are registered at the Wellness clinic of Bernice Samuel Hospital in Delmas for the period 1 January 2009 to 31 December 2009 were taken. The variables studied included Prevalence, Demographic variables (gender, age group, population group, marital and employment status as well as Proximity to ART site) and Clinical variables(Viral load at presentation, CD4 count, Hemoglobin, associated sexually transmitted disease, associated health problems pre and post HAART, antiretroviral regimen, WHO staging).

Results. The study showed a great disparity between the total number of adolescents picked up by VCT in the community and those registered for follow up care at the Hospital's Wellness clinic (Clinic prevalence 2.3% versus community prevalence 3.8%). Most of the patients were females, evenly distributed in early and late adolescence, were scholars presenting at an advanced stage of the disease despite an easy access to health care. Common health problems encountered in these patients were oral Candidiasis, malnutrition, pneumonia, and diarrheal illness. The commonest adverse reactions to HAART were gastrointestinal symptoms and hepatotoxicity. Retention on the ARV treatment program was good but there was an unacceptable delay in initiating HAART. Death was the commonest cause of loss to follow up.

Conclusion. Adolescent HIV/AIDS remains a problem in the Delmas municipality even though prevalence appears to be low. The cause of late presentation in the wellness clinic despite good access will need to be investigated and rectified.

CHAPTER 1: INTRODUCTION

1.1 **Background**

The HIV/AIDS epidemic has had a far reaching impact on world health as a whole and human life expectancy in general. No part of the globe has borne the burden and misery of the disease as sub-Saharan Africa. As at 2007, a total of 33.2 million people were living with HIV in the world (UNAIDS, 2008). This figure includes 2.5 million adults and children that were newly infected in 2007. An estimated 22.4 million (67% of the total) adults and children were living with HIV in Sub-Saharan Africa at the end of 2008. During 2008, an estimated 1.4 million Africans died from AIDS (UNAIDS, 2009). Of all African countries, Southern African countries are worst affected with adult seroprevalence rates of between 0.1% for Madagascar and 26.1% for Swaziland (AVERT, 2010). Most Southern African countries have HIV/AIDS rates in double digits.

The impact of the epidemic on South Africa as a country is equally serious. Based on its sample of 33,488 women attending 1,415 antenatal clinics across all the nine provinces, the South African department of health study estimates that 28% of pregnant women were living with HIV in 2007 (National Department of Health, 2008).

The provinces that recorded the highest HIV rates were Kwazulu natal, Mpumalanga, and the Freestate. The Northern Cape and the Western Cape recorded the lowest prevalence.

In 2008, the South African National HIV Survey estimate that 10.9% of all South Africans over 2 years old were living with HIV. Among those between 15 and 49 years old, the estimated HIV prevalence was 16.9 % while the prevalence in children aged 2-14 years was 2.5%. Mpumalanga province in which the Delmas district municipality is situated is the second worst affected by the HIV epidemic. It is divided into three districts as follows:

- Ehlanzeni district,
- Gert Sibande district, and
- Nkangala district

The Delmas municipality is located within the Nkangala district which is the least affected of the three provincial districts in terms of the HIV seroprevalence. This however not to

trivialize the HIV situation in the Delmas municipality as the epidemic remains an important public health concern. According to the district health information system, in 2007, 23% of all antenatal clients tested positive for HIV in Delmas during an antenatal survey while 35% of all client tested (excluding antenatal cases) tested positive. HIV positive under 5, accounted for 37% of all clients aged under 5years old who were tested (District Health Information System, 2010).

DELMAS DISTRICT MUNICIPALITY

The municipality is situated in Mpumalanga province within the Nkangala district. It is bordered to the west by the Ekurhuleni Metropolitan municipality in Gauteng province, to the north by the Kwingini local municipality, and the south by the Govan Mbeki and Lesedi local municipalities (figure 1.1) (Nkangala District Municipality 2009).



Figure 1.1: Delmas Locality Map (Adapted from Nkangala District Municipality, 2009).

According to the 2001 Census, the total population of Delmas Local Municipality is approximately 56 207 persons, which amounts to 5.5% of the total Nkangala District Municipality population (1 020 589) and 1.8% of the Mpumalanga province population (3 122 988 persons). Table 1.1 shows the population composition of the municipality. Of the population of 56 207 persons, 27 665 are male (49.2%) and 28 542 are female (50.8%). Settlements in the area are sparsely distributed with residential densities increasing away from the town centre. Urban settlements are found mostly in Eloff, Sundra, Delmas and Botleng. Rural settlements include Brakfontein, Argent, Arbor, Dryden and Waaikraal. Agricultural settlements in form of smallholdings are also found in Eloff, Sundra (Droogfontein and Reitkol), Strydpan and Delmas (Leeupoort). Dryden is also a railway settlement with industrial development such as BME and AFGRI (Nkangala District Municipality, 2009).

TABLE 1.1: Population composition of Delmas Municipality according to sex

| Male | Female |
|----------------|-----------------|
| 27 665 (49.2%) | 28 542 (50.8%). |

According to the 2001 Census, there are 13 391 households in Delmas Local municipality. The average household is 4.2 persons per household, which is slightly lower than that of the Mpumalanga province, at 4.3 persons per household. Table 1.2 shows the concentration of people in Delmas per ward (Stat SA, 2001)

Table 1.2. The concentration of people in Delmas per ward (Stat SA, 2001)

| Ward | Population |
|-------------|-------------------|
| Ward 1 | 6405 |
| Ward 2 | 24702 |
| Ward 3 | 3802 |
| Ward 4 | 6073 |
| Ward 5 | 8663 |
| Ward 6 | 10296 |
| Ward 7 | 11458 |
| Ward 8 | 4808 |

The following table (table 1.3) shows the categorization of the population per race per ward. What is apparent is that generally there are more blacks than all other races combined and ward 2 is composed of more people, followed by ward 7. Wards 6, 7, and 8 are the more privileged sections of the municipality in terms of socioeconomic status of the citizens of the community (Stat SA, 2001).

Table 1.3: Population by Race, by Ward (Stat SA, 2001)

| Ethnic group | Total | Ward 1 | Ward 2 | Ward 3 | Ward 4 | Ward 5 | Ward 6 | Ward 7 | Ward 8 |
|-------------------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| African | 49643 | 6379 | 4696 | 3612 | 6051 | 8626 | 6979 | 10839 | 2461 |
| Colored | 258 | 20 | 6 | 30 | 18 | 28 | 70 | 52 | 34 |
| Indian | 102 | 4 | 0 | 18 | 3 | 0 | 37 | 30 | 10 |
| White | 6203 | 0 | 0 | 142 | 0 | 9 | 3211 | 538 | 2303 |
| Total population | 56207 | 6405 | 4702 | 3802 | 6073 | 8663 | 10296 | 11458 | 4808 |

In terms of gender distribution in the municipality, males constitute 49% of the total populace whereas females make up 51% of the population. Delmas has a relatively young population with 54% of the population between 0 and 24 years.

The level of education in the community is very low with 34.7 % of the population having never attended an educational institution. The Delmas Municipality is largely rural and the residents are mostly farmers and farm workers with a scattering of other occupations in between.

BERNICE SAMUEL HOSPITAL

The hospital is a 40 bed level 1 health centre serving the population of the Delmas Municipality. The hospital receives referral from three primary health care clinics, two company occupational health clinics, as well as two mobile clinics. The hospital's clinical section comprises of the outpatient unit, the accident and emergency unit and the in-patient unit. The in-patient unit is further subdivided into a general ward which caters for medical, surgical, pediatric and gynecology patients, and a maternity section which also houses the nursery.

In 2005, a wellness clinic was added to the hospital. Prior to this addition, HIV positive patients requiring initiation of antiretroviral medications were referred to Witbank academic hospital for treatment.

A non-government organization called REACTION started the wellness clinic at the hospital and had run the clinic from inception until early 2010 when doctors working for the Mpumalanga provincial department of health and stationed at the Bernice Samuel Hospital, Delmas were deployed to work at the Wellness clinic.

1.2 Problem identification

The researcher of this study being the doctor deployed to the wellness clinic noticed cases of adolescent patients placed on ART who were under 18years of age. Some features noticed in this group of patients provoked this study and these are as itemized below:

- There seemed to be some discrepancy between the number of adolescent HIV positive cases picked up during voluntary counseling and testing and those presenting at the wellness clinic for initiation of antiretroviral therapy (ART).
- Also, there seem to be a general preponderance of adults and children compared to adolescents among patients presenting at the wellness clinic for HAART even though adolescents are known for early initiation of sex as well as high risk sexual behavior which is a feature of their developmental stage (Hsieh, Shih, Lin, Hsieh, Kuo, Lin, Gaydos, 2010; Henry-Reid, O'Connor, Klein, Cooper, Flynn, Futterman, 2010). This disparity becomes more obvious when we consider the fact that Delmas municipality

has a relatively high teenage pregnancy rate alongside a high antenatal HIV seroprevalence rate.

- The researcher also observed a paucity of information regarding the social and demographic distribution of adolescent HIV/AIDS in the community. There seemed to be a gender imbalance in favor of females amongst the adolescent HIV/AIDS cases seen in the wellness clinic. Knowledge of demographic factors such as gender, age group distribution, and referral sources could be important in the formulation of new patient recruitment strategies.
- It also appears as if many of the adolescent attending the Wellness clinic were coming in at a late stage of HIV infection. This observation prompted studies of other aspect of the condition amongst the study group such as clinical condition of the patient before treatment, retention of the patients in the program, and clinical outcomes (success and failure).

Knowledge of all the above mentioned socioeconomic, demographic and clinical characteristics of these patients will help the health team in formulating new patient recruitment strategies.

Knowledge of the above stated factors will also assist in understanding the factors responsible for poor adherence to treatment regimen amongst patient as well as give a clear direction to take in tackling problems observed amongst patients.

CHAPTER 2: LITERATURE REVIEW

2.1 Sources of references

References have been taken from the internet using the search engines GOOGLE scholar, GOOGLE, and PUBMED. Key words used were adolescents, AIDS and HIV infection, Journals and articles were retrieved from the library as were related to the topic.

2.2 Origins of HIV

A group of researchers from the University of Alabama had studied frozen tissue from a chimpanzee and found that the Simian virus it carried was almost identical to HIV-1 which was once common in West-Central Africa. HIV-2 corresponds to a simian immunodeficiency virus found in the Sooty Mangabey monkey which is indigenous to West Africa.

The first recognized case of AIDS occurred in the USA in the early 1980s. The origin of HIV has been a subject of fierce debate over the years. The earliest case of any type of HIV in a human was from a blood sample analyzed in 1998 but collected in 1959 from an adult male in what is now the Democratic republic of Congo. Tests proved that the man died of AIDS. The first two official AIDS death in South Africa were recorded in 1982 (South Africa History on-line, 2010).

2.3 HIV and AIDS, the epidemic

South Africa has the largest population of people living with HIV/AIDS in the world with about 5.7 million people living with HIV in 2007 (UNAIDS report, 2009). Mpumalanga province comes second on the list of provinces in terms of seroprevalence rate coming second only to Kwazulu-Natal (Department of Health SA, 2007).

The otherwise devastating effect of HIV/AIDS in the population has been ameliorated since the introduction of a highly active antiretroviral therapy (HAART). Children and adolescents are affected by this pandemic in both a direct and an indirect manner. Apart

from the psychological and social dislocation that the disease cause to HIV orphans, the HIV pandemic can affect children and adolescents in a direct manner as listed below:

- Vertical infection of babies in utero and during labor (Bennet, Rogers, 1991; Kozinetz, 2001),
- Infection of babies in early infancy via breast milk (Kozinetz, 2001);
- Infection of adolescent through early sexual initiation (Mbirimtengerenji, 2007; UIC,2005)
- Uncommon modes of transmission of the Virus in children and adolescents include: Blood transfusion, sharing sharp instruments (in cultures that practice circumcision and scarification) (Kozinetz, 2001) and child sexual abuse (Samayoa, Anderson, Grazioso *et al*, 2009).

All age groups are affected by the HIV/AIDS epidemic. Children, adolescents, the middle aged and elderly are all affected. The bulk of the disease load is however borne by the productive segment of the population.

Young people bear a proportionate size of the disease burden of the HIV/AIDS epidemic.

The World Health Organization estimates that of approximately 1600 children infected with the HIV-1 everyday or approximately 600,000 new infections annually in children throughout the world, 90% occur in developing countries. Most children become HIV infected in utero, at birth, or by breastfeeding. In some urban African centers, AIDS is a major cause of infant death and a source of increased infant mortality worldwide (Kozinetz, 2001).

Of all HIV infections around the globe, the prominence of adolescents and young adults remains a consistent theme (Monasch, 2006). For example, in the United States of America, 15-24 year olds represent 14% of HIV cases diagnosed in 2006 and 50% of all sexually transmitted infections reported annually (Henry-Reid, O'Connor, Klein *et al*, 2010). This is thought to be a result of a tendency of present day teenagers to start sexual initiation at an earlier age (Henry-Reid, O'Connor, Klein *et al*, 2010; Hsieh *et al*, 2010). Studies conducted amongst high school scholars in the USA and Southern Taiwan showed that the proportion of scholars who had initiated sex whilst in high school were respectively 47,4% and 27%. The impact of the epidemic on the adolescent segment of the population warrants special attention because although adolescents are more likely to indulge in high risk sexual behavior because

of their developmental stage, (Henry-Reid *et al*, 2010) in this age group, health education, preventive efforts and sexual risk reduction interventions are likely to yield good results (Kozinetz, 2001).

2.4 Adolescent HIV and gender distribution

Young people face the increased risk of HIV infection by virtue of their social position, unequal life chance, rigid and stereotypical gender roles, and poor access to education and health services (Rivers and Aggleton, 2010). Gender is one important factor responsible for the vulnerability of young people to HIV infection. Unequal power relations between men and women for example may render young women especially vulnerable to coerced or unwanted sex and can also influence the capacity of young women to influence where, when, and how sexual relations occur (Aggleton and Rivers, 1998). In a survey of 52,569 persons with heterosexually acquired HIV carried out in the United States of America between 1999 and 2004, 33,554 (64%) were women. All the above mentioned points to the fact of increased susceptibility of women to HIV infection (Loreno & Irene, 2007). The pattern is however not consistent with other studies carried out. For example, studies carried out in the United Kingdom showed that while black females were more likely to be infected with HIV, this was not the case with Caucasians, Black-Caribbean, Asian and other mixed population groups where the converse was found to hold true (Health Protection agency centre for infections and health protection, Scotland, 2010). Given the significant number of young people living in developing countries seriously affected by the epidemic, UNAIDS and its co-sponsoring organization including UNDP has identified young people as a key group for HIV related preventive activities (Rivers and Aggleton, 2010).

2.5 The age distribution of HIV

It is estimated that half of HIV infection world-wide have occurred in people aged less than 25 years. In some developing countries, up to 60% of all new HIV infection occurs amongst 15-24 year olds (World Health Organization, 1995). The picture in South Africa shows some difference however. The South African National HIV survey of 2008 shows only about 11.5% of the affected falling into the under 5 year category (Human Sciences Research Council, 2008). A need to establish the impact on the different age groups

become imperative because of the notion in some quarters that the bulk of individuals afflicted with HIV in middle adulthood (which comprise the bulk of patients) occur in late adolescence and early youth.

2.6 HIV and distance to health care facility.

Patient choice and access to health care is compromised by many barriers including travel distance. Adherence to medications and treatment surveillance is affected by how far the patient has to travel to access health care. Health care facilities are established to offer equitable services to the citizenry. However, despite offering an equitable service, travel costs may advantage those with higher income.

Long distance travel is recognized to be an important factor limiting patient choice and access (Fryer, Drisko, Krugman *et al*, 1999; Prette & Moos, 1996).

Persons infected with HIV are included amongst those most in need of high quality and accessible health care (Fiscella & Shin, 2005). Many factors can influence a patient's choice of a health care facility and often, patient choice can override access barrier. For example, HIV positive patients living in rural areas may travel great distances to maintain anonymity (Heckman, Somlai, Peters *et al*, 1998). HIV positive individuals thus have considerable flexibility as to where they access services, and may choose to boycott a local centre and travel a significant distance for treatment. Many however reside far from a treatment centre and have no choice but to travel (Cook, Downing, Wheater *et al*, 2009).

2.7 Adolescent HIV and socioeconomic status

Not much has been done with regards to the impact of the socioeconomic status and adolescent HIV seroconversion. The works done on the influence of socioeconomic status on HIV in general is not very clear due to reasons stated below:

- The different measures of socioeconomic status affect HIV seroconversion in different ways (Wojcicki, 2005). Common measures of socioeconomic status include educational attainment, household wealth categories, and household expenditure.
- In the first instance, there is difficulty distinguishing between the effect of socioeconomic status on HIV infection and the effect of HIV infection on socioeconomic status (Braveman, Cubbin, Egerter *et al*, 2005; Mosley, 2004; & Myer, Erhlich, Susser, 2002).
- The simultaneous effect of socioeconomic status on HIV incidence and HIV positive survival time (Braitstein, Brinkhof, Schechter *et al*, 2006; Wood, Montaner, Chan *et al*, 2002). These problems were solved by a longitudinal study employing a cohort of HIV negative individuals monitored over time. The result of the study revealed that wealthier households had a 72% higher hazard of HIV acquisition than poorer households. Per capita household expenditure did not significantly affect HIV incidence. One additional year of education reduced the hazard of acquiring HIV by 7%.

Several cross-sectional studies carried out showed a similar trend (Wojcicki, 2005; Mishra, Assche, Greener *et al*, 2007 and Booyesen and Summerton, 2002). Adolescent social behavior has been found to play some role in adolescent HIV prevalence. Adolescent social behavior such as having older male sexual partners was found to be associated with a higher prevalence of adolescent HIV (Chapman, White, Shafer *et al*, 2010). Other social factors implicated include; erosion of social and cultural control on pre-marital sex, abandonment of pubertal rites of passage, and more widespread schooling (Zabin & Kiragu, 1998).

2.8 Racial distribution of the HIV epidemic

It will appear that the HIV virus has a Predilection for African Blacks. In the United States of America for instance, African-American blacks make up 49% of the HIV/AIDS diagnosis despite constituting just 12% of the population. They are followed by the white segment of the society at 30% while constituting 66% of the American populace (Center for disease control and prevention, 2009). A similar disproportionate affliction of Blacks is noticed in the United Kingdom (Health Protection agency centre for infections and health protection, Scotland, 2010). In South Africa, blacks also constitute the most afflicted population group with a seroprevalence rate of 13.6% followed by Colored with 1.7% (table 2.1) (Avert, 2010):

TABLE 2.1: Racial distribution of HIV infection in South Africa

| Population group | Prevalence (%) |
|-------------------------|-----------------------|
| African | 13.6 |
| White | 0.3 |
| Colored | 1.7 |
| Indian | 0.3 |

2.9 HIV and association with other sexually transmitted infections (STI)

The yearly rate of STIs in Sub Saharan Africa is believed to be the highest in the world. 69 million new STIs are diagnosed annually in a population of 269 million 15-49 year olds (Corbett, Steketee, Ter kulle, Latif *et al*, 2002). STIs enhance HIV transmission through increasing HIV viral burden in genital secretions and through damage to the integrity of the genital tract from genital ulceration and the local inflammatory response that recruits leucocytes into the genital tract. Where STIS are highly prevalent, effective STI management services are essential component of HIV control (Donovan, 2004).

2.10 HIV and associated health problems

Survival into adolescence of vertically infected HIV positive children was previously considered extremely unusual but is now increasingly well described.

There is however an overall impact on adolescent health in a setting with a high HIV prevalence that will need to be studied. For instance, HIV infection and its complications is the commonest cause of acute adolescent admission to hospital in Harare and other areas in Zimbabwe (Ferrand, Bandason, Musvaire *et al*, 2010). Common problems encountered in the population studied include adult spectrum opportunistic infections, infections such as Tuberculosis and pneumonia, stunted growth and pubertal delays. Oral mucosal pathologies are another important oral health manifestation of advanced HIV disease. A study in rural Western Cape found that HIV positive research participants had significantly higher rate of oral mucosal lesion (OML) than those found amongst HIV negative participants (Naidoo, Chikte, Gouws & Abdool-Karim, 2009). Other health problems commonly observed among patients include HIV associated malignancies, anemia and nutritional diseases (Shet, Mehta, Rajagopalan *et al*, 2009) as well as diarrheal illness.

2.11 HIV and antiretroviral therapy (ART)

ART has been shown to reduce the incidence of opportunistic disease and to reduce short term mortality from HIV infection. It is cost effective (Creese, Floyd & Guinness, 2002). Furthermore, it can be implemented in resource poor settings (Farmer, Leandre, Mukherjee *et al*, 2001). Pre treatment counseling is very important if the required level of adherence required to produce results is to be achieved.

Poor adherence is due to the costliness of the medications on one hand and the serious adverse effect that can manifest in the first few weeks of therapy.

In the public sector, there are presently two broad group of ART dispensed to patients. The first line agents are prescribed for treatment naïve uncomplicated HIV positive patients who have fulfilled all the criteria for the initiation of antiretroviral therapy. These fist line regimens are as listed in table 2.2 below:

Table 2.2a: First line regimens (old Regimen)

| Regimen | Medications |
|---------------------|------------------------------------|
| 1a | Lamivudine, Stavudine, Effavirenz |
| 1b | Lamivudine, Stavudine, Nevirapine |
| 1c (alternative 1a) | Zidovudine, Lamivudine, Effavirenz |
| 1d (alternative 1c) | Zidovudine, Lamivudine, Nevirapine |

Due to the adverse reactions observed with Stavudine and Zidovudine, the new antiretroviral treatment guidelines propose a gradual phasing out off the two medications (South African National Department of Health, 2010). Stavudine is to be replaced with Tenofovir. The older second line medications in the public sector are Didanosine, Zidovudine and Lopinavir/Ritonavir combination (alluvia or Kaletra).

The new standardized antiretroviral treatment regimen for adults and adolescents is as tabulated below (South African National Department of Health, 2010):

Table 2.2b: New Standard antiretroviral regimen

| 1st line | | |
|--|---|---|
| All new patients needing treatment, including pregnant women | Tenofovir+ Lamivudine or Emtricitabine+ Efavirenz or Nevirapine | For TB co-infection efavirenz is preferred. For women of child bearing age not on reliable contraception, then Nevirapine is preferred. |
| Currently on d4T based regimen with no side effects | Stavudine+ Lamivudine +Efavirenz. | Remain on d4T if well tolerated. Early switch with any toxicity. Substitution to TDF if at high risk of toxicity (high BMI, Low HB, older female) |
| Contraindication to TDF: renal disease. | Zidovudine, Lamivudine, Efavirenz or Nevirapine. | |
| 2nd line | | |
| Failing on a d4T or AZT based 1 st line regimen | Tenofovir +Lamivudine or Emtricitabine+ Lopinavir/Ritonavir | |
| Failing on a TDF based 1 st line regimen | Zidovudine +Lamivudine+ Lopinavir/Ritonavir | |
| Salvage | | |
| Failing any 2 nd line regimen | Specialist referral. | |

Many of the ARVS are associated with serious and sometimes fatal adverse reactions (ADRs). A classification of ARVs and common ADRs associated with each class are given in the table 2.3 below:

TABLE 2.3: SIDE EFFECT AND ADVERSE REACTION OF ARVs (South African National Department of Health, 2009)

| CLASS | DRUG | SIDE EFFECTS/ADRs |
|--------------|-------------|---|
| NRTI | Zidovudine | Anemia, granulocytopenia, myopathy, lactic acidosis |
| | Didanosine | Common: Abdominal pains, Nausea and vomiting. Uncommon: Pancreatitis and peripheral Neuropathy, Lactic Acidosis. |
| | Stavudine | Common: Headache, rash, gastrointestinal Uncommon: Pancreatitis, peripheral neuropathy, Lactic acidosis. |
| | Abacavir | Hypersensitivity reaction with or without rash-May be fatal in adults and children |
| | Lamivudine | Common: Headache, fatigue and abdominal pains. Uncommon: Pancreatitis, peripheral neuropathy, Lactic acidosis. |
| NNRTI | Nevirapine | Skin rash, sedative effect, Diarrhea. HEPATOTOXICITY |
| | Effavirenz | SKINRASH. CNS - Sleep disturbance, confusion, abnormal thinking, teratogenic in primates. |
| PI | Ritonavir | Nausea, vomiting, Diarrhea. Hyperlipidemia |
| | Nelfinavir | Diarrhea can worsen chronic liver disease, Hyperlipidemia. |
| | Kaletra | Nausea, vomiting, diarrhea, Hyperlipidemia |

Many factors affect the decision to commence ARVs one of which is the prevailing economic situation in the country. In resource poor setting like South Africa, the World Health

Organization Guidelines of 2002 recommends the following criteria for the initiation of ARVs (WHO, 2002).:

WHO stage IV disease i.e. clinical AIDS irrespective of CD4 count.

WHO stage I, II, or III disease with a CD4 count of less than 200 cells /cu mm

WHO stage II or III of HIV with a total lymphocyte count below 1200 cell/cu mm.

The most recent National antiretroviral treatment guideline adds some new criteria for initiation of ARVs as documented below (South African National Department of Health, 2010):

- Pregnant women with a CD4 count < 350 cells /cu mm to start lifelong highly active antiretroviral therapy (HAART) while those with a CD4 count higher than 350 cells/cu mm are registered on the regular PMTCT program.
- Patients with MDR/XDR Tuberculosis
- Patients with stage IV disease.
- Patients with CD4 count < 200 cells /cu mm

Loss to care and death occur frequently before starting HAART at an HIV clinic. This delay from CD4 count to ART training even amongst those with the lowest CD4 count highlights the need for intervention that improve linkage to care and prioritize ART initiation for those with low baseline CD4+ count (Basset, Wang, Chetty, Mazibuko, Bearnst, Caddy, Lu, Losina, Walensky, Freedberg, 2009).

There is evidence of moderate quality that initiating ART at CD4 levels higher than 200 or 250 cells/microL reduces mortality rates in asymptomatic, ART-naive, HIV-infected people.

Practitioners and policy-makers may consider initiating ART at levels \leq 350 Cells/microL for patients who present to health services and are diagnosed with HIV early in the infection (Siegfried, Uthman, Rutherford, 2010).

In all cases, the patient must express readiness to commence ARVs before it is started. Once placed on HAART, decision will be made at some point as to whether or not to switch from first to second line regimen. Parameters to use in this situation are immunologic, virologic, and clinical. Studies have shown that in a resource poor setting like South Africa, the best parameters of treatment failure are clinical and immunologic (Chang & Humphreys, 2010).

2.12 Adolescent HIV and Parity

A large proportion of HIV cases in Sub-Saharan Africa occur through hetero sexual contact same way as pregnancy. Indeed, pregnancy and has been associated with HIV infection in American adolescents (Koenig, Espinoza, Hodge & Ruffo, 2007; Gavin, Mackay, Brown *et al*, 2007). Given the relatively high prevalence of teenage pregnancies in the Delmas Municipality, it will be interesting to know how much of adolescent HIV cases are associated with Teenage pregnancies.

2.13 The stage of Disease at presentation

The stage of the infection at presentation will be a measure of Health seeking behavior of the youths in the Municipality as well as the level of Denial of the disease amongst the youth.

Staging of HIV disease is carried out using clinical and laboratory parameters (CD4+ &Viral load). Overall survival is a function of the correlation between the patient's viral load and CD4+ level (hence the stage of the disease) (Charurat, Blattner, Hershow *et al*, 2008). Advanced stage HIV disease is characterized by a high viral load, and low CD4+ count. The higher the measured viral load in the blood, the faster HIV destroys the immune system (Lyles, Munoz, Ymashita *et al*, 2000). Using the Jamaican national surveillance data, it was demonstrated that age, the number of opportunistic infections, and initial stage at presentation were strongly associated with mortality in HIV infected individuals (Losina, Figuero, Duncan *et al*, 2008). Good HAART and strict adherence are the means to reverse the negative impact of HIV on the body's immune system (Detels, Tarwater, Phair *et al*, 2001).

2.14 The period on HAART

The period an individual has been on HAART will give a rough estimate of the level of retention of patients in the antiretroviral treatment program. After some time on HAART, drug toxicities and side effects build up. The quality of life of patients which showed an earlier improvement starts deteriorating once again due to increasing side effects to antiretroviral drugs (Burgoyne and Tan, 2008). A qualitative study in Canada investigating HIV positive youths' perceptions of, and experience with antiretroviral treatment revealed a confusion and skepticism towards ARVs amongst study participants. The youths felt they have no choice and were emotionally unprepared. More importantly, they had issues with social routine disruptions and side effects (Veinol, Flicker, Skinner *et al*, 2006). All of these points can adversely affect how long a patient stays on the ARV treatment program. Success on HAART depends almost entirely on good adherence to therapy. This requires a close to 100% compliance with the ART regimen as well as regular follow up year in year out. Good patient support is required to achieve this. It has however been demonstrated that this kind of support can be mobilized within poor communities like Haiti and that patients can adhere to difficult drug regimens in the most unpromising surroundings (Farmer, Leandre, Mukherjee *et al*, 2001). Counseling is a key support ingredient required for retention in the ARV program. This in turn leads to good adherence (Sherr, 2000).

SUMMARY OF LITERATURE REVIEW

From the foregoing, it can be seen that adolescent HIV/AIDS is a major public health concern affecting predominantly black populations around the world. The issues involved in the epidemiology of this infection are complex involving sociocultural, socioeconomic, gender, and health issues. The impact on adolescent health is particularly crippling and exposes several behavioral and health concerns that needs to be put into perspective.

CHAPTER 3: METHODOLOGY

3.1 Research questions

Research question 1: What is the prevalence of adolescent HIV cases attending the Wellness clinic of the Bernice Samuel Hospital in Delmas as well as the Delmas Municipality for the year 2009?

Research question 2: Is there any discrepancy between the number of adolescent HIV positive cases picked up during voluntary counseling and testing in the Delmas municipality and those presenting at the wellness clinic of the Bernice Samuel hospital for initiation of antiretroviral therapy (ART)?

Research Question 3: What is the demographic, clinical and laboratory characteristics of adolescent HIV cases seen at the Wellness Clinic of Bernice Samuel Hospital?

3.2 Hypotheses

This study firstly aims to test the hypothesis that adolescent patients arrive at the wellness clinic at Bernice Samuel hospital in advanced stages of immunodeficiency, with a specific demographic profile in terms of age, sex and residential distribution. The study also aims to explore the suspicion that there is a shortfall when the adolescent HIV positive cases picked up in the municipality during VCT is compared to those presenting in the wellness clinic for follow up and treatment at the Wellness clinic of the Bernice Samuel Hospital in Delmas.

3.3 Aim and objectives of the study

For this reason, the following specific objectives were explored:

1. To determine the prevalence of adolescent HIV cases seen in the Wellness clinic of the Bernice Samuel Hospital, Delmas and the Delmas municipality for the year 2009.
2. To determine the proportion of the total adolescent HIV cases that finally end up being seen at the wellness clinic in the year 2009.

3. To determine the demographic characteristics of adolescent HIV cases seen in the Bernice Samuel Hospital wellness clinic in Delmas in 2009.
4. To identify common clinical condition at presentation, clinical outcomes (success and failures), retention of patients and common adverse reaction to ARVs in adolescents seen at the Bernice Samuel Hospital wellness clinic in 2009.

3.4 STUDY DESIGN

The study is a descriptive cross sectional survey of all adolescent HIV positive cases presenting at the wellness clinic of the Bernice Samuel Hospital in Delmas.

3.5 SETTING

The Wellness Clinic of Bernice Samuel Hospital, Delmas, in Mpumalanga.

3.6 SAMPLE/STUDY POPULATION

Due to the small study population, a non probability sample was taken (criterion sampling), consisting of all adolescent HIV positive patients in the age range 11-19years registered with the Wellness Clinic of the Bernice Samuel Hospital in Delmas for the period January to December 2009. All patients were required to have a residence address in the Delmas municipality to avoid selection of candidates from other municipalities. In all, a total of 21 patients were identified in the wellness clinic register that satisfied all the criteria. Only nineteen of the files could be retrieved from the registry. Some information on the two missing files was retrieved from the register and these were used in some of the analyses.

3.7 Definition of variables

3.7.1 Patients

Adolescent patients (aged between 11 years and 19 years) tested positive by an HIV Elisa test, who are registered for care at the Wellness clinic of the Bernice Samuel Hospital in Delmas.

3.7.2 Variables

The variables studied are itemized in table 3.1 below:

Table 3.1 Definition of variables (Adapted from Membo, 2009)

| Demographic profile | |
|---|---|
| Gender | Male or female. |
| Age group | Males and female adolescent patients aged between 11 years and 19 years |
| Population groups | As defined by statistics South Africa, patients were classified into 4 racial groups: African, Colored, White and Indian. |
| Marital status | Single, Divorced, Relationship, Separated, Married, Co-habiting |
| Employment status | Employed or unemployed. |
| Clinical and immunological profile | |
| WHO staging | WHO Disease Staging System for HIV Infection and Disease in Adults and Adolescents updated in 2005, in which patients can be classified into four different stages according to the progression of the disease and the clinical manifestations. |
| CD4 cell count | Number of 'helper' T cells/L in patients with HIV, which declines as infection progresses; used as one of the standard laboratory parameters to monitor immune suppression in persons with HIV. |

| | |
|------------|---|
| Viral load | Measure of the severity of a viral infection, and can be calculated by estimating the amount of virus in an involved body fluid. For example, we reported HIV RNA copies per milliliter of blood plasma. |
| Hemoglobin | Hemoglobin concentration found in the blood, measured in grams per 100 milliliter, which is abbreviated to g/dl. Different categories were created for men and women due to physiological differences between the genders |

Residential areas

| | |
|---------------------------------------|--|
| Distance from home to wellness clinic | With a Global Positioning System device (GPS), the distance was calculated and classified into 3 categories: less than 5 km, between 5 and 10 km, and more than 10 km. |
|---------------------------------------|--|

3.8 Data collection

The cases were selected from the patient register kept at the wellness clinic. All the patients who fall within the selection criteria were selected for the study. All patients were required to have a residence address in the Delmas municipality thus avoiding selection of candidates from other municipalities. The patients' case files were then retrieved from the registry. Data was collected from the patient's files into the data collection sheet (appendix 1C).

Data from the data collection sheets were captured on Microsoft Excel spreadsheets (2007) and analyzed.

3.9 Data analysis

Simple statistical calculations of prevalence and proportion were carried out on the data collected. The relationship between the variables was then summarized using measures of central tendency, percentages and measures of dispersion. Data were presented in graphs that attempt to show relationships from a set of data. The data obtained from the Wellness clinic of the Bernice Samuel Hospital was compared with data for the Delmas district municipality collected from the district health information system.

3.10 Ethical considerations:

An ethics approval was obtained from the University of Limpopo MREC followed by approval from the hospital research and ethics committee (the hospital superintendent was required to sign a consent form for the research) and finally, the Mpumalanga department of health research committee. (See appendices). Information gathered from the case files was kept confidential. The names of the subjects were not reflected on the data collection sheet. Rather, codes were be used.

Since this was a retrospective record review, individual consent was not obtained.

3.11 Validity, Reliability and Objectivity

To ensure the Validity and reliability of the data collected, the following was done.

- Only the researcher collected data for the study.
- Another researcher, (the author's supervisor) assisted in scrutinizing the data to determine if they are in agreement with the data interpretation.
- The population and the criteria to be measured were strictly defined and used throughout the study. This helped to ensure content validity of the study.
- The research process was made clear and accurately described to ensure replicability by other researchers.

3.12 Bias

- Observer bias was minimized by limiting the data collection to the researcher alone.
- A major challenge during the study was Information /misclassification bias. This is because the information required was sometimes not available in the files. The researcher had to work with observation made by other health care professionals. The truthfulness and accuracy of these observations could not be ascertained. In addition, the content of the files depended on the quality of medical notes which varied from one health care professional to another. All this was taken into consideration in drawing conclusions from the study.
- Selection bias was addressed by strictly defining the selection criteria and including all patients who fall within the selection criteria into the study.

CHAPTER 4: RESULTS

We were able to analyze all of the variables we set out to analyze. The results are classified into the following three categories: Prevalence studies, demography, and clinical profiles. Each of them is presented according to the baselines characteristics observed in 2009.

In all the tables, the results are expressed in percentage and absolute numbers.

4.1 PREVALENCE STUDIES

A total of 21 patient entries were found in the register at the Bernice Samuel hospital, Delmas who fulfilled the inclusion criteria for the study at the end of 2009. A total of 918 HIV positive patients were on the patient register during this same time period. These 918 patients comprise all the different age groups registered for treatment at the Bernice Samuel Hospital Wellness Clinic.

The prevalence of adolescent HIV positive cases calculated as a proportion of total HIV positive cases seen in the Bernice Samuel Hospital Wellness clinic in 2009 therefore will be:

$$21/918 \times 100 = 2.3\%$$

77 adolescent HIV positive individuals were registered in the three local municipality clinics, mobile clinics and the Bernice Samuel Hospital Wellness clinic. This is out of a total of 2,052 individuals of different age groups who tested positive. This gives a prevalence of:

$$77/2052 \times 100 = 3.8\%$$

This is the prevalence calculated as a proportion of total HIV positive individuals in the community.

4.2 DEMOGRAPHY

The variables analyzed under Demography includes the gender, present age of the patient, the age of the patient when diagnosis was made, distance of residence from the hospital, marital status, occupation, and racial grouping. The different variables are analyzed as below:

4.2.1 Gender distributions

Of the 21 patients sampled, 3 were males and 18 were females. Even though only nineteen files could be retrieved, information regarding the age and gender were retrievable from the Wellness clinic attendance register.

TABLE 4.1: Gender distribution of the adolescent HIV cases in Bernice Samuel Hospital (2009).

| Male | Female |
|------------|-------------|
| 14% (3/21) | 86% (18/21) |

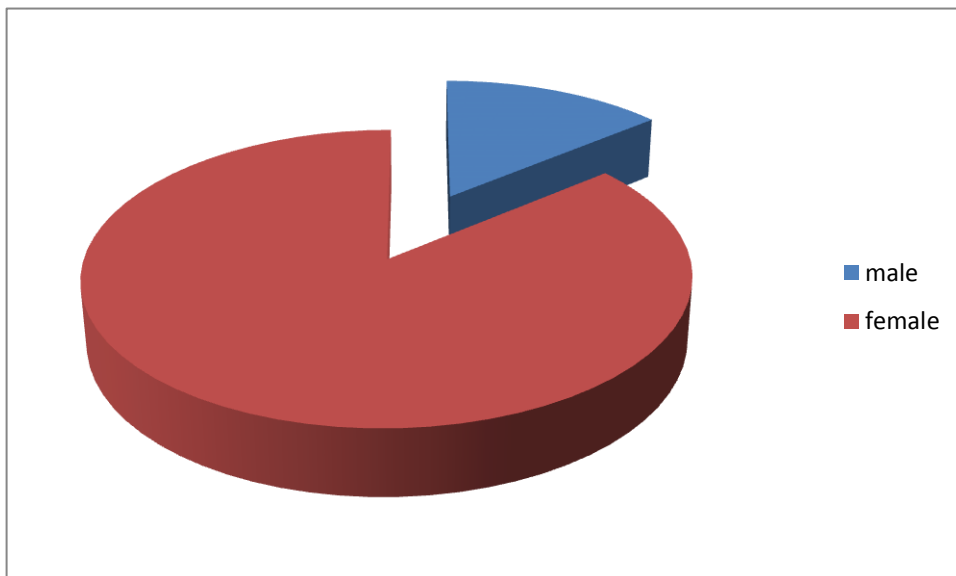


Figure 4.1 Showing gender distributions amongst adolescent HIV+ patients studied in 2009

4.2.2 Age distribution

50% of the adolescents fell between 15 years and 19 years while those between 11 years and 14 years also comprised 50%. The cases in the 11 year age group were more than any of the other age groups studied (22.22%). This is followed by the 13, 18, and 19 year age groups (16.67%).

Table 4.2: shows the age distribution of the study population.

| Age (years) | 11+ | 12+ | 13+ | 14+ | 15+ | 16+ | 17+ | 18+ | 19+ |
|---------------|------------------|-----------------|------------------|--------------|-----------------|-----------------|-----------------|------------------|------------------|
| Male | 1/21 (5.56%) | 1/21 (5.56%) | 0/21 (0%) | 0/21 (0%) | 0/21 (0%) | 1/21 (5.56%) | 0/21 (0%) | 0/21 (0%) | 0/21 (0%) |
| Female | 4/21 (22.22%) | 2/21 (11.1%) | 3/21 (16.67%) | 0/21 (0%) | 1/21 (5.56%) | 0/21 (0%) | 2/21 (11.1%) | 3/21 (16.67%) | 3/21 (16.67%) |

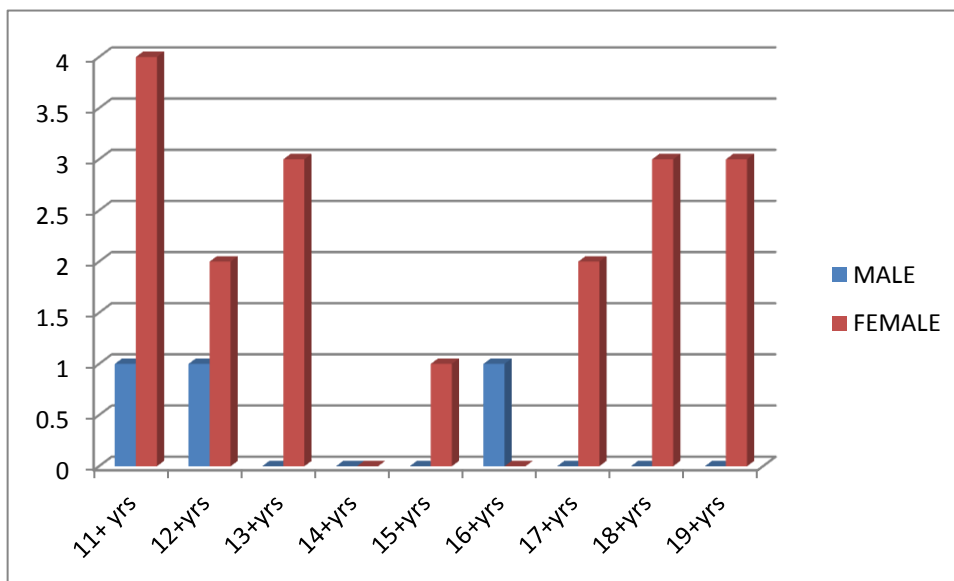


Figure 4.2 Age distribution in 2009

4.2.3 Age at first diagnosis

58% of the study population had their HIV diagnosis before their 13th year while the remaining subjects were diagnosed at 16 years and above. The peak age at first diagnosis was 17years (24%). Information on this parameter was collected from 19 of the files surveyed.

Table 4.3 Age of the subject at the time the first diagnosis of HIV was made

| Age @ first diagnosis (years) | 6+ | 7+ | 8+ | 9+ | 10+ | 11+ | 12+ | 13+ | 14+ | 15+ | 16+ | 17+ | 18+ | 19+ |
|-------------------------------|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| frequency | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 0 | 0 | 1 | 1 | 5 | 1 | 0 |

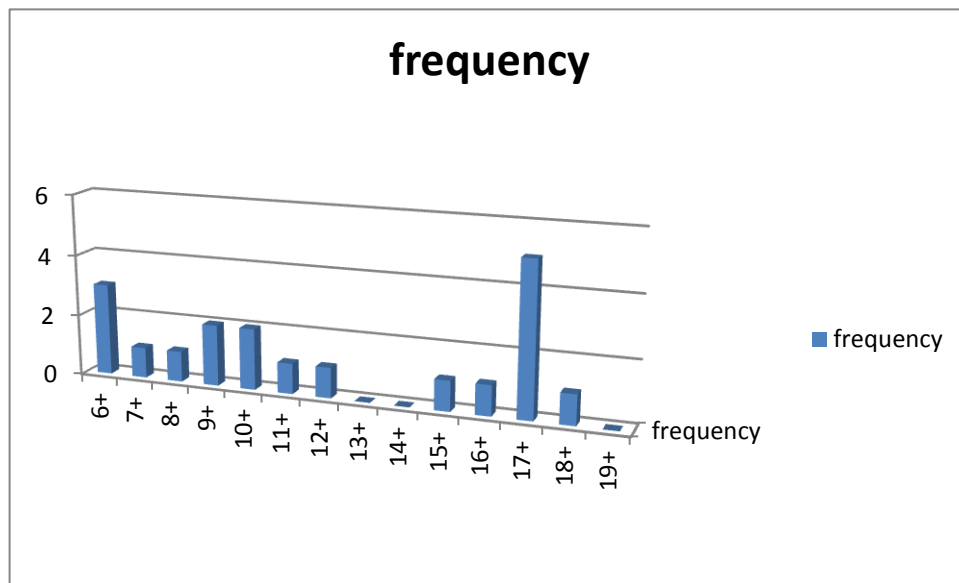


Figure 4.3 Age at first presentation.

4.2.4 Population group

The population group observed shown in figure 4.4 were distributed as follows:

African: males 15 % and females 80%

Colored: females 5 % and no males

White: males 0 % and females 0 %.

Indian: Males 0 % and females 0%.

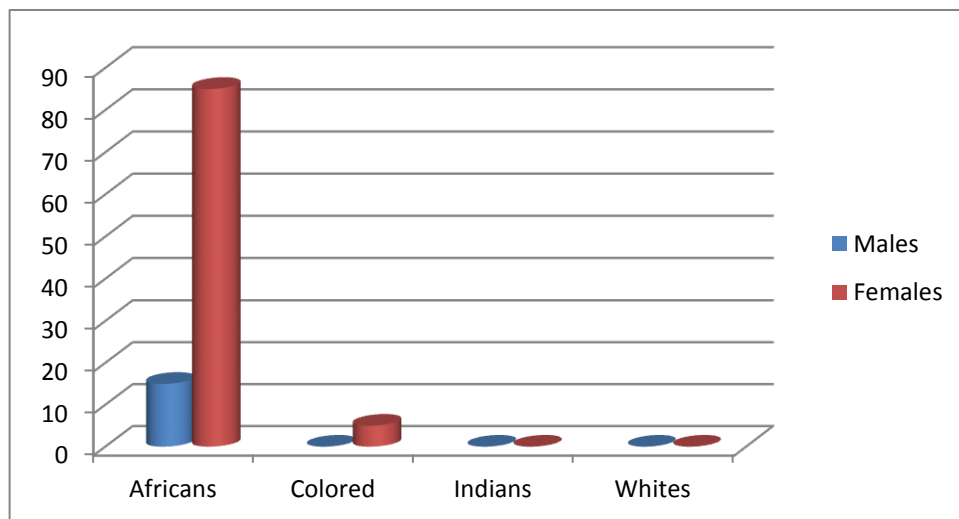


Figure 4.4 Population groups of adolescent HIV+ patients in 2009

4.2.5 Marital status

The marital status of patients shown in the figure 5 was distributed as follows:

- Single: males 15.7 % and females 84.3%.
- Married: males' 0% and females0%.
- Widowed: males 0% and females 0%
- Divorced: males 0% and females 0%.
- Cohabiting: Males 0% and Females 0%

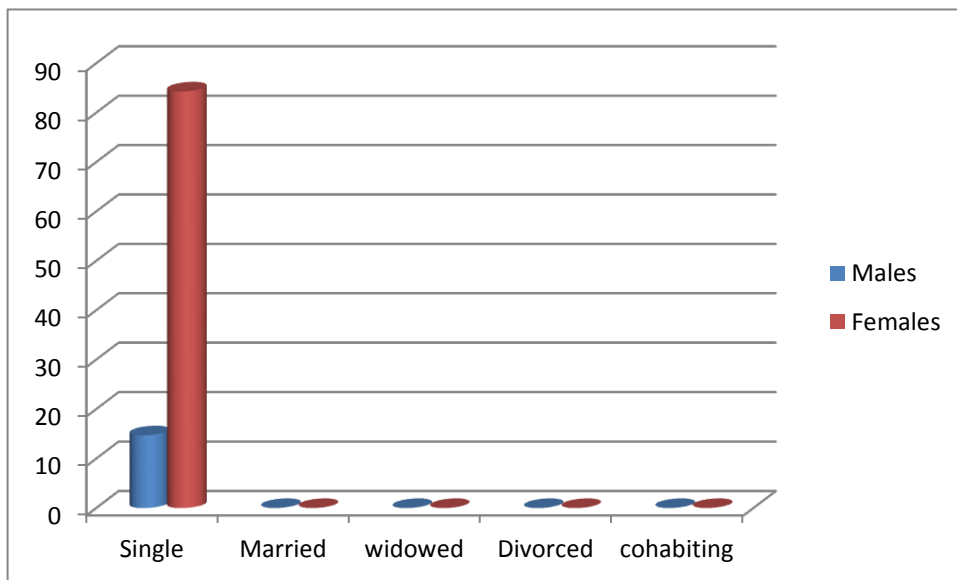


Figure 4.5 Showing the marital status of adolescent HIV+ patients seen in 2009

4.2.6 Employment status

In terms of the employment status, the bulk of the adolescents surveyed were scholars (57.9% females and 15.8% males. The remainder of the study group was unemployed females (31.6%)

All the 19 patients surveyed had information on their employment status.

The employment status of patients is tabulated as follows:

Table 4.4 Showing the employment status of the study population

| | EMPLOYED | UNEMPLOYED | SCHOLAR |
|---------------|-----------------|-------------------|----------------|
| MALE | 0% (0/19) | 0% (0/19) | 15.8% (3/19) |
| FEMALE | 0% (0/19) | 31.6% (6/19) | 57.9% (11/19) |

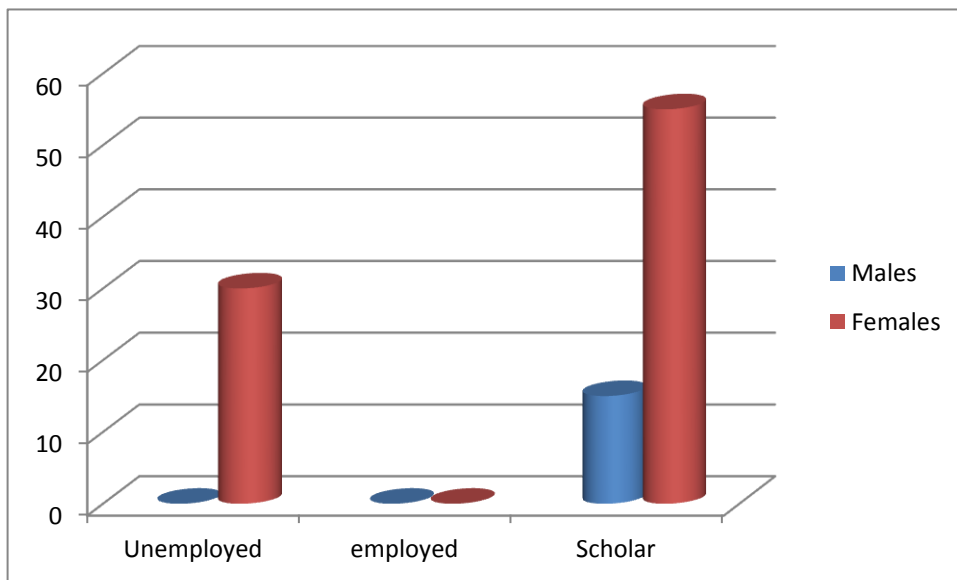


Figure 4.6 The employment status of adolescent HIV+ patients seen in 2009

4.2.7 Proximity to the hospital

The following table shows the distance patients have to travel to get to the clinic on appointment days. Nineteen patients had information on their place of residence. About 95% of the adolescents surveyed lived within a 15km distance to the hospital. The largest segment of the adolescents surveyed live within 10-15km (42%) of the hospital followed by those who live less than 5km from the hospital (32%). The distribution of distance of residence of the patients to the hospital Wellness clinic is as displayed below:

Table 4.5: Distance traveled to the hospital by adolescent HIV+ patients seen in 2009

| Distance to hospital | 0-5km | 5.1-10km | 10.1-15km | 15.1-20km | >20km |
|----------------------|-------|----------|-----------|-----------|-------|
| frequency | 6 | 4 | 8 | 0 | 1 |

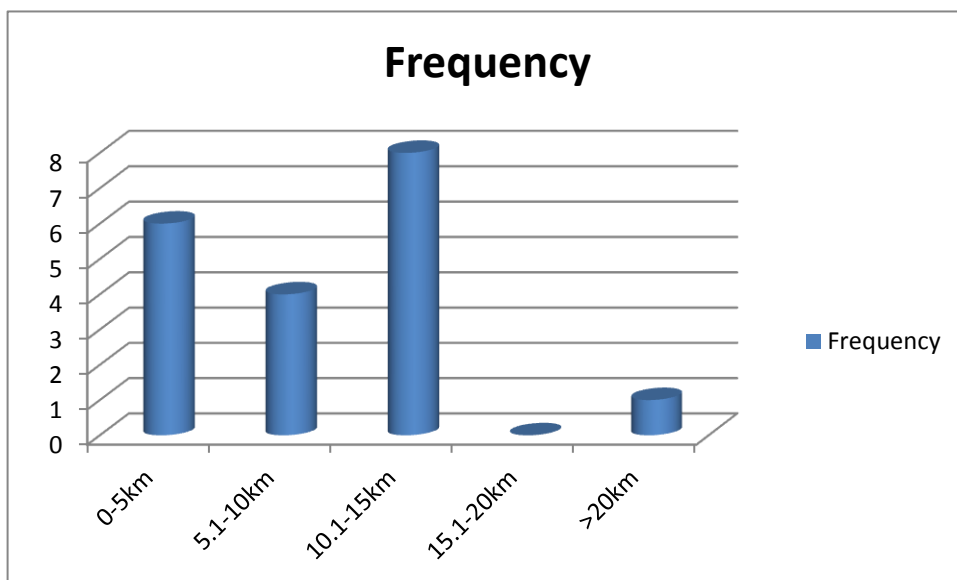


Figure 4.7: Distance Traveled to the hospital by adolescent HIV+ patients seen in 2009

4.3 CLINICAL PROFILE

4.3.1 WHO staging at presentation

The majority of the patients had advanced disease (stage 3) followed by those with an AIDS defining illness (stage 4) at their first visit. 68% of patients came in advanced stage of the disease (stages 3 & 4). Nineteen patients had information regarding their clinical stage at initial presentation to the Wellness clinic.

Table 4.6: Clinical staging at presentation

| Clinical stage | Stage I | Stage II | Stage III | Stage IV |
|----------------|------------|------------|------------|------------|
| Frequency | 5% (1/19) | 26% (5/19) | 47% (9/19) | 21% (4/19) |

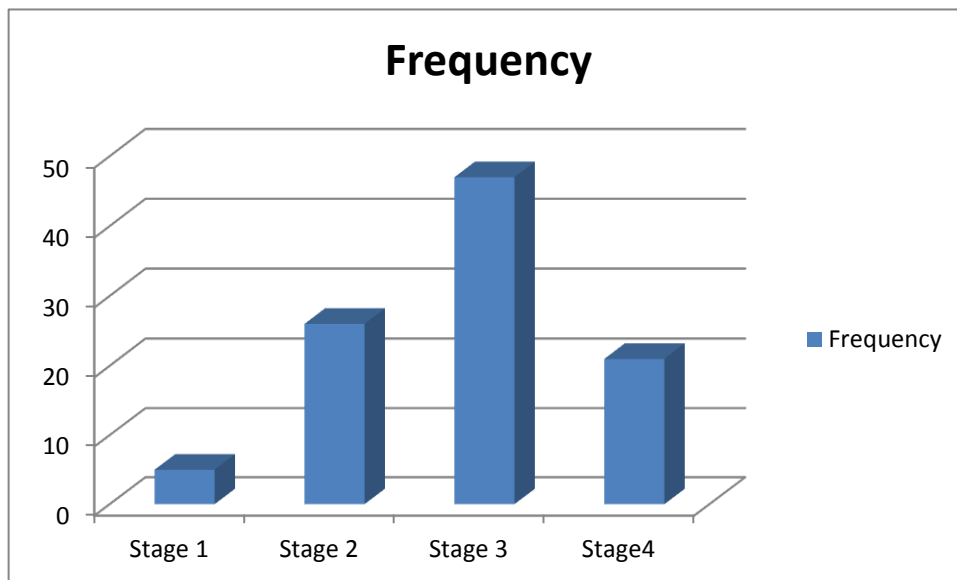


Figure 4.8 WHO Staging at presentation of adolescent HIV+ patients seen in 2009.

4.3.2 CD4 count at presentation

Eighteen patients had information regarding their CD4+ count at initial presentation to the Wellness clinic. Most of the adolescents surveyed had a CD4+ count of >200cell/microL at presentation to the Wellness clinic (42.1%). 57.9% of the adolescents had an absolute CD4+ level above 150 cell/microL. The distribution of the CD4+ count amongst the study population is as shown below:

Table 4.7 CD4+Distribution amongst subjects

| CD4+ (Cells/MicroL | <50 | 50-100 | 101-150 | 151-200 | >200 | No CD4+ Count |
|-----------------------|-------------|-------------|-------------|-------------|-------------|------------------|
| FREQUENCY | 10.5%(2/19) | 15.8%(3/19) | 10.5%(2/19) | 15.8%(3/19) | 42.1%(8/19) | 5.3%(1/19) |

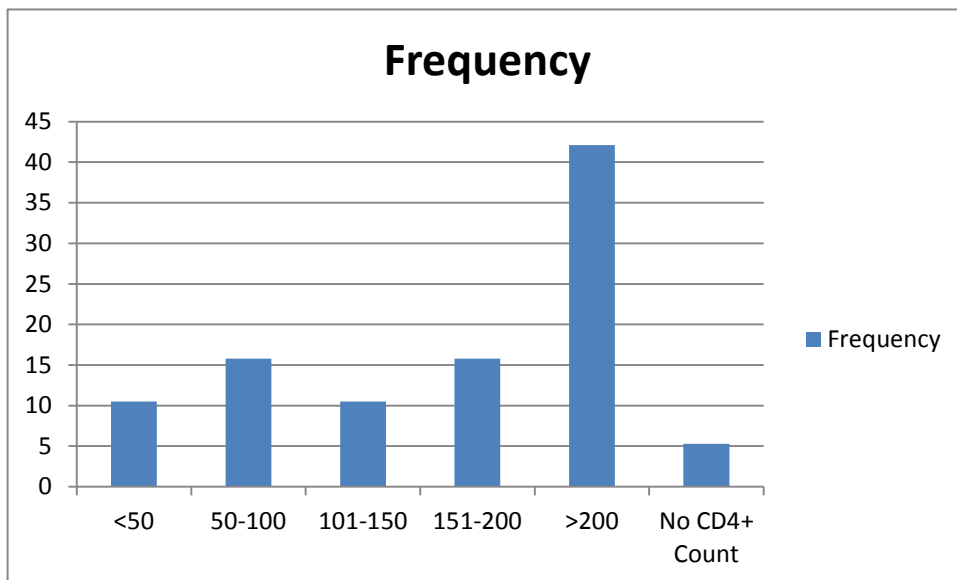


Figure 4.9 CD4+ distributions (Cells/microL) in adolescent HIV patients in 2009

4.3.3 Viral load at presentation

Fifteen of the patients surveyed had information in their files regarding the viral load at initial presentation. As displayed in the table below, a high viral load of more than 100 000 was found in 26.3% of adolescent patients presenting at the Wellness clinic for the first time. About 47.37% of these patients had initial viral load levels greater than 15, 001 copies/ml.

Table 4.8 Showing the distribution of viral load at presentation

| Viral load (copies/ml) | <50 | 50-15000 | 15001-100,000 | >100,000 | No viral load result |
|-------------------------------|----------|-------------|---------------|--------------|----------------------|
| Frequency | 0%(0/19) | 31.58(6/19) | 21.05%(4/19) | 26.32%(5/19) | 21.05%(4/19) |

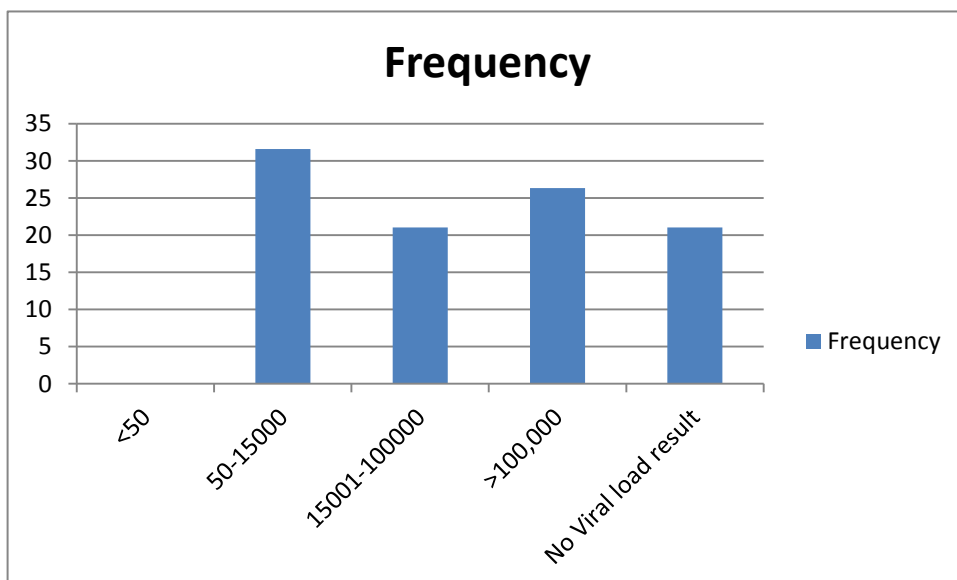


Figure 4.10: Viral load distributions (copies/ml) at presentation in adolescent HIV patients in 2009

4.3.4 Hemoglobin

As can be seen below, most of the adolescents attending the Wellness clinic for the first time had hemoglobin of above 10g/dl (79%). Only 5.3% of patients surveyed had values below 10g/dl. Nineteen patients in all were analyzed for the hemoglobin level at presentation.

TABLE 4.9 Showing the hemoglobin level at presentation

| Hemoglobin at presentation (gram/dl) | <10 | 10-13.5 | >13.5 | Not done |
|--------------------------------------|-------------|---------------|-------------|--------------|
| FREQUENCY | 5.3% (1/19) | 73.7% (14/19) | 5.3% (1/19) | 15.8% (3/19) |

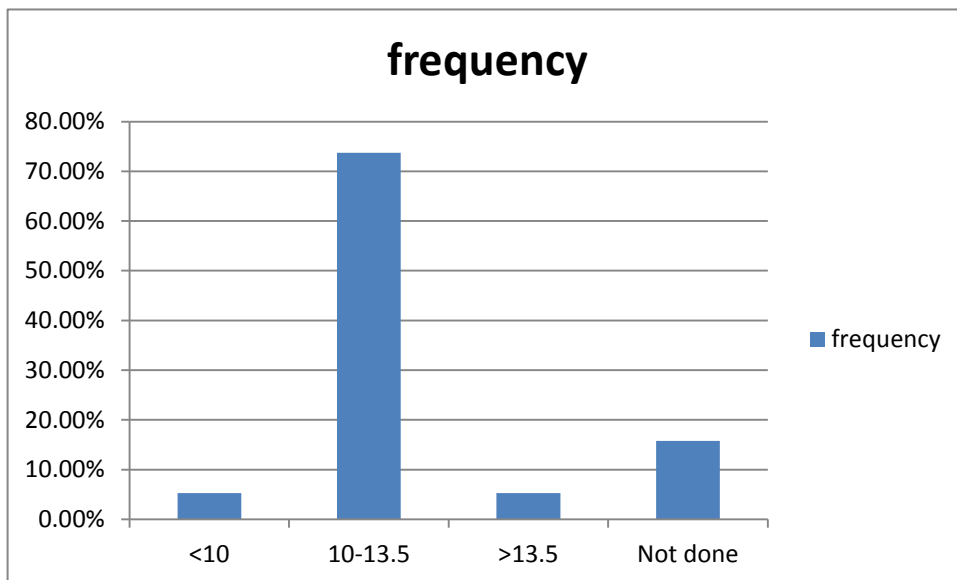


Figure 4.11 Hemoglobin at presentation amongst adolescent Subjects in the Wellness clinic in 2009

4.3.5 Time taken to initiate HAART

Of the nineteen files analyzed, 31.6% of the patients started antiretroviral therapy only after 6months of Qualifying for treatment. 15.8% never started treatment. The peaks were at less than three months and greater than 6months.

TABLE 4.10 Showing distribution of time to start HAART amongst the subjects

| Time taken to initiate HAART | <2weeks | <1month | <3months | <6months | >6months | Never started ARVS |
|------------------------------|----------|-------------|-------------|------------|-------------|--------------------|
| Frequency | 0%(0/19) | 15.8%(3/19) | 31.6%(6/19) | 5.3%(1/19) | 31.6%(6/19) | 15.8%(3/19) |

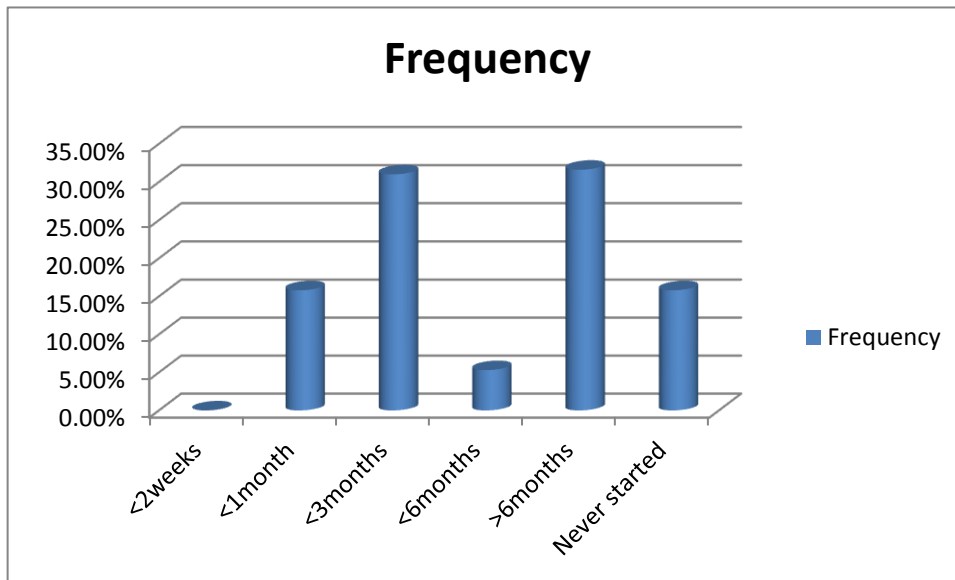


Figure 4.12: Time taken to initiate HAART among subjects.

4.3.6 Antiretroviral regimen.

Sixteen of the nineteen patients surveyed had been started on antiretroviral medications

Most of these patients (41%) were on regimen 1a as at the time of the study.

The table and graph below shows the distribution of the patients across the antiretroviral treatment regimens. The distribution of those patients on ARVs is as shown below:

TABLE 4.11 Showing antiretroviral regimens

| Antiretroviral regimen | 1a | 1b | 1c | 1d | 2 | Not on ARVs |
|------------------------|-----------|-----------|----------|--------------|-----------|-------------|
| Frequency | 41%(8/19) | 16%(3/19) | 0%(0/19) | 10.5% (2/19) | 16%(3/19) | 16%(3/19) |

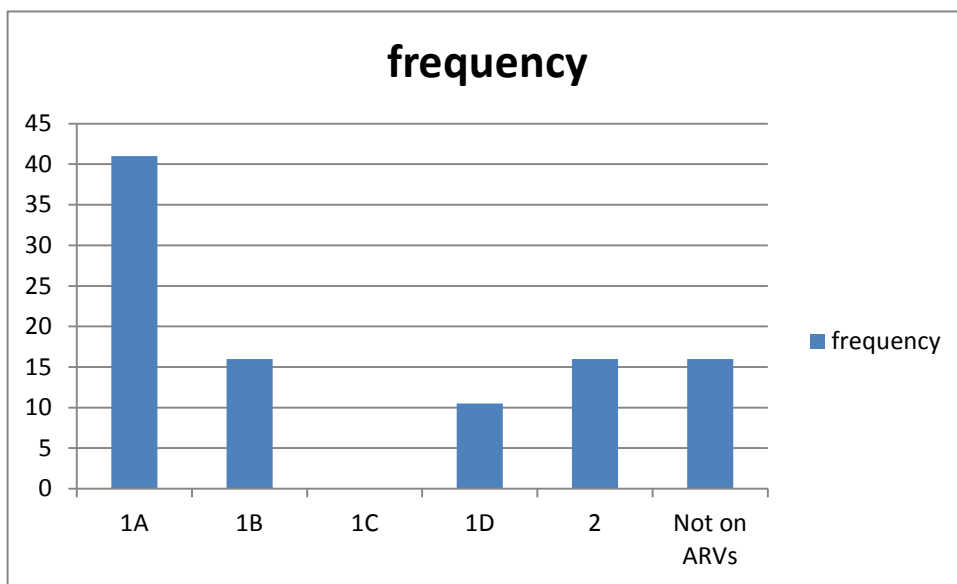


Figure 4.13: Antiretroviral regimens used for adolescents in the Wellness clinic at BSH in 2009

4.3.7 Adverse reactions to antiretroviral therapy

12 out of the 16 patients on antiretroviral therapy reported some form of adverse reaction to the medications this constitute 63.2% of the total sample size. The adverse reactions reported were either single adverse reaction or combined. The term single adverse reaction refers to an isolated complaint by an individual patient that can be attributable to a side effect of the antiretroviral medication whereas the term combined adverse reactions is used to refer to a situation where more than one side effects of the ARV are observed in combination in a specific patient. 5 out of 19 (26.3%) of the subjects had combined adverse reaction to the antiretroviral medications while 4 out of 19 (21.1%) patients had no adverse reaction. The range of adverse reactions experienced is as shown in the tables 4.12a and 4.12b below:

TABLE 4.12a Showing the frequency of ADRs to ARVs:

| ADRs TO ARVs | Dyslipidemia | Fatigue | Lipodystrophy | GI symptoms | Hepatotoxicity | Dizziness | Neuropathy | Not on ARVs |
|--------------|--------------|-------------|---------------|-------------|----------------|-------------|-------------|-------------|
| frequency | 10.5%(2/19) | 10.5%(2/19) | 5.3%(1/19) | 21.1%(4/19) | 21.1%(4/19) | 10.5%(2/19) | 10.5%(2/19) | 15.9%(3/19) |

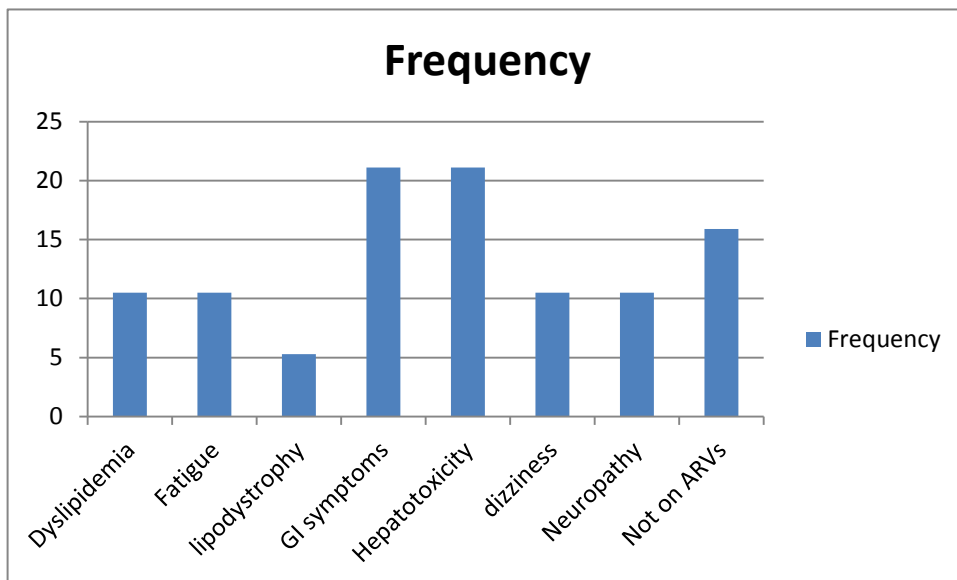


Figure 4.14: The distribution of adverse reactions to antiretroviral medications amongst adolescents studied in 2009.

Table 4.12b: The nature of adverse reactions experienced by adolescents studied in 2009.

| Nature of ADRs to ARVs | Single adverse reaction | Combined adverse reaction | No adverse reaction |
|------------------------|-------------------------|---------------------------|---------------------|
| Frequency | 36.8%(7/19) | 26.3%(5/19) | 21.1%(4/19) |

4.3.8 Associated health problems pre-HAART

Nineteen files were analyzed for health problems pre and post HAART. Numerous health problems associated with the immunocompromised state were experienced by the patients before the commencement of antiretroviral therapy. As is shown below, Candidiasis was the most common medical condition seen in the adolescents registered at the Bernice Samuel Hospital Wellness clinic in 2009(47%). This is followed by Tuberculosis and malnutrition (26%). These are as tabulate below:

TABLE 4.13 Showing the frequency of health problems before initiation of HAART

| Health problems pre-HAART | TB | Candidiasis | RTI | DIARRHEA | MALNUTRITION | Anemia | Skin disorder | Bacterial infections |
|---------------------------|------------|-------------|------------|------------|--------------|------------|---------------|----------------------|
| Frequency | 26% (5/19) | 47% (9/19) | 16% (3/19) | 21% (4/19) | 26% (5/19) | 11% (2/19) | 11% (2/19) | 11% (2/19) |

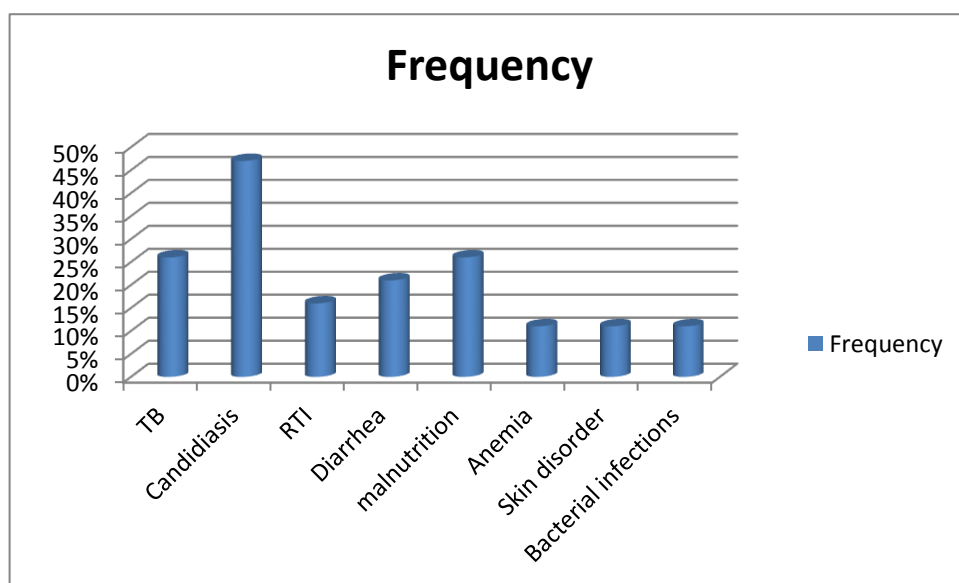


Figure 4.15: Distribution of medical conditions observed in adolescents studied before commencement of ARTs (2009).

4.3.9 Associated health problems after HAART

There were a few problems that were experienced after the commencement of the anti-retroviral therapy. Three of the patients had not started HAART as at the time of the study. As seen above, Candidiasis remains the commonest cause of morbidity even after commencement of antiretroviral therapy (21.1%). This is followed by different bacterial infections (15.8%). About 15.8% of the study population either had no medical condition after the introduction of HAART, or information was not available for the parameter. These are as itemized below:

Table 4.14: Showing the frequency of health problems after initiation of HAART.

| Health problems after HAART | Frequency |
|------------------------------------|------------------|
| Nil | 15.8% (3/19) |
| Viral RTI | 5.3% (1/19) |
| Fatigue | 5.3% (1/19) |
| Pneumonia | 10.5%(2/19) |
| Candidiasis | 21.1%(4/19) |
| TB | 10.5% (2/19) |
| Diarrhea | 10.5% (2/19) |
| Abdominal Cramps | 5.3% (1/19) |
| Nutritional diseases | 5.3% (1/19) |
| Bacterial infections | 15.8% (3/19) |
| Anemia | 5.3% (1/19) |
| Headache | 5.3%(1/19) |
| Musculoskeletal pains | 5.3%(1/19) |
| Not on HAART | 15.8%(3/19) |

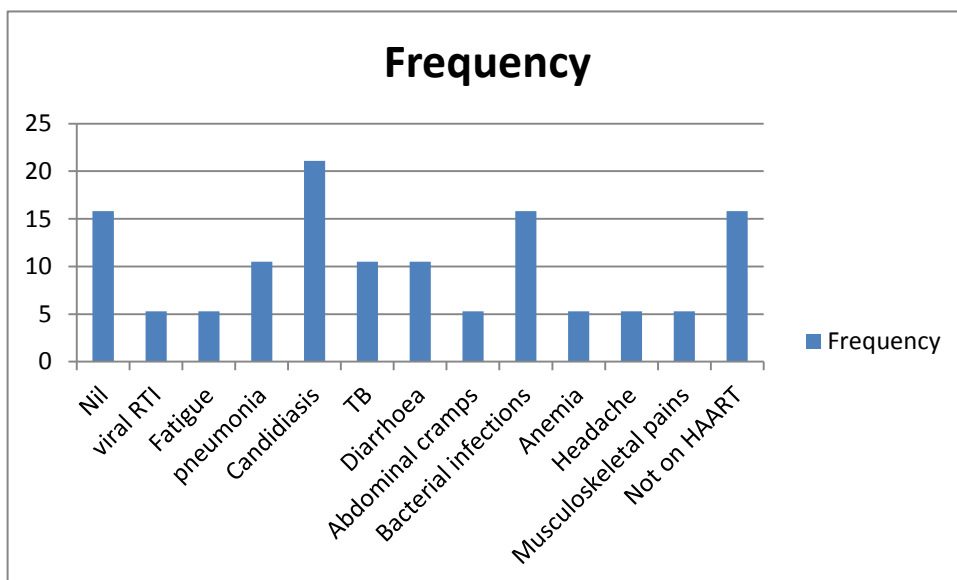


Figure 4.16: Distribution of medical conditions in the study population after commencement of ART in 2009.

4.3.10 Period on HAART

Of the 16 patients who had started HAART, 13 (68.4%) had been on HAART for more than 6months. Measurement of the duration the patients has been on HAART is as tabulated below:

Table 4.15 Periods on HAART

| Duration on HAART | <2weeks | <1month | <3months | <6months | >6months | Not on HAART |
|--------------------------|----------|----------|-------------|------------|--------------|--------------|
| Frequency | 0%(0/19) | 0%(0/19) | 10.5%(2/19) | 5.3%(1/19) | 68.4%(13/19) | 15.8%(3/19) |

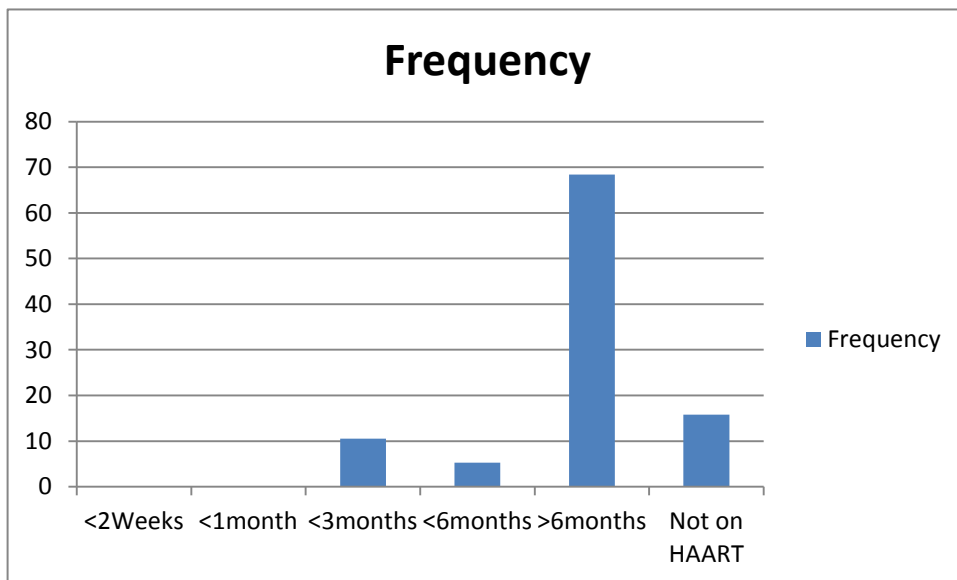


Figure 4.17: Duration on HAART of the study population in 2009

4.3.11 Parity

Only 2 out of the 19 patients analyzed (10.5%) had children. An 18 year old patient had 2 Children while a 19 year old had one.

4.3.12 Outcome

Outcome parameters measured include patient retention in the antiretroviral treatment program, viral suppression, as well as adherence to treatment amongst the patients. Each of these outcome measures are analyzed below:

4.3.13 Patient retention on the ARV program

Most of the patients initially registered (84%) were still in the program as at the time of the study. Of the 19 patients analyzed, two died and one was lost to follow up.

TABLE 4.16 Showing retention of patients in ARV treatment program.

| Retention on the ARV treatment program | Yes | No |
|---|-------------|------------|
| Frequency | 16/19 (84%) | 3/19 (16%) |

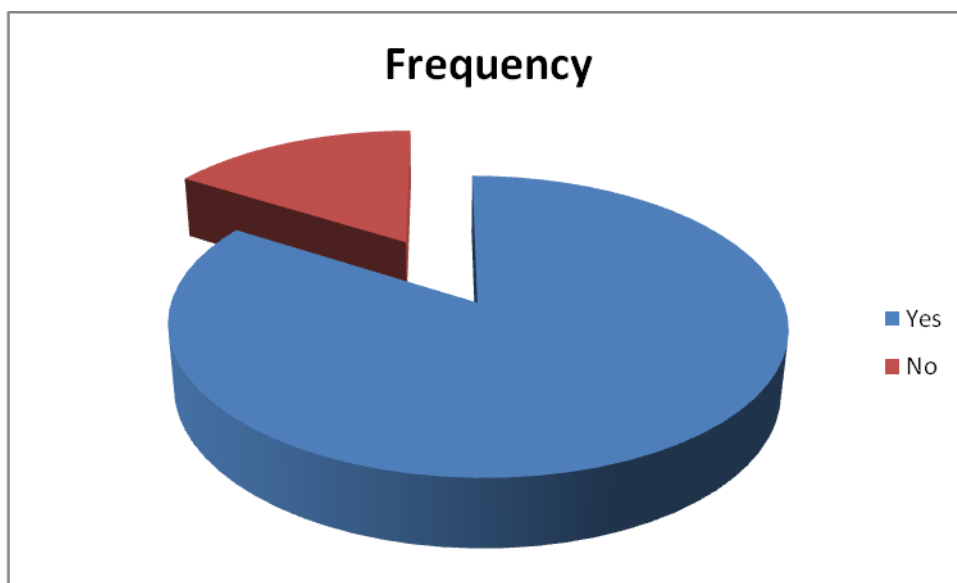


Figure 4.18: Retention of adolescent patients on the antiretroviral treatment program in 2009.

4.3.14 Viral suppression

Only sixteen of the nineteen files analyzed had started HAART. Out of this sixteen, only 12 had laboratory result measuring viral load following initiation of HAART. 52.6% of the adolescents surveyed had good viral suppression with a viral load of <400copies/ml. 5.3% had a fair viral suppression (400-5000 copies/ml). Poor viral suppression was seen in another 5.3% of those studied. The distribution of viral load values amongst patients is as displayed below:

TABLE 4.17 Showing viral suppression in adolescent patient on antiretroviral treatment program in 2009

| Viral suppression | Good(<400copies/ml) | Fair (400-5,000copies/ml) | Poor >5,000copies/ml | Not Available | Never started HAART |
|--------------------------|---------------------|---------------------------|----------------------|---------------|---------------------|
| Frequency | 52.6%(10/19) | 5.3%(1/19) | 5.3%(1/19) | 21.1%(4/19) | 15.8%(3/19) |

4.3.15 Adherence pattern

Partial adherence refers to those patients whose treatments are regularly collected by proxy by the primary caregivers without the patient being presented at the clinic for examination. The bulk of the patients studied showed good adherence to the treatment program (47.4%). Patients who were partially adherence constitute 21.1% of the study population. The pattern of adherence of the remaining patients is as tabulated below:

TABLE 4.18 Showing adherence to antiretroviral treatment

| Adherence | GOOD | PARTIAL | POOR | Never started HAART |
|------------------|-------------|----------------|-------------|----------------------------|
| Frequency | 47.4%(9/19) | 21.1%(4/19) | 15.8%(3/19) | 15.8%(3/19) |

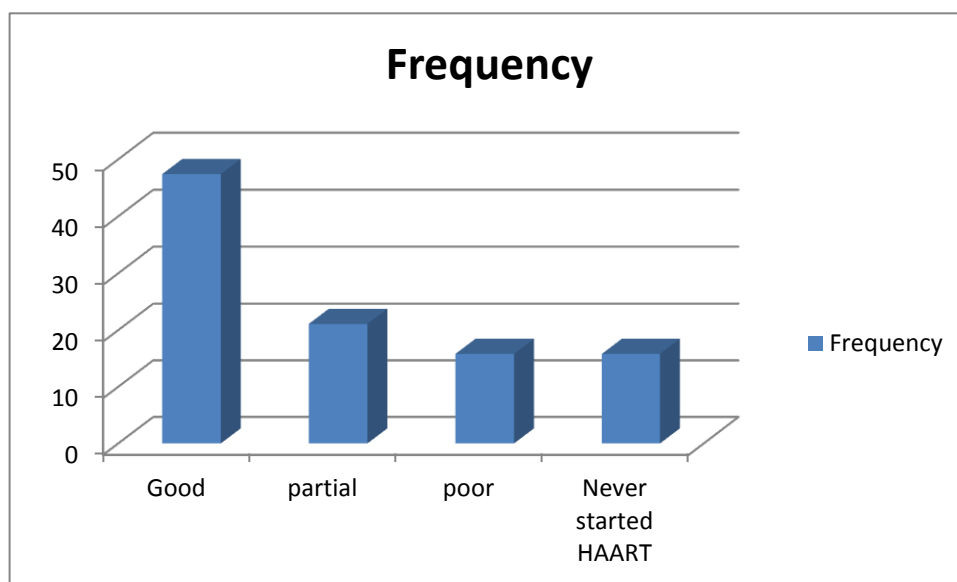


Figure 4.19: Showing the Pattern of adherence to the antiretroviral treatment program amongst the study population.

CHAPTER 5: DISCUSSION

This chapter discusses the patient profiles in 2009 and the trend observed in the parameters studied.

5.1 PREVALENCE STUDIES

There is an obvious difference in the prevalence of adolescent HIV+ patients seen in the hospital's Wellness clinic compared to the community. The prevalence in the hospital was found to be 2.3% of the total HIV positive individuals registered in the hospital's Wellness clinic. This is compared to a prevalence of 3.8% of the total HIV positive patients in the community. This finding is quite significant. This prevalence is lower than that obtained in a study carried out in a peri-urban location in Cape Town. The prevalence in this study was found to be 10.6% (Jasper, Berwick, Myer, Mathews, Flister, Wood, and Bekker, 2006).

A similar trend to the Cape Town study was also observed in a study of HIV seroprevalence in a group of homeless youth in Hollywood. In the study, the HIV seroprevalence was found to be 11.5% (Pfeifer & Oliver, 1997). The reasons for the perceived low prevalence of Adolescent HIV in the community are;

A). There is the possibility of a generally low uptake of voluntary counseling and testing in the community. In such a scenario, the prevalence of the condition being studied will always be underreported.

B). With the exception of adolescent females attending antenatal clinics in the municipality, adolescents as a group were not frequently targeted for voluntary counseling and testing campaigns.

C). The Other studies earlier cited were carried out in large urban and peri-urban areas where the likelihood of HIV transmission is greater and hence the high prevalence. Delmas is a largely rural community.

Also noticed is a difference in the absolute number of adolescent HIV positive patients picked up in the community and those registered for the antiretroviral treatment program in the Wellness clinic of the Bernice Samuel Hospital in Delmas. 21 adolescent out of the total of 77 picked up by VCT in the community are registered on the Wellness clinic program.

This amount constitutes a mere 27% of the total. The implication is that 73% of adolescent HIV+ patients are lost to follow up following initial diagnosis. There are several reasons that can be attributed to the observed trend. These are as itemized below:

- **The stage of denial amongst HIV positive adolescent in the community**

According to Elizabeth Kubler Ross, denial is one of the early phases of the grief reaction (Kubler-Ross, Wessler & Avioli, 1972). It is possible that many of the adolescents testing positive in the community enters into a state of denial and remain in this state until they are jolted out of it by the reality of their disease condition as the disease process advance.

- **Fear of stigmatization associated with the condition**

In the early years of the epidemic, the stigmatization associated with HIV infection was so great that patients were often disowned by even their own closest relatives (Rivers & Aggleton, 2010). The problem of stigmatization became reduced as people became more aware of the causation and natural history of the condition. However, although reduced, stigma is still associated with the HIV/AIDS disease. Adolescents aware of their image amongst their peers will likely stay away from the Wellness clinic until their condition advance to a stage where it cannot be ignored.

- **Inadequate education from Health Care Workers (HCW)**

Another possibility is that these patients were not sufficiently post counseled and educated on what to do after their initial diagnosis. This fact may cause patients not to continue follow up of their condition in the Wellness clinic.

- **Accessing Private Health Care**

The patients may prefer to consult with private practitioners (both orthodox and alternative health care practitioners) rather than attend public hospitals where treatment is free. This may occur as a result of the impression that confidentiality will be better guaranteed in the private health care sector. This scenario is highly unlikely in the situation of the Delmas Municipality as the entire patients affected in this community are from the poorest section of the community.

- **Patients attending follow up care in primary health care clinics**

Adolescent patients diagnosed may opt for follow up care at one of the three primary health care clinics in the community. This however was not the case as a perusal of clinic records show.

- **Centralization of the Wellness clinic**

Centralization of antiretroviral treatment roll out as is currently the case could be responsible for the poor attendance of adolescent patients for Wellness care. The fact that patients have to attend a special clinic in order to receive care can increase the stigma and ostracization associated with the HIV/AIDS infection and causes the patients to stay away. The national department of health has begun a large scale roll out of antiretroviral treatment and pre-HAART care to clinics and primary health care facilities in a bid to counteract this effect.

From the above, it can be seen that while adolescent HIV/AIDS has a low prevalence in the Delmas municipality, there is a need to carry out voluntary counseling and testing programs that will target adolescents in the community. This will need to be separate from the general VCT program for the other age groups. This way, the actual magnitude of the adolescent HIV problem will come to light. Adolescents represent a special segment of the community because as a group they are caught between childhood and adulthood. There is also a need to find out what happens to those adolescents who fail to show up at the wellness clinic following diagnosis of HIV/AIDS. This knowledge will help with limiting the harm to adolescent health by the disease in the community. Adolescent sufferers will present earlier for treatment and can then be counseled on health promoting behavior.

5.2 Demography:

- **5.2.1 Gender distribution:**

A staggering 86% of the study population was female compared to 14% who were males. This appears to be significant. This same picture was observed in the primary health care clinics. The predominance of females amongst adolescent HIV sufferers will tend to support the suggestion that the picture uncovered by this study is not a true picture of what obtains in the community. This is because gender specific infection rates seem to be closely related to the overall prevalence rates. At low prevalence levels, the infection rate amongst male adolescents is higher than amongst females. Young female adolescents however become the most vulnerable group in society at high prevalence rates. In Lesotho for instance, HIV infection amongst girls is twice as high as for boys (26% vs. 12%) (UNICEF, 2000). It would

be expected therefore that there should be more male adolescent HIV sufferers than females in the Delmas municipality. The converse however is the case.

The reason for this wide gender disparity is probably due to the fact that pregnant adolescent females have to undergo voluntary counseling and possible testing at antenatal clinics. This data gathering process is likely to skew the findings in favor of females rather than males. Adolescent females are also more likely to date older men who in turn pass on the Virus to them than the converse (Sturderant, Belzer, Weismann, Friedman, Sarr, Muenz, 2001; Miller, Clark, Moore, 1995). Studies have shown that in most countries, adolescent females are disproportionately represented amongst those that are newly infected with HIV. A proper study in the Delmas municipality targeting adolescents at a future date will shed some light on the true picture. The data collection process will need to be standardized as the data collection methods at present target females rather than males.

▪ **5.2.2 Age distribution:**

The age distribution in both genders illustrates the impact of HIV and AIDS on the adolescent members of the Delmas community. 50% of the adolescents fell between 15 years and 19 years while those between 11 years and 14 years also comprised 50%. The possible source of HIV infection patients between 15 years and 19 years is most probably heterosexual contact while in cases below 14 years; the possibility of intrauterine fetomaternal infection is greater with the exception of cases of child sexual molestation which does not form a prominent mode of HIV virus transmission in this part of world (Samayoa, Anderson, Grazioso, Rivera, Harrison, O'Brien & Arathoon, 2009). The cases in the 11 year age group were more than any of the other age groups studied (22.22%). This is followed by the 13, 18, and 19 year age groups (16.67%). 58% of the study population had their HIV diagnosis before their 13th year further supporting the idea that patients below 15 years amongst the cases were infected in-utero. The remaining subjects were diagnosed at 16 years and above. The peak age at first diagnosis was 17 years (24%). This group of patients was probably picked up during antenatal Clinic attendance. This finding has implications when planning preventive measures amongst adolescents in the community. A sizeable proportion of adolescent HIV/AIDS can be prevented by effective prevention of mother to child transmission (PMTCT) program. Also, at least 50% of cases of adolescent HIV/AIDS transmission may be prevented by effective sex education programs targeting adolescents before sexual debut.

▪ **5.2.3 Employment, marital and population group:**

As presented in the results, the majority of adolescent patients surveyed belonged to the African population group (95%). Of this, 80% were females while 15% were males. The predominance of black Africans amongst the adolescent HIV sufferers in the Delmas Municipality appears quite significant. Colored members of the community comprised the remaining 5% of the study population. This racial distribution is in keeping with studies conducted in other multiracial societies like the UK, and the USA where the black members of the populace bear a disproportionate burden of the HIV epidemic (Loreno & Irene, 2007; Health Protection agency centre for infections and health protection. Scotland, 2010; Avert, 2010). The reason for this trend is probably the fact that compared to other racial groupings in the country, black Africans are proportionately more than other racial groups (Stat SA, 2001). This notwithstanding however, African blacks are known to be more prone to the HIV virus even in countries where they are racial minorities (Center for disease control and prevention, 2009; Health Protection agency centre for infections and health protection, Scotland, 2010). In addition, there could be sociocultural factors which this researcher is not presently aware of which can facilitate transmission of the HIV virus amongst South African Blacks. Knowledge of this will assist public health experts in designing an intervention program to combat the epidemic. In terms of the employment status, the bulk of the adolescents surveyed were scholars-55% females and 15% males. The remainder of the study group was unemployed females (30%). The predominance of scholars amongst HIV sufferers in the Delmas municipality is quite significant but expected considering the age group being studied. 30% of patients reviewed were unemployed and were in their late adolescence. Epidemiological studies across the developing world show that young people are not equally affected by HIV/AIDS. Rather, those who are most socially and economically disadvantaged are at highest risk (Elford, 1997). The risk of HIV infection for young people in developing countries is increased by socio-cultural, political and economic forces such as poverty, migration, war and civil disturbance (Sweat and Denison, 1995). The fact that a large proportion of those studied are scholars is likely to have a huge impact on school health as well as adolescent health in the community. All adolescents surveyed were single. This is significant but expected from the age group surveyed. The implication is that compared to other African countries, early Marriages do not appear to be a factor in adolescent HIV in the Municipality (UIC, 2005).

- **5.2.4 Proximity to the hospital**

Accessibility to health care is one of the most important factors contributing to treatment success in the ARV program. As the epidemic is prevalent amongst the poorer sections of the community, transport cost to the patient will be crucial to whether the patient will honor his appointment at the Wellness clinic. As shown in the result section, distance travelled to access health care is not an important issue amongst HIV positive adolescents seen in Delmas hospital Wellness clinic. This is because 95% of the adolescents surveyed lived within a 15km distance to the hospital. This number represents a significant proportion of patients surveyed. Long distance has long been seen as an important factor limiting access to care in HIV infected individuals (Fryer, Drisko, Krugman *et al*, 1999; Prette & Moos, 1996). This however appears not to be the case amongst patients surveyed in the Delmas municipality. The largest segment of the adolescents surveyed live within 10-15km (42%) of the hospital followed by those who live less than 5km from the hospital (32%). Despite this nearness to the Wellness clinic, most of the patients present in the hospital at advanced stage of the disease as will be seen in the subsequent section. The factors responsible for the above observation is a combination of denial on the part of patients, fear of stigmatization associated with the disease, inadequate education from health care workers, preference for private health care, preference for primary health care facilities, and overcentralization of the ARV rollout and care. All of these have been discussed in preceding sections. An effective comprehensive care management and treatment of Adolescent HIV will require a thorough understanding of factors responsible for patients staying away from the wellness clinic.

5.3 Clinical profile:

5.3.1 Stage of the disease at presentation

The clinical profile of patients in this study was described by the following variables: CD4+ count, Viral load, Hemoglobin, and WHO staging. According to physicians evaluating the patients at first appointment in the Wellness clinic, 68% of the adolescent patients surveyed presented to the hospital in World Health Organization stage 3 and 4. This number represents a significant proportion of patients surveyed. There is a paucity of information in the literature regarding the stage of presentation amongst adolescent HIV sufferers. However, from the Jamaican national HIV surveillance data, it can be seen that 38% of adult HIV sufferers present at an advanced stage of disease and these are usually associated with a higher morbidity, association with opportunistic infections and mortality (Losina, Figuero, Duncan *et al*, 2008). In this study, Patients presenting for the first time in stage three of the disease were by far more than any of other WHO staging categories. The CD4+ count at presentation does not however reflect the WHO staging attributed to the cases. Most of the adolescents surveyed had a CD4+ count of >200cell/microL at presentation to the Wellness clinic (42.1%). 57.9% of the adolescents had an absolute CD4+ level above 150 cell/microL. This discrepancy between the absolute CD4+ level and clinical staging is probably due to the fact that a sizeable proportion of the adolescents surveyed were classified in the pediatric age group. CD4% rather than absolute CD4+ count was used as a measure of immune suppression in this category of patients. The possible reasons for the late presentation of patients surveyed were discussed in preceding sections. Only 26.3% of patients had a CD4+ level below 100cell/microL.

Of the adolescents surveyed, 47.4% had a viral load of >15,000 copies/ml at presentation in the Wellness clinic. The remaining 31.58% had a viral load of between 50-15,000 copies/ml. Anemia did not feature prominently in the baseline laboratory markers recorded before initiation of antiretroviral therapy. 73.7% of the adolescents had a hemoglobin level greater than 10g/dl. This is significant considering the fact that most patients presenting for the first time with Advanced HIV disease already have opportunistic infections and accompanying anemia. Only 5.3% had laboratory indicator of significant anemia (hemoglobin<10g/dl). The low prevalence of anemia is a positive trend given the fact that co-existing anemia with HIV infection worsens the outlook and accelerates the disease process (Sullivan, Hanson, Chu, Jones & Ward, 1998).

5.3.2 Time taken to initiate HAART

A significant proportion of the adolescents studied only started HAART more than 6 months after they became eligible to commence treatment (31.6%), while some were never started on treatment (15.8%). The reasons for this observation are not known and could not be gleaned from the records reviewed. This phenomenon is undesirable and will need to be studied further. As at 6 months of registration on the program, 47.4% of patients had not started antiretroviral treatment. Studies have shown that initiation of antiretroviral therapy at early stages of infection results in lower residual viremia when ART is started. This supports the initiation of ARVs as early as possible during the disease process (Yerly, Kaiser, Perneger *et al*, 2000). In another study, it was discovered that advanced HIV disease, Hepatitis C virus co-infection, and early HAART period were determinants of AIDS progression to death (Jaen, Esteve, Miro *et al*, 2008). Considering the fact that most patients present late for treatment (stages 3 and 4), further delays in the health facility will only serve to worsen the outcome. Prompt commencement of ARVs before the emergence of serious opportunistic infections improves the outlook of patients on ARVs (Lawn, Myer, Orrell, Bekker & Wood, 2005). In the light of the above findings, an in house review of the factors responsible for late commencement of antiretroviral therapy in qualifying patients will need to be carried out by the management of the Bernice Samuel Hospital Wellness clinic.

5.3.3 Associated health problems before and after commencement of HAART

Various forms of Candida infections ranked highest in patients surveyed both pre and post HAART (47% and 21.1% respectively). Next to Candida infection ranked TB and malnutrition (26%) amongst the patients before ARVs were started. Diarrheal illness follows closely at 21%.

After initiation of HAART, next to Candida ranked Bacterial infections (15.8%). There was however another category of patients who had no health complaints after initiation of antiretroviral therapy (15.8%) this is a significant finding considering the fact that this group was not present before the introduction of HAART and tends to underscore the beneficial effects of ARVs on the course of the HIV disease progression. As viral suppression and immune reconstitution occurs, the body regains its ability to fight its own battles against the

common pathogens. Diarrheal illness, TB, and Pneumonia was however also prevalent amongst the patients surveyed even after starting HAART. The presence of Candida infection, TB, Diarrheal illness, Pneumonia and Bacterial infections in patients both pre and post HAART albeit in differing proportions, helps to illustrate the areas of emphasis in the health care of these patients. A study in the United States to determine the effect of clinical care on the natural history of HIV disease also showed Candida esophagitis to be the commonest co-morbid condition associated with advanced HIV infection. Other common conditions observed in this study were- *Pneumocystis carinii* pneumonia, *Mycobacterium avium* complex bacteremia, cytomegalovirus, and the acquired immunodeficiency syndrome dementia complex (Moore & Chaisson, 1996). In a study of autopsies performed on HIV infected individuals in a high HIV burden rural area in south Africa, the major post mortem findings were related to infections with 38% of patients having Tuberculosis, followed by pyogenic infections and bacterial pneumonias (21.5%), meningitis (10.1%) and septicemias (5.1%) (Garcia-Jardon, Bhat, Blanco-Blanco & Stepien, 2010). This finding was similar to what we found though not necessary in the same order. The preponderance of oral Candidiasis is hardly surprising. Oral Candidiasis is the commonest mucocutaneous manifestation of HIV disease found in a rural household survey in the Western Cape (Naidoo *et al*, 2009). In addition, in a study of women with AIDS defining illness, the frequency of either esophageal or bronchial Candidiasis as an initial AIDS defining illness shows an increasing trend whereas a decrease in the proportion of cases with non Tuberculous Mycobacterial infection was observed over the same period (Charurat M, Blattner W, Hershov R *et al*, 2004).

5.3.4 Antiretroviral treatment regimens and adverse reactions.

As displayed in the results section, most of the patients studied are on regimen 1a (41%). This is followed by regimens 1b and regimen 2 (16%). 10.5% were on regimen 1d (alternate 1b) and 0% on regimen 1c (alternate 1a). There was not much difference between the result obtained and what was expected. The reason for the trend observed is the fact that most adult and adolescent patients starting HAART start with regimen 1a. They are only changed to any of the other first line regimens when the need arises; Change to regimen 1b occurs when the patient is pregnant before HAART or becomes pregnant on antiretroviral therapy. Regimens

1c and 1d are started when severe adverse reaction to individual antiretroviral drug occurs (South African National Department of Health, 2010). It is quite noteworthy however that none of the cases studied was on regimen 1c (alternate 1a). This was probably due to the fact that the doctors were avoiding efavirenz in patients in the reproductive age group who are unable to guarantee reliable contraception. This is as is required in the old protocol (NDOH, 2004). First line regimens are changed to regimen 2 when there is virological failure. Most patients remain on regimen 1a if there is no reason to change. Knowledge of antiretroviral medications most commonly used in the Wellness clinic will help direct scarce funds towards buying enough of the most essential medications.

The commonest adverse effect to antiretroviral medication among adolescents attending the Wellness clinic of the Bernice Samuel Hospital in Delmas were Gastrointestinal symptoms (nausea, vomiting, abdominal cramps, dyspepsia and diarrhea), and mild hepatotoxicity (both 21.1%). Other adverse reactions to ARVs encountered were dyslipidemia, fatigue, lipodystrophy, dizziness and neuropathy. Generally, the adverse reactions observed amongst adolescents on HAART during this study were not significant either in scope or seriousness as there was no major adverse reaction noticed. Studies have shown that the quality of life erosion seen in patients before HAART has now been supplanted by antiretroviral drug toxicities (Johnson, Grinsztejn, Rodriguez, *et al*, 2006). This has not been the case in this study. Despite the use of relatively cheap antiretrovirals with considerable adverse effect profiles, no major adverse event was experienced. This shows that these antiretrovirals still have a considerable role to play in resource poor settings like South Africa. Diarrhea is often associated with Protease inhibitor based regimens and is often associated with gastrointestinal complaints such as nausea, vomiting, and bloating (Johnson, Grinsztejn, Rodriguez, *et al*, 2006).

Significant hepatotoxicity is also common although the liver involvement in this study were mild derangements of liver enzymes only picked up from laboratory assay. Hepatotoxicity in severe cases can also present as fulminant liver failure. Significant hepatotoxicity has been reported in 5-10% of individuals on HAART and becomes more common with co-infection with Hepatitis B and C (Sulkowski, Thomas, Chaisson, *et al*, 2000 & Reisler, Liou, Servoss, *et al*, 2001). Lipodystrophy is a chronic toxicity affecting HIV sufferers on HAART. It comprises lipoatrophy and lipohypertrophy either singly or in combination. Common offending ARVs are the thymidine analogues e.g. Stavudine and Zidovudine. The characteristics of this condition include increased central adiposity, dorsocervical fat pads, fat accumulation in the breasts, and increased omental fat. Peripheral neuropathy is another long

recognized toxicity of NRTIs such as zalcitabine, Didanosine, and Stavudine all of which are still in use in resource poor settings. Symptoms are reversible if medications are stopped early.

Dizziness may be one of the neuropsychiatric symptoms of efavirenz. These neuropsychiatric symptoms may range from mild to severe and includes severe depression, suicidal ideation, mania, paranoia, and aggression (Lochet, Peyriere, Lotthe *et al*, 2003).

Metabolic and laboratory abnormalities like dyslipidemia and insulin resistance are usually asymptomatic and are seen with multiple HAART regimens. Hyperlactemia associated with NRTI use is also generally asymptomatic. Severe cases however may present with fulminant lactic acidosis.

68.4% of adolescent surveyed had been on HAART for more than 6months. None had been on HAART for less than 1 month. Retention on the antiretroviral treatment program was good at 84%. 16% of patients died or dropped out during the course of therapy.

In a study conducted in a poorly resourced setting like Delmas, 16.4% of patients receiving antiretroviral treatment dropped out of the program. Death accounted for 48% of discontinuations. Common non mortality causes included relocation or clinic transfers (25.4%) and hospitalization (10.4%). A few cited financial difficulties or medication toxicity (Dalal, Macphail, Mqhayi, Wing, Feldman, Chersich & Venter, 2008).

In this study, the picture is similar to that observed in the study described above. The retention rate in the antiretroviral treatment program was good and was probably due to the mild adverse reactions experienced by the patients on HAART. Even though some studies have revealed quality of life deterioration for patients on ARVs, resulting from adverse reactions to many of the classes of antiretrovirals(Johnson, Grinsztejn, Rodriguez, *et al*, 2006), this has not been observed in this study. Many of our patients continued on HAART because of an improvement in their general wellbeing on HAART compared to their pre-HAART period. Death was the major cause of loss to follow up accounting for 67% who failed to continue with treatment.

5.3.5 Parity

Two out of 16 patients with information regarding parity had children (10.5%). Both patients were older than 18 years. An 18 year old patient had 2 Children while a 19 year old had one. This does not appear to have any significance. The purpose of including parity was to see how many of the older adolescents were having unprotected sex as indicated by parity. Even though pregnancy has been associated with HIV infection in American adolescents (Koenig,

Espinoza, Hodge & Ruffo, 2007; Gavin, Mackay, Brown *et al*, 2007), this study was not designed to elicit causation and the result does not prove that the other adolescents who do not have children were not having unprotected sex. The result does however underscore the need for sex education targeting adolescents before their sexual debut. This will enable young people to make correct life choices regarding sex.

5.3.6 Associated sexually transmitted disease

Only one case of vaginitis was found out in the entire population of adolescent studied. The nature of the vaginitis could not be determined as there was insufficient notes in the file to determine the cause. There was generally insufficient information regarding sexually transmitted infections in most of the files surveyed. This is very significant as it is likely that there will be other sexually transmitted infection especially amongst the older adolescents. A study from a developing African country investigating reproductive tract infections or other indicators of sexual health among unmarried adolescent girls in rural areas showed Vaginal discharge in 82.4% of a sample of 12-19year olds studied (Brabin, Kemp, Dollimore *et al*, 2009). It is possible that health workers attending to these adolescents overlook the possibility of sexually transmitted infections and do not actively enquire about them. This will need to be investigated amongst health care workers in the Wellness clinic and corrected.

5.4 OUTCOME

The outcome measure studied include-Patient retention on antiretroviral therapy, viral suppression, as well as adherence to treatment. Patient retention has been discussed earlier.

5.4.1. Viral suppression

With regards to viral suppression, 52.6% of the adolescents surveyed had good viral suppression with a viral load of <400copies/ml. 5.3% had a fair viral suppression (400-5000 copies/ml). Poor viral suppression was seen in another 5.3% of those studied. This quite significant considering the fact that greater than 95% adherence gives good viral suppression in 70% of cases. The absence of viral load result in files of patients undergoing HAART is however a point of concern as this signifies a lapse in treatment monitoring. In 21.1% of the

cases, the viral load results were not available in the patient file. Poor viral suppression can be due to antiretroviral resistance problems but is often tied to adherence problems.

5.4.2 Adherence to antiretroviral treatment program.

In terms of adherence, the bulk of the patients showed good adherence to therapy (47.4%). This is quite significant. Partial adherence was seen in 21.1% of cases while 15.8% showed poor adherence to treatment. Factors responsible for adherence could not be elicited as the study is not designed to elicit such. Partial adherence is a term coined by the researcher and refers to patients whose medications are collected by proxy by either the primary care givers or associates without the patient being physically present for evaluation. As can be seen, the proportion of patients who fall into this category is quite substantial. Usually this scenario involves the younger adolescents who have to attend schools during the day and as a result cannot come to the hospital for proper evaluation. This study shows that despite the fact that adolescents have issues with social routine disruptions and ARV side effects (Veinol, Flicker, Skinner *et al*, 2006), a reasonable degree of adherence to HAART regimens can still be obtained. All that is required is support. Counseling has proven to be a key support ingredient which in turn leads to good adherence (Sherr, 2000). As such this should be strengthened in all adolescent HAART programs. An important fall out of this study is the recognition of the need to strengthen the school health system to include the antiretroviral roll out program. This will enable scholars who comprise the bulk of the adolescent HIV positive cases seen to be properly evaluated in the school environment. The twin benefit of this will be the eradication of the ‘partially adherent’ group of adolescents, as well as minimizing the school absenteeism that is likely to result from Wellness clinic attendance.

5.5 Limitations of the study:

A major limitation of this study is the small sample size. The sample size could not be determined ahead of time as a criterion sampling was done. All patients who fit the inclusion criteria were selected. In addition, because the sampling was a non- probability sampling, results cannot be generalized to the population at large. The study was aimed at showing the characteristics of the target patients in the Wellness clinic setting of the Bernice Samuel Hospital, Delmas.

Another challenge of this study was information/misclassification Bias. This is a direct result of the quality of record keeping in the clinic. We could not analyze some of the variables. In many other instances the information requested was simply not available in the patient file. In many instances, the researcher had to rely on classification by other doctors who saw the patients at an earlier presentation to the clinic. The Criteria used for staging by these doctors and whether their staging is correct cannot be verified by the researcher.

In view of the retrospective nature of this study the presence of confounders cannot absolutely be excluded. However, in view of the large number of studied variables this would seem unlikely.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion:

This study was carried out to determine the extent of adolescent HIV/AIDS infection in the Delmas municipality as well as the characteristics of adolescent HIV/AIDS cases seen in the Wellness clinic of the Bernice Samuel hospital in Delmas.

The study result show that there is a great disparity between the number of HIV+ adolescents picked up by voluntary counseling and testing in the community, and those registered on the antiretroviral treatment program at the Hospital Wellness clinic. The Clinic prevalence is 2.3% compared to a prevalence of 3.8% in the community. Most of the adolescent HIV+ cases seen in the hospital are females and evenly distributed in early and late adolescence. The bulk of these patients are scholars and the patients present at a clinically advanced stage of the disease with minimum immunological decline. The late presentation is despite having easy access to the hospital for health care. Common problems pre and post HAART includes Candidiasis, malnutrition, Tuberculosis, pneumonia and diarrheal illness. Most of these patients are on regimen 1a and the most common adverse reaction to HAART among the adolescent HIV+ cases are gastrointestinal symptoms and hepatotoxicity. Retention on the program is good but there is an unacceptable delay in initiation of HAART. There was good viral suppression on HAART. The adherence is good though the issue of 'partial adherence' is a problem that has to be addressed.

6.2 Recommendations:

Adolescent HIV cases exist in the community even though it is a small proportion of the total HIV cases. It is a problem that can have a serious impact on school and adolescent health in the community. In the light of the above, the following recommendations are in order.

1. The shortfall in adolescent HIV diagnosis i.e. the adolescent HIV+ patients that are lost immediately after VCT should be traced and enrolled in the antiretroviral treatment program. A more detailed study can be carried out at a later stage in order to find out what happen to this category of patients.
2. It appears that more females than males are picked up during VCT. This is due to the mandatory counseling during antenatal care. A standardized VCT program targeting adolescents needs to be carried out especially in schools. This will pick up more scholars of the different sexes who may be HIV infected. The present system is skewed towards picking up females.
3. A health education program emphasizing the benefits of early enrolment into the antiretroviral treatment program should be carried out in schools and the community at large.
4. Primary health care nurses visiting schools should be encouraged to receive HIV.
5. Special attention needs to be given to HIV positive children who contracted the virus earlier in life through the uteroplacental route. This group of children should be followed up into adolescence and educated on the real possibility of transmitting the virus amongst their peers should have unprotected sex with them.
6. Factors responsible for delayed initiation of antiretroviral therapy in adolescents in the Bernice Samuel hospital Wellness clinic should be identified and corrected.
7. Peer educators should be trained to help improve the knowledge of HIV/AIDS amongst adolescents in schools.
8. A plan should be put in place whereby scholars in the antiretroviral treatment program can get treatment and assessment without losing their schoolwork and attendance. This system can be co-ordinated via the school health system.

REFERENCES

- Aggleton, P. and Rivers, K. (1998) 'Behavioral Interventions for Adolescents' in L.Gibney, R. DiClemente and S. Vermund (eds.) Preventing HIV Infection in Developing Countries, New York: Plenum Publications.
- AVERT. Sub-Saharan HIV, AIDS statistics: May 2010. (On line). Available from URL: <http://www.avert.org/africa-hiv-aids-statistics.htm>
- Avert.HIV and AIDS statistics for South Africa 2010. Available from <http://www.avert.org/safricastats.htm>
- Basset VI, Wang B, Chetty S, Mazibuko M, Bearnst B, Caddy J, Lu Z, Losina E, Walensky R, Freedberg KA. Loss to care and death before antiretroviral therapy in Durban South Africa. *J. Acquir. Immune Defic. Syndr.* 2009 June; 51(2):135-139
- Bennet JV, Rogers M. Child survival and perinatal infections with human immunodeficiency virus. *Am J Dis Child.* 1991; 145(11):1242-1247.
- Booysen AE, Summerton J. Poverty, risky behavior and vulnerability to HIV infection: evidence from South Africa. *J. Health Popul. Nutr.* 2002 Dec; 20(4): 285-8
- Brabin L, Kemp J, Dollimore N, Obunge O, Ikimalo J, Briggs P, Odu N, Hart P. Reproductive tract infections and abortion among adolescent girls in rural Nigeria. *The Lancet.* 2009. , Volume 345, Issue 8945, Pages 300-304
- Braitstein P, Brinkhof MW, Schechter M, Boulle A, Miotti P, et al. Mortality of HIV-1 infected patients in the first year of anti retroviral therapy: Comparison between low income and high income countries. *Lancet.* 2006; 367:817-824.
- Braveman PA, Cubbin C, Egerter S, Chideya S, Marchi KS, and Metzler M, Posner S. Socioeconomic status in health research: one size does not fit all. *JAMA.* 2005; 294:2879-2888.
- Burgoyne RW and Tan DS. Prolongation and quality of life for HIV infected adults treated with highly active antiretroviral therapy (HAART): a balancing act. *Journal of antimicrobial chemotherapy.* 2008. 61(3): 469-473
- Center for disease control and prevention. (2009). HIV/AIDS surveillance report.
- Chang LW, Humphreys E. Optimal monitoring strategies for guiding when to switch first line antiretroviral therapy regimens for treatment failure in adults and

adolescents living with HIV in low resource settings. *Cochrane database syst. Rev.* 2010 April 14; 4: CD 008494.

- Chapman R, White RG, Shafer LA, Pettifor A, Muguranyi O, Ross D, Pascoe S, Cowan FM, Grosskurth H, Buve A, Hayes RJ. Do behavioral differences help to explain the variations in HIV prevalence in adolescents in Sub-Saharan Africa? *Trop. Med. Int. Health.* 2010 May; 15(5):554-66.
- Charurat M, Blattner W, Hershov R, Buck A, Zorilla CD, Watts HD, Paul M, Landesman S, Adeniyi-Jones S, Tuomala R. Changing trends in clinical AIDS presentation and survival amongst HIV-1 infected women. *J. Women Health.* July/August 2004, 13(6): 719-730.
- Cook PA, Downing J, Wheeler CP, Belis MA, Tocque k, Quttub S, Phillips-Howard PA. Influence of socio-demographic factors on distances travelled to access HIV services: Enhanced surveillance of patients in Northwest England. *BMC Public Health.* 2009; 9:78.
- Corbett EL, Steketee RW, Ter kulle FO, Latif AS, Kamali A, Hayes RJ. HIV/AIDS and the control of other infectious diseases in Africa. *Lancet* 2002; 359:2177-87.
- Creese A, Floyd K, Guinness L. Cost effectiveness of HIV/AIDS intervention in Africa: a systematic review of the evidence. *Lancet* 2002; 359:1635-42.
- Dalal RP, Macphail C, Mqhayi M, Wing J, Feldman C, Chersich MF, Venter WD. Characteristics and outcomes of adult patients lost to follow-up at an antiretroviral treatment clinic in Johannesburg, South Africa. *J Acquir Immune Defic Syndr.* 2008 Jan 1; 47(1):101-7.
- Detels R, Tarwater P, Phair JP, Margolick J, Riddler SA, Munoz A. Effectiveness of potent antiretroviral therapies on the incidence of opportunistic infections before and after AIDS diagnosis. *AIDS.* 2001; 15:347-55.
- Department of Health SA. HIV: Situational analysis by province.2007.Available from: www.info.gov.za/other/docs/2007/aidsplan2007/situation_analysis.pdf.
- Department of Health. National HIV & Syphilis antenatal seroprevalence survey. 2002-2007.
- Donovan B. Sexually transmitted infections other than HIV. *Lancet.* 2004; 363:545-56.

- Elford J.'HIV and AIDS in Adolescence: Epidemiology' in L. Sherr (ed.) AIDS and Adolescence. 1997. Amsterdam: Harwood Academic Publishers.
- Farmer P, Leandre F, Mukherjee JS, Claude MS, Neville P, Smith-Fauzi MC, Koenig SP, Castro A, Beccera MC, Sachs J, Attaran a, Kim JY. Community based approaches to HIV treatment in resource poor settings. *Lancet* 2001; 358:404-9.
- Ferrand RA, Bandason T, Musvaire P, Larke N, Nathoo K, Mujuru H, Ndhlovu CE, Munyati S, et al. Causes of acute hospitalization in adolescence: Burden and spectrum of HIV related morbidity in a country with an early onset and severe HIV epidemic-a prospective survey. *Plos Med.* 2010 Feb; 7(2):e1000178.
- Fiscella K, Shin P. The inverse care law: implications for health care of vulnerable populations. *J. Amb. Care. Manage.* 2005; 28:304-8.
- Fryer GE jr, Drisko J, Krugman RD, Vojir CP, Prochezka A, Miyashi TJ, Miller ME. Multi method assessment of access to primary medical care in Rural Colorado. *J. Rural Health* 1999; 15:113-121.
- Garcia-Jardon M, Bhat VG, Blanco-Blanco E, Stepian A. Post mortem findings in HIV/AIDS patients in a tertiary care hospital in rural South Africa. *Trop. Doct.* 2010 Apr; 40(2):81-4.
- Gavin L, Mackay AP, Brown K, Harrier S, Ventura SJ, Kann L, Ranger M, ET al. Sexual and reproductive health of persons aged 10-24 years-United States 2002-2007.*MMWR Surveill. Summ.* 2009 Jul 17; 59(6): 1-58
- Health Protection agency centre for infections and health protection, Scotland. HIV diagnosis surveillance tables in UK statistics by race, gender and age. 2010. Available from: <http://www.avert.org/uk-race-age-gender.htm>
- Heckman TG, Somlai AM, Peters J, Walker J, Otto-Salaj L, Galdabai CA, Kelly JA. Barriers to care amongst persons living with HIV/AIDS in urban and rural areas. *AIDS care.*1998;10:365-375
- Henry-Reid LM, O'Connor KG, Klein JD, Cooper E, Flynn P, Futterman DC. Current pediatrician practices in identifying high-risk behaviors of adolescents. *Pediatrics.* 2010 Apr; 125(4):e741-7.
- Hsieh YH, Shih TY, Lin HN, Hsieh TC, Kuo MJ, Lin CW, Gaydos CA. High-risk sexual behaviors and Chlamydial infections in high school students in Southern Taiwan. *Int J STD AIDS.* 2010 Apr; 21(4):453-9.

- Human Sciences Research Council. National HIV prevalence, HIV incidence, behavior, and communication survey. 2008.
- Jaen A, Esteve A, Miro J, Tural C, Montoliu A, Ferrer E, Riera M *et al.* Determinants of HIV progression and assessment of optimal time to initiate HAART: PISCIS cohort (Spain). *JAIDS*. Feb 2008. Vol 47 issue 2 pp212-220.
- Jasper HB, Berwick JR, Myer L, Mathews C, Flister AJ, Wood R, Bekker LG. Adolescent HIV prevalence, sexual risk and willingness to participate in HIV vaccine trial. *Journal of adolescent health*. Nov 2006. Vol 39, issue 5, Pages 642-648.
- Johnson M, Grinsztejn B, Rodriguez C, et al. 96-week comparison of once-daily atazanavir/Ritonavir and twice-daily Lopinavir/Ritonavir in patients with multiple virologic failures. *AIDS*. 2006; 20:711–8.
- Koenig LJ, Espinoza L, Hodge K, Ruffo N. Young seropositive and pregnant: epidemiologic and psychosocial perspectives on pregnant adolescent with human immunodeficiency virus infection. *Am J. Obstet Gynecol*. 2007 Sep;197(3suppl):S123-31
- Kozinetz CA- Epidemiology of HIV/AIDS in developing countries: The Children. *AIDS PATIENT CARE and STDs*. 2001: Volume 15(4):181-4
- Kubler-Ross E, Wessler S, Avioli LV. On death and dying. *JAMA*. 1972; 221(2): 174-179.
- Lawn, S D; Myer, L; Orrell, C; Bekker, L G; Wood, R. Early mortality among adults accessing a community-based antiretroviral service in South Africa: implications for program design. *AIDS*. 2005 Dec 2; 19(18):2141-48.
- Lochet P, Peyriere H, Lotthe A, et al. Long-term assessment of neuropsychiatric adverse reactions associated with efavirenz. *HIV Med*. 2003; 4:62–6.
- Loreno E, Irene H. Characterization of persons with heterosexually acquired HIV infections, United States, 1999-2004. *Am J. Public Health*. 2007 January 97(1):144-9.
- Losina E, Figuero P, Duncan J, Divi N, Wolf LL, Hirschhorn LR, Robertson M, Harvey K, Whorms S, Freedberg KA, Gebre Y. HIV morbidity and mortality in Jamaica: analysis of national surveillance data, 1993-2005. *J. Infect. Dis*. March 2008. Vol12, issue2, pp 132-138.

- Lyles RH, Munoz A, Ymashita TE, Bazmi H, Detels R, Rinaldo CR, Margolick JB, Phair JP, Mellors JW. Natural history of the HIV type 1 viremia after seroconversion and proximal to AIDS in a large cohort of homosexual men. *J. Infect. Dis.* 2000; 181:872-80.
- Mbirimtengerenji DN. Is HIV/AIDS epidemic outcome of poverty in Sub-Saharan Africa? *Croat Med Journal.* 2007; 48:605-17.
- Membo K. 2009. A study of the clinical, demographic and referral profiles of adult patients attending the Witbank hospital wellness clinic. Pretoria: University of Pretoria (Unpublished M.MED dissertation).
- Miller KS, Clark LF, Moore JB. Sexual initiation with older men and subsequent HIV risk behavior amongst female adolescents. *Family planning perspectives.* Sept-Oct 1995. Vol 29, no 5; pp 212-214.
- Mishra V, Assche SB, Greener R, Vaessen M, Hong R, Grys PD, Boerma JT, Van Assche A, Khan S, Rutstein S. HIV infection does not disproportionately affect the poorer in sub-Saharan Africa. *AIDS.* 2007 Nov; 21 Suppl 7 : 817 -28
- Monasch R. Young people: The centre of the HIV epidemic. *WHO Tech. Rep. Ser.* 2006;938:15-41
- Moore RD, Chaisson RE. The natural history of opportunistic disease in an HIV – infected urban clinical cohort. *Annals of Internal Medicine.* 1996 April; 124(7):632-42
- Mosley A. Does HIV or poverty cause AIDS? Biomedical and epidemiological perspectives. *Theor. Med. Bioeth.* 2004; 25: 399-421.
- Myer L, Erhlich RI, Susser ES. Social epidemiology in South Africa. *Epidemiol. Rev.* 2002; 26:112-123.
- Naidoo S, Chikte U, Gouws E, Abdool-Karim S. Oral mucosal lesions and HIV status in a rural household survey in South Africa. *SADJ.* 2009 Nov; 64(10):466-9
- National Department of Health, South Africa. National Antiretroviral treatment Guidelines.2004. Pretoria. Jacana Publishers.
- Nkangala District Health information system database. Bernice Samuel hospital, Delmas. 2010.

- Nkangala District Municipality. Integrated Development plan 2006-2011. 3rd Revision. 2009.
- Pfeifer RW, Oliver J. A study of HIV seroprevalence in a group of homeless youth in Hollywood. *Journal of Adolescent Health*. May1997. Vol20, issue 5 pg 339-342.
- Prette JD, Moos RH. The influence of distance on ambulatory care use, death, and readmission following Myocardial infarction. *Health Serv. Res.* 1996; 31:573-591.
- Reisler R, Liou S, Servoss J, et al. Incidence of hepatotoxicity and mortality in 21 adult antiretroviral treatment trials ACTG Liver Diseases Focus Group. 1st International AIDS Society Conference on HIV Pathogenesis and Treatment, Buenos Aires, Argentina, 2001. Abstract 43.
- Rivers K and Aggleton P. Adolescent Sexuality, Gender and the HIV Epidemic. 2010. Available from: <http://www.undp.org/hiv/publications/gender/adolesce.htm>
- Samayoa B, Anderson MR, Grazioso C, Rivera B, Harrison M, O'Brien W, Arathoon E. Experience of a paediatric HIV clinic in Guatemala City. *Rev. Panam. Salud. Publica.*2009 Jan; 25(1):51-5.
- Sherr L. Understanding adherence. *J. HIV Ther.* May 2000; 5:30-5.
- Shet A, Mehta S, Rajagopalan N, Dinakar C, Ramesh E, Samuel NM, Indumathi CK, Fauzi WW, Kurpad AV. Anemia and growth failure among HIV infected children in INDIA: a retrospective analysis. *BMC Pediatr.* 2009 June 16; 9:37
- Siegfried N, Uthman OA, Rutherford GW. Optimal time for the initiation of antiretroviral therapy asymptomatic HIV infected , treatment naïve adults .*Cochrane database syst, Rev.* 2010 Mar17; 3:CD008272.
- South Africa History on-line. History of HIV Aids. Available from URL: <http://www.sahistory.org.za/pages/artsmediaculture/culture%20&%20heritage/hiv-aids/ori...2010>.
- South African National Department of Health. Guidelines for the management of HIV infected children. 2009.
- South African National Department of Health. Standard Antiretroviral treatment Guidelines. 2010.
- Statistics South Africa. Census 2001. Available at: www.statssa.gov.za/census01/html/default.asp

- Sturderant MS, Belzer M, Weismann G, Friedman LB, Sarr M, Muenz LR. The relationship of unsafe sexual behavior and the characteristics of sexual partners of HIV infected and HIV uninfected adolescent females. *Journal of Adolescent Health*. Sept 2001. Vol 29, issue 3 suppl1. Pg 64-71
- Sulkowski MS, Thomas DL, Chaisson RE, et al. Hepatotoxicity associated with antiretroviral therapy in adults infected with human immunodeficiency virus and the role of hepatitis C or B virus infection. *JAMA*. 2000. 283:74–80.
- Sullivan PS, Hanson DL, Chu SY, Jones JL, Ward JW. Epidemiology of Anemia in Human Immunodeficiency Virus (HIV)-Infected Persons: Results from the Multistate Adult and Adolescent Spectrum of HIV Disease Surveillance Project. *Blood*. January 1, 1998 Vol. 91 No. 1: pp. 301-308
- Sweat, M.D. and Denison, J. HIV Incidence in Developing Countries with Structural and Environmental Interventions. *AIDS*. 1995; 9 (Suppl A): S251-57.
- UIC. Teenage marriages in Africa. University conference report on African studies; 2005 Chicago (IL); University of Illinois at Chicago.
- UNAIDS report.2009.Availablefrom http://data.unaids.org/pub/report/2009/JCI1700_ epi_update_2009_en.pdf
- UNAIDS, WHO. 2008 Report on the global AIDS epidemic: July 2008. [On line]. Available from URL:http://data.unaids.org/pub/GblobalReportt/2008/JC1511_GR08_ExecutiveSummary_en.pdf [Cited 15 September 2009]
- UNAIDS. Report on the global AIDS pandemic. 2009. UNAIDS
- UNICEF. 2000, PG 4-5.
- Veinol TC, Flicker SE, Skinner HA, McClelland A, Saulnier A, Read SE, Goldberg E. Supposed to make you feel better but it doesn't really: HIV positive youths' perception of HIV treatment. March 2006. *J. Adolescent Health*; Volume 38, Issue 3, Pages 261-267
- WHO. Scaling up antiretroviral therapy in a resource poor settings. Guideline for a public health approach. Executive Summary. 2002june; 10: 11.

- Wojcicki JM. Socioeconomic status as a risk factor for HIV infection in women in East, Central and South Africa: a systematic review. *J. Biosoc. Sci.* 2005; 37:1-36.
- Wood E, Montaner JS, Chan K, Tyndal MW, Schechter MT, Bangsberg D, et al. Socioeconomic status, access to triple therapy and survival from HIV disease since 1996. *AIDS.* 2002;16:2065-2072
- World Health Organization. Women and AIDS: an agenda for action. (1995) Geneva: Author.
- Yerly S, Kaiser L, Perneger TV, Cone RW, Opravil M, Chave J, Furrer H, Hirschel B, Perrin L. Time of initiation of antiretroviral therapy: impact on HIV-1 viremia. *AIDS.* Feb 2000;14:issue3-pp243-249
- Zabin LS, Kiragu K. The health consequences of adolescent sexual and fertility behavior in Sub-Saharan Africa. *Stud. Fam. Plan.* 1998 June; 29(2):210-32.

APPENDICES

UNIVERSITY OF LIMPOPO, MEDUNSA CAMPUS

FACULTY OF HEALTH SCIENCES

DEPARTMENT OF FAMILY MEDICINE & PHC

TITLE: PREVALENCE AND CHARACTERISTICS OF ADOLESCENT HIV/AIDS CASES SEEN AT THE WELLNESS CLINIC OF BERNICE SAMUEL HOSPITAL IN DELMAS, MPUMALANGA (2009).

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POST CURRENTLY HELD: Senior Lecturer

PREVALENCE AND CHARACTERISTICS OF ADOLESCENT HIV/AIDS CASES SEEN AT THE WELLNESS CLINIC OF BERNICE SAMUEL HOSPITAL IN DELMAS, MPUMALANGA (2009).

1. INTRODUCTION

Bernice Samuel Hospital in Delmas is a 40-bed level 1 hospital serving the population of the Delmas Municipality in the Nkangala district of the Mpumalanga province. The hospital serves a population of roughly sixty thousand people and receives referrals from three primary health care clinics, two company occupational health clinics, as well as two mobile clinics. The Delmas municipality is largely rural and the residents are mostly farmers and farm workers with a scattering of other occupations mixed in between.

The hospital's clinical section comprises of the outpatient unit, the accident and emergency unit and the in-patient unit. The in-patient unit is further subdivided into a general ward which caters for medical, surgical, pediatric and gynecology patients, and a maternity section which also houses the nursery.

In 2005, a wellness clinic was added to the hospital. Prior to this addition, HIV positive patients requiring initiation of antiretroviral medications were referred to Witbank academic hospital for treatment.

A non governmental organization called REACTION started the wellness clinic at the hospital and had run the clinic from inception until early this year when doctors working for the Mpumalanga provincial department of health and stationed at the Bernice Samuel Hospital, Delmas were deployed to work at the Wellness clinic.

2. STUDY PROBLEM

This researcher being the doctor deployed to the wellness clinic noticed cases of adolescent patients placed on ART who were under 18years of age. Some features noticed in this group of patients provoked this study and these are as itemized below:

- There seemed to be some discrepancy between the number of adolescent HIV positive cases picked up during voluntary counseling and testing and those presenting at the wellness clinic for initiation of antiretroviral therapy (ART).
- Also, there seem to be a general preponderance of adults and children compared to adolescents among patients presenting at the wellness clinic for HAART even though

adolescents are known for early initiation of sex as well as high risk sexual behavior which is a feature of their developmental stage (1) (2). This disparity becomes more obvious when we consider the fact that Delmas municipality has a relatively high teenage pregnancy rate alongside a high antenatal HIV seroprevalence rate.

- The researcher also observed a paucity of information regarding the social and demographic distribution of adolescent HIV/AIDS in the community. There seemed to be a gender imbalance in favor of females amongst the adolescent HIV/AIDS cases seen in the wellness clinic. Knowledge of demographic factors such as gender, age group distribution, and referral sources could be important in the formulation of new patient recruitment strategies.
- We have the impression that most of the adolescent patients seen were coming to the clinic in advanced stages of the disease. This observation prompted studies of other aspect of the condition amongst the study group such as clinical condition of the patient before treatment, retention of the patients in the program, and clinical outcomes (success and failure).

3. LITERATURE REVIEW

South Africa has the largest population of people living with HIV/AIDS in the world with about 5.7 million people living with HIV in 2007 (3). Mpumalanga province comes second on the list of provinces in terms of seroprevalence rate coming second only to Kwazulu-Natal (4).

In 2007, 23% of all antenatal clients tested positive for HIV in Delmas during an antenatal survey while 35% of all client tested (excluding antenatal cases) tested positive. HIV positive under 5 accounted for 37% of all clients aged under 5years old who were tested (5).

The otherwise devastating effect of HIV/AIDS in the population has been ameliorated since the introduction of a highly active antiretroviral therapy (HAART). Children and adolescent are affected by this pandemic in both a direct and an indirect manner. Apart from the psychological and social dislocation that the disease cause to HIV orphans, the HIV pandemic can affect children and adolescents in a direct manner viz:

- Vertical infection of babies in utero and during labour (6) (7),
- Infection of babies in early infancy via breast milk (7);
- Infection of adolescent through early sexual initiation (8) (9)
- Uncommon modes of transmission of the Virus in children and adolescents include: Blood transfusion, sharing sharp instruments (in cultures that practice circumcision and scarification) (7) and child sexual abuse (10).

All age groups are affected by the HIV/AIDS epidemic. Children, adolescents, the middle aged and elderly are all affected. The bulk of the disease load is however borne by the productive segment of the population.

Young people bear a proportionate size of the disease burden of the HIV/AIDS epidemic.

The World Health Organization estimates that of approximately 1600 children infected with the HIV-1 everyday or approximately 600,000 new infections annually in children throughout the world, 90% occur in developing countries. Most children become HIV infected in utero, at birth, or by breastfeeding. In some urban African centres, AIDS is a major cause of infant death and a source of increased infant mortality worldwide (7).

Of all HIV infections around the globe, the prominence of adolescents and young adults remains a consistent theme (11). For example, in the United States of America, 15-24 year olds represent 14% of HIV cases diagnosed in 2006 and 50% of all sexually transmitted infections reported annually (2). This is thought to be a result of a tendency of present day teenagers to start sexual initiation at an earlier age (1) (2). Studies conducted amongst high school scholars in the USA and Southern Taiwan showed that the proportion of scholars who had initiated sex whilst in high school were respectively 47,4% and 27%. The impact of the epidemic on the adolescent segment of the population warrants special attention because although adolescents are more likely to indulge in high risk sexual behaviour because of their developmental stage, (2) in this age group, health education, preventive efforts and sexual risk reduction interventions are likely to yield good results (13).

4. AIM

The aim of the study is to determine the prevalence and characteristics of adolescent HIV positive cases seen at the wellness clinic in Bernice Samuel Hospital, Delmas.

5. OBJECTIVES OF THE STUDY

The specific objectives of the study are:

1. To determine the prevalence of adolescent HIV cases seen in the Delmas municipality for the year 2009.
2. To determine the proportion of the total adolescent HIV cases that finally end up being seen at the wellness clinic.
3. To determine the demographic characteristics of adolescent HIV cases seen in the Bernice Samuel Hospital wellness clinic in Delmas.

4.To identify common clinical condition at presentation, clinical outcomes (success and failures), retention of patients and common adverse reaction to ARVs in adolescents seen at the Bernice Samuel Hospital wellness clinic.

6. STUDY DESIGN

The study will be a descriptive cross sectional survey of all adolescent HIV positive cases presenting at the wellness clinic of the Bernice Samuel Hospital in Delmas.

7. SAMPLE/STUDY POPULATION

Due to the small study population, a Criterion sample (a type of purposeful sample) will be taken, consisting of all adolescent HIV positive patients in the age range 11-19years registered with the Wellness Clinic of the Bernice Samuel Hospital in Delmas for the period January to December 2009.

8. DATA COLLECTION

The cases will be selected from the patient register kept at the wellness clinic. All the patients who fall within the selection criteria will be selected for the study. All patients will be required to have a residence address in the Delmas municipality thus avoiding selection of candidates from other municipalities. The patients' case files will then be retrieved from the registry. Data will be collected from the patient's files into the data collection sheet (appendix 1C), and analyzed.

9. DATA ANALYSIS

Simple statistical calculations of prevalence and proportion will be carried out on the data collected. The relationship between the variables will be summarized using measures of central tendency, percentages and measures of dispersion. Data will be presented in graphs that attempt to show relationships from a set of data. Comparison will be made with data for the Delmas district municipality collected from the district health information system.

10. VALIDITY, RELIABILITY AND OBJECTIVITY

To ensure the Validity and reliability of the data collected, the following will be done.

- Only the researcher will collect data for the study.
- Getting another researcher(supervisor) to scrutinize the data to determine if they are in agreement with the data interpretation (triangulation)
- Defining the population and the criteria to be measured strictly and sticking with it. This will help to ensure content validity of the study.

- Making sure that the research process is clear and accurately described to ensure replicability by other researchers.

11. BIAS

- Observer bias will be minimized by limiting the data collection to the researcher alone (12).
- Information /misclassification bias will be an issue as all the information required may not be available in the files and the content of the files will depend on the quality of medical notes. This will be taken into consideration in drawing any conclusion from the study.
- Selection bias will be addressed by strictly defining the selection criteria and including all patients who fall within the selection criteria into the study.
- All patients will be required to have a residence address in the Delmas municipality thus avoiding selection of candidates from other municipalities.

12. ETHICAL CONSIDERATIONS

An ethics approval will be obtained from the University of Limpopo MREC followed by approval from the hospital research and ethics committee (the hospital superintendent will be required to sign a consent form for the research) and finally, the Mpumalanga department of health research committee. (See appendices A and B). Information gathered from the case files will be kept confidential. The names of the subjects will not be reflected on the data collection sheet. Rather, codes will be used.

13. BUDGET OF THE STUDY

The budget to be incurred on the study is as stated below:

- Administrative costs - R1000:00
 - Stationeries - R1000:00
 - Miscellaneous expenses - R500:00
 - Statistician - R1500:00
- Total expenses - R4000:00

The funds for the research will be from the principal researcher's private account.

14. TIMING

It is expected that the study will be completed within a month of approval being given by the MREC

Gant Chart:

May June July

Submit protocol and approval from Ethics Committee

Data collection and analysis

Internal reviewer and submission of dissertation.

APPENDIX A

To:

The Chairperson,

Bernice Samuel Hospital Research and Ethics Committee,

Delmas.

Dear Sir/Madam,

My name is Olatayo Oladejo and I am currently registered as a 4th year M.MED

(FAMILY MEDICINE) student at the University of Limpopo, MEDUNSA Campus. I am

Conducting research on 'Prevalence and characteristics of adolescent HIV/AIDS cases

Seen at the Wellness Clinic of Bernice Samuel Hospital in Delmas, Mpumalanga (2009).'

In this study, I wish to investigate the features of the HIV/AIDS cases seen in the Hospital's Wellness clinic and to find out if there is a disproportion between adolescents diagnosed with HIV and those who are eventually placed on antiretroviral therapy as well as other characteristics of adolescent HIV in the Municipality. It is hoped that the findings of the study will throw some light on the nature of adolescent HIV disease in the Municipality. This study will be a forerunner to other studies in this area. It is hoped that the overall benefit will be an improvement in the general health and school performance of teenagers in school. I plan to collect my data from files in the Hospital's wellness clinic registry and I will like to ensure you that confidentiality with respect to the information provided will be maintained.

However, my supervisor may have access to data for academic purposes only. The information gathered will be published in the form of a research report for the purpose of my degree.

If you require further information about the study, please contact me on 0725065156.

Thank you very much for taking the time to read this letter.

I will present a copy of my research report to the management of Bernice Samuel Hospital after completion of the study.

Yours sincerely,

Dr O.W. Oladejo

APPENDIX B

To:

The Chairperson,

Research and Ethics Committee,

Mpumalanga Department of Health.

Dear Sir/Ma,

My name is Olatayo Oladejo and I am currently registered as a 4th year M.MED (FAMILY MEDICINE) student at the University of Limpopo, MEDUNSA Campus. I am conducting research on 'Prevalence and characteristics of adolescent HIV/AIDS cases Seen at the Wellness Clinic of Bernice Samuel Hospital in Delmas, Mpumalanga (2009).'

In this study, I wish to investigate the features of the HIV/AIDS cases seen in the Hospital's Wellness clinic and to find out if there is a disproportion between adolescents diagnosed with HIV and those who are eventually placed on antiretroviral therapy as well as other characteristics of adolescent HIV in the Municipality. It is hoped that the findings of the study will throw some light on the nature of adolescent HIV disease in the Municipality. This study will be a forerunner to other studies in this area. It is hoped that the overall benefit will be an improvement in the general health and school performance of teenagers in school. I plan to collect my data from files in the Hospital's wellness clinic registry and I will like to assure you that confidentiality with respect to the information provided will be maintained. However, my supervisor may have access to data for academic purposes only. The information gathered will be published in the form of a research report for the purpose of my degree. If you require further information about the study, please contact me on 0725065156.

Thank you very much for taking the time to read this letter.

I will present a copy of my research report to the management of Bernice Samuel Hospital after completion of the study. Yours sincerely,

Dr O.W. Oladejo

9 Associated health problems (Pre- HAART)
Diarrhoeal illness Candidiasis
Tuberculosis (pulmonary or extra pulmonary) AIDS associated malignancies

Nutritional diseases

Others.....(Specify)

Haemoglobin at presentation-

10 Health Problems (after HAART)
Diarrhoeal illness Candidiasis
Anaemia Nutritional diseases
Tuberculosis (pulmonary or extra pulmonary) AIDS associated malignancies

Others (specify)

11 Antiretroviral regimen
Regimen 1a: Lamivudine (3TC), Stavudine (d4t), Effavirenz (efv)
Regimen 1b: Lamivudine (3TC), Stavudine (d4t, Nevirapine (NVP)
Regimen 1c: Zidovudine (AZT), 3TC, EFV
Regimen 1d: AZT, 3TC, NVP.
Regimen 2: AZT, DDI, LOP/RTV
Others:

12 Complication and adverse reactions to antiretroviral therapy (if applicable)

| | |
|------------------------|-------------------------------|
| Anaemia | Anorexia |
| Abnormal dreams | Cutaneous manifestations |
| Dizziness | Dyslipidemia |
| Drowsiness | Gastrointestinal side effects |
| Hallucinations | Headache |
| Impaired concentration | Insomnia |
| Lactic acidosis | Lipodystrophy |
| Malaise | Myalgia |
| Nausea | Neutropenia |
| Polyneuropathy | Others (specify) |

13 Stage of infection at presentation

Viral load

Absolute CD4 count

% CD4 count

14. Time taken to initiate HAART

- <2weeks
- <1month
- <3months
- <6momths
- >6months

15. Parity (For females)

16. Period on HAART

- <2weeks
- <1month
- <3months
- <6months
- >6months

OUTCOME.

RETENTION YES NO

VIRAL SUPPRESSION AFTER 6MONTHS GOOD FAIR POOR

ADHERENCE GOOD FAIR POOR

7. REFERENCES

1.Hsieh YH, Shih TY, Lin HN, Hsieh TC, Kuo MJ, Lin CW, Gaydos CA. High-risk sexual behaviors and Chlamydial infections in high school students in Southern Taiwan. *Int J STD AIDS*. 2010 Apr; 21(4):453-9.

2.Henry-Reid LM, O'Connor KG, Klein JD, Cooper E, Flynn P, Futterman DC. Current pediatrician practices in identifying high-risk behaviors of adolescents. *Pediatrics*. 2010 Apr; 125(4):e741-7.

3.UNAIDS report.2009.Available from http://data.unaids.org/pub/report/2009/JCI1700_

epi_update_2

4.Department of Health SA. HIV: Situational analysis by province.2007.Available from: [www.info.gov.za/other docs/2007/aidsplan2007/situation_analysis.pdf](http://www.info.gov.za/other_docs/2007/aidsplan2007/situation_analysis.pdf).

5.Nkangala District Health information system database. Bernice Samuel hospital, Delmas.

6.Bennet JV, Rogers M.Child survival and perinatal infections with human immunodeficiency virus. *Am J Dis Child*. 1991; 145(11):1242-1247.

7.Kozinetz CA- Epidemiology of HIV/AIDS in developing countries: The Children. *AIDS PATIENT CARE and STDs*. 2001: Volume 15(4):181-4

8.Mbirimtengerenji DN. Is HIV/AIDS epidemic outcome of poverty in Sub-Saharan Africa? *Croat Med Journal*. 2007; 48:605-17.

9.UIC. Teenage marriages in Africa. University conference report on African studies; 2005 Chicago (IL); University of Illinois at Chicago.

10.Samayoa B, Anderson MR, Grazioso C, Rivera B, Harrison M, O'Brien W, Arathoon E. Experience of a paediatric HIV clinic in Guatemala City. *Rev. Panam. Salud. Publica*.2009 Jan; 25(1):51-5.

11.Monasch R. Young people: The centre of the HIV epidemic. *WHO Tech. Rep. Ser*. 2006;938:15-41

12.Struwig FW, Stead GB. Understanding reliability and validity. In *Planning, designing and reporting research*. 2nd impression. Cape Town. Maskew Miller Longman Publishing. 2004. p129-147.

13.Gaydos CA, Hsieh YH, Galbraith JS, Barnes M, Waterfield G, Stanton B. Focus-on-Teens, sexual risk-reduction intervention for high-school adolescents: impact on knowledge, change of risk-behaviors, and prevalence of sexually transmitted diseases. *Int J STD AIDS*. 2008 Oct; 19(10):704-10.

To:

Professor Ogunbanjo,

Director: Research & Chairperson MREC

P.O.Box 163

University of Limpopo

Medunsa Campus, 0204

Dear Sir,

RE: PREVALENCE AND CHARACTERISTICS OF ADOLESCENT HIV/AIDS CASES
SEEN AT THE WELLNESS CLINIC OF BERNICE SAMUEL HOSPITAL IN DELMAS.
(2009)

Sequel to the receipt of the recommendations made at the MCREC meeting held on 09 June 2010 regarding the above research protocol, I have made the necessary correction as prescribed. The Changes made to the protocol are as itemized below:

1. Study Sample: As discussed with my supervisor, due to the small study population involved, a Criterion sample (a type of purposeful sampling) will be carried out. This sample will comprise of all adolescent HIV positive patients in the age range 11-19 years registered with the Wellness Clinic of the Bernice Samuel Hospital, Delmas in 2009. In Criterion sampling, a criterion is set and all cases that meet the criteria are selected.

(See <http://www.socialresearchmethods.net/tutorials/Mugo/tutorial.htm>.)

I hope my revised protocol meets with your approval.

Faithfully yours,

Olatayo Oladejo

ADDENDUM 1

UNIVERSITY OF LIMPOPO

Medunsa Campus



MEDUNSA RESEARCH & ETHICS COMMITTEE

CLEARANCE CERTIFICATE

P O Medunsa
Medunsa
0204
SOUTH AFRICA

MEETING: 05/2010

PROJECT NUMBER: MREC/M/88/2010: PG

Tel: 012 - 521 4000
Fax: 012 - 560 0086

PROJECT :

Title: Prevalence and characteristics of adolescent HIV/AIDS cases seen at the wellness clinic of Bernice Samuel Hospital in Delman, Mpumalanga (2009).

Researcher: Dr O Oladejo
Supervisor: Dr JV Ndimande
Hospital Superintendent: Dr A Venter
Department: Family Medicine & PHC
School: Medicine
Degree: MMed

DECISION OF THE COMMITTEE:

MREC approved the project.

DATE: 09 June 2010


PROF GA OGUNBANJO
CHAIRPERSON MREC



Note:

- i) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.
- ii) The budget for the research will be considered separately from the protocol. PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

ADDENDUM 2

BERNICE SAMUEL HOSPITAL
HOSPITAL STREET
DELMAS
2210
SOUTH AFRICA

PRIVATE BAG X 1006
DELMAS, 2210
TEL: 013 665 8200
INT +2713
FAX: 013 665 8241
INT + 2713



Depart^{ment} of Health Bernice Samuel Hospital

Litiko Letemphilo

Umyango WezaMaphilo

Departement van Gesondheid

To:

1 July 2010

**The Chairperson,
Bernice Samuel Hospital Research and Ethics Committee,
Delmas.**

Dear Sir/Madam,

My name is Olatayo Oladejo and I am currently registered as a 4th year M.MED (FAMILY MEDICINE) student at the University of Limpopo, MEDUNSA Campus. I am conducting research on 'Prevalence and characteristics of adolescent HIV/AIDS cases Seen at the Wellness Clinic of Bernice Samuel Hospital in Delmas, Mpumalanga (2009).'

In this study, I wish to investigate the features of the HIV/AIDS cases seen in the Hospital's Wellness clinic and to find out if there is a disproportion between adolescents diagnosed with HIV and those who are eventually placed on antiretroviral therapy as well as other characteristics of adolescent HIV in the Municipality. It is hoped that the findings of the study will throw some light on the nature of adolescent HIV disease in the Municipality. This study will be a forerunner to other studies in this area. It is hoped that the overall benefit will be an improvement in the general health and school performance of teenagers in school. I plan to collect my data from files in the Hospital's wellness clinic registry and I will like to ensure you that confidentiality with respect to the information provided will be maintained. However, my supervisor may have access to data for academic purposes only. The information gathered will be published in the form of a research report for the purpose of my degree.

If you require further information about the study, please contact me on 0725065156.

Thank you very much for taking the time to read this letter.

I will present a copy of my research report to the management of Bernice Samuel Hospital after completion of the study.

Yours sincerely,

Dr O.W. Oladejo

Dr H.K. Tshehla. (Medical Superintendent.)

H.K. Tshehla 16/07/2010

APPROVED NOT APPROVED

ADDENDUM 3

DATA COLLECTION SHEET

DEMOGRAPHIC DATA

| | | | |
|---|-----|-------------|---------------|
| 1 | Sex | Male 1.1 | Female 1.2 |
|---|-----|-------------|---------------|

| | | |
|---|-----|---|
| 2 | Age | 2 |
|---|-----|---|

| | | |
|---|---|---|
| 3 | Residential proximity to hospital (km) | 3 |
|---|---|---|

| | | | | | |
|---|----------------|----------|--------------|---------|-------------|
| 4 | Marital status | Single | Relationship | Married | Co-habiting |
| | | Divorced | Separated | | |

| | | | | | |
|---|------------|---------|----------|------------|------------------|
| 5 | Occupation | Scholar | Employed | Unemployed | Self employed |
|---|------------|---------|----------|------------|------------------|

| | | | | | |
|---|------|-------|---------|-------|---------|
| 6 | Race | White | African | Asian | Colored |
|---|------|-------|---------|-------|---------|

| | | |
|---|-------------------------------------|--|
| 7 | Age when the HIV diagnosis was made | |
|---|-------------------------------------|--|

CLINICAL DATA

| | | | |
|---|---|--|------------------------|
| 8 | Associated sexually transmitted infections (if applicable) | | |
| | Syphilis | | Condylomata acuminatum |
| | Gonorrhea | | Genital ulcer syndrome |
| | Pelvic inflammatory disease | | Others(specify) |

| | | | |
|---|--|--|------------------------------|
| 9 | Associated health problems (Pre- HAART) | | |
| | Diarrheal illness | | Candidiasis |
| | Tuberculosis (pulmonary or extra pulmonary) | | AIDS associated malignancies |
| | | | Nutritional diseases |
| | Others.....(Specify) | | |
| | Hemoglobin at presentation- | | |

| | | | |
|----|---|--|------------------------------|
| 10 | Health Problems (after HAART) | | |
| | Diarrheal illness | | Candidiasis |
| | Anemia | | Nutritional diseases |
| | Tuberculosis (pulmonary or extra pulmonary) | | AIDS associated malignancies |
| | Others (specify) | | |

| | | |
|----|---|--|
| 11 | Antiretroviral regimen | |
| | Regimen 1a: Lamivudine (3TC), Stavudine (d4t), Effavirenz (efv) | |
| | Regimen 1b: Lamivudine (3TC), Stavudine (d4t, Nevirapine (NVP) | |
| | Regimen 1c: Zidovudine (AZT), 3TC, EFV | |
| | Regimen 1d: AZT, 3TC, NVP. | |
| | Regimen 2: AZT, DDI, LOP/RTV | |
| | Others: | |

| | | | |
|----|---|--|-------------------------------|
| 12 | Complication and adverse reactions to antiretroviral therapy (if applicable) | | |
| | Anemia | | Anorexia |
| | Abnormal dreams | | Cutaneous manifestations |
| | Dizziness | | Dyslipidemia |
| | Drowsiness | | Gastrointestinal side effects |
| | Hallucinations | | Headache |
| | Impaired concentration | | Insomnia |
| | Lactic acidosis | | Lipodystrophy |
| | Malaise | | Myalgia |
| | Nausea | | Neutropenia |
| | Polyneuropathy | | Others (specify) |

| | | |
|----|---|--|
| 13 | Stage of infection at presentation | |
| | Viral load | |
| | Absolute CD4 count | |
| | % CD4 count | |

| | | |
|----------------------------------|--|--|
| 14. Time taken to initiate HAART | | |
| • <2weeks | | |
| • <1month | | |
| • <3months | | |
| • <6months | | |
| • >6months | | |
| 15. Parity (For females) | | |
| 16. Period on HAART | | |
| • <2weeks | | |
| • <1month | | |
| • <3months | | |
| • <6months | | |
| • >6months | | |

OUTCOME.

| RETENTION | YES | NO | |
|--|-------------|----------------|-------------|
| VIRAL SUPPRESSION AFTER 6MONTHS | GOOD | FAIR | POOR |
| ADHERENCE | GOOD | PARTIAL | POOR |

ADDENDUM 4

DATA SHEET

| | sex | Age (Yrs) | Distance to hosp. Km | Marital status | occupation | Race | Age @ diagnosis yrs | Associated STI | Associated health problems(Pre-HAART) |
|----|--------|--------------|----------------------------|-------------------|------------|---------|---------------------------|-----------------------------|--|
| 1 | Male | 12.5 | 25 | single | Scholar | African | 9yrs | nil | TB,Candidiasis,Nutritional disease |
| 2 | Female | 12.5 | 5 | single | Scholar | African | 7yrs | nil | unknown |
| 3 | Female | 19yrs | 5 | single | unemployed | African | 18yrs | nil | Pneumonia |
| 4 | Female | 11.5 | 6,5 | single | Scholar | African | 8yrs | c. Vulvitis | nil |
| 5 | Female | 15.5 | 10,7 | single | unemployed | African | 11yrs | nil | Diarrhea, Candidiasis, nutritional disease |
| 6 | Female | 11.5 | 5 | Single | Scholar | African | 6..5yrs | nil | Diarhea,Candidiasis |
| 7 | Female | 14yrs | 13.7 | Single | Scholar | African | 12 | nil | pneumonia |
| 8 | Female | 12.5 | 6,5 | Single | Scholar | African | 10yrs | nil | Diarrhea, nutritional disease, Anemia |
| 9 | Female | 11 | 13.7 | Single | Scholar | African | 6 | nil | Candidiasis, Nutritional disease |
| 10 | Female | 13 | 6.5 | Single | Scholar | African | 9 | nil | Tuberculosis |
| 11 | Female | 18.5 | 5 | Single | Scholar | African | 17.5 | nil | Iron def. Anemia, Molluscum contagiosum |
| 12 | Female | 11 | 5 | single | Scholar | African | 10.5 | nil | nil |
| 13 | Male | 16 | 13.7 | Single | Scholar | African | 15 | nil | Diarrhea, Candidiasis |
| 14 | Female | 18 | 10.7 | Single | Unemployed | African | 17.5 | nil | Candidiasis |
| 15 | Female | 17 | 10.7 | single | Scholar | colored | 17 | nil | TB, Cellulitis, Candidiasis |
| 16 | Female | 18 | 5 | single | Unemployed | African | 17 | Genital ulcer, Warts. | Candidiasis |
| 17 | Female | 19 | 13.7 | Single | unemployed | African | 17 | nil | TB, Cellulitis |
| 18 | male | 11 | 10.7 | single | Scholar | African | 6 | nil | URTI |

| | | | | | | | | | |
|----|--------|------|-----|--------|------------|---------|----|-----|--|
| 19 | Female | 17.5 | 6.5 | Single | unemployed | African | 16 | PID | TB, ECZEMA, Candidiasis, Nutritional disease |
| 20 | Female | 13 | - | single | scholar | African | 10 | - | - |
| 21 | Female | 19 | - | - | - | African | - | - | - |

| Subj ect | Health proble ms (Post HAART) | ARV regi men | ADRs to ARVs | VL (present ation) Copies/ml | CD4+ (present ation) X10 ⁶ /l | %CD4+ (present ation) | Time taken for initiati on-- HAART | parity | Period on HAART | Retent ion | Viral suppres sion Copies/ml |
|----------|--|------------------|---------------------------|------------------------------|--|-----------------------|------------------------------------|----------|-----------------|------------|------------------------------|
| 1 | nil | 1a | Dyslipidemia | 170,000 | 231 | 6.74% | >6mo nths | n/a | >6mon ths | yes | Good-550 |
| 2 | Viral RTI, Tiredne ss | 1d chan ged to 2 | tiredness | unknown | unknown | unknown | >6mo nths | 0 | >6mon ths | yes | good |
| 3 | pneum onia | 1a | nil | 440 | 148 | 9.7% | <6mo nths | unkn own | >6m0n ths | yes | Good-LDL |
| 4 | Candidi asis | 1a to 2 | nil | 3,000,00 0 | 408 | 16.4 | <1mo nth | 0 | >6mon ths | yes | Poor430 ,000 |
| 5 | Candidi asis | 1d | Lipodystrophy | 790 | 4 | 0.88 | <1mo nth | 0 | >6mon ths | yes | Good-LDL |
| 6 | Abdomi nal cramps, pneum onia | 1a | Gastrointestinal symptoms | - | 503 | 9..96 | <3mo nths | 0 | >6mon ths | yes | Good-LDL |
| 7 | tubercu losis | 1a | Grade Hepatotoxicity | 640 | 380 | 10.50 | <3mo nths | 0 | >3mon ths | yes | Viral Blip-1400 |
| 8 | Diarrhe a, om, nutritio nal disease, abscess | 1a | Anorexia ,dizziness | 15,000 | 213 | 8.32 | <1mo nth | 0 | >6mon ths | yes | Good-LDL |
| 9 | Candidi asis | 1a | Hepatotoxicity | 73,000 | 245 | 8.14 | <3mo nths | 0 | >6mon ths | yes | Good-LDL |
| 10 | Sore throat, earache | 1a | Polyneuropathy | 4900 | 440 | 12.60 | <3mo nths | 0 | >6mon ths | yes | Good-LDL |

| | | | | | | | | | | | |
|----|--|-----------------------------|-----------------------------------|-------------|-----|-------|-----------------------------|-----|--------------------------|--------------|-------------------------|
| 11 | Anemia | 1b | nil | 97,000 | 149 | 15.70 | >6mo nths | | >6mo nths | yes | Not availabl e |
| 12 | nil | 1a | nil | 210,600 | 06 | 0.82 | <3mo nths | 0 | <6mon ths | yes | Not availabl e |
| 13 | Not on HAART | - | - | NOT DONE | 79 | 14.60 | - | N/A | - | yES | - |
| 14 | Candidi asis | 1a | Dizziness, Nausea | 290,000 | 79 | 8.8 | <3mo nths | 0 | >6mon ths | Yes | Good |
| 15 | Did not start ARVs | - | - | 92,000 | 93 | 15.7 | - | 0 | -- | Died | Died |
| 16 | Did not start ARVs | Did not start ARVs | Did not start ARVs | Not done | 189 | 19.70 | Did not start ARVs | P2 | Did not start ARVs | No | Lost to follow up |
| 17 | nil | 1b | Hepatotoxicity, Polyneuropathy | 3100 | 154 | 13.90 | >6mo nths | P1 | Yes | >6mo nths | Not done |
| 18 | Diarrhe a | 1a to 2 | Dyslipidemia,Hepa totoxicity | 1235911 | 332 | 7 | >6mo nthd | n/a | yes | >6mo nths | Good - 260 |
| 19 | TB, Headac hes, painful neck | 1b | Nausea, Malaise | 43,000 | 158 | 15.70 | >6m0 nths | 0 | NO | <3mo nths | Died |
| 20 | | | | | | | | | | | |
| 21 | | | | | | | | | | | |

| subjects | Immune Response | Adherence | Clinical Staging |
|----------|-----------------|-----------|------------------|
| 1 | Good | good | 1 |
| 2 | Good | Good | 1 |

| | | | |
|----|-------------------|-------------------|-------------------|
| 3 | Good-309 | Good | 1 |
| 4 | Good-332 | poor | 1 |
| 5 | Good-391 | good | 1 |
| 6 | Good-983 | poor | 1 |
| 7 | Good-765 | partial | 1 |
| 8 | Poor-117 | poor | 3 |
| 9 | Good-584 | Partial | 1 |
| 10 | Good | Good | 1 |
| 11 | Not available | Good | 2 |
| 12 | Not available | partial | 3 |
| 13 | - | Good | 3 |
| 14 | Good | Good | 2 |
| 15 | Died | Died | Died |
| 16 | Lost to follow up | Lost to follow up | Lost to follow up |
| 17 | Poor 197 | Good | 3 |
| 18 | Good-548 | Fair | 1 |
| 19 | Died | Died | Died |
| 20 | | | |
| 21 | | | |

| Subject | Clinical staging @ presentation | Hemoglobin @presentation g/dl |
|---------|---------------------------------|-------------------------------|
| 1 | 4 | 13.9 |
| 2 | 3 | 11 |
| 3 | 2 | 12.6 |
| 4 | 3 | 10 |
| 5 | 3 | 12 |
| 6 | 3 | 12 |
| 7 | 2 | 10.8 |

| | | |
|----|---|----------|
| 8 | 2 | 10.8 |
| 9 | 2 | 10 |
| 10 | 1 | 11.9 |
| 11 | 3 | 10.6 |
| 12 | 3 | 11.2 |
| 13 | 3 | 13 |
| 14 | 3 | Not done |
| 15 | 4 | Not done |
| 16 | 3 | Not done |
| 17 | 4 | 8.8 |
| 18 | 2 | 10.6 |
| 19 | 4 | 12.6 |
| 20 | | |
| 21 | | |