NUTRITIONAL STATUS OF HIV-INFECTED ADULTS IN MASERU, LESOTHO

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Declaration of independent work

I, Neheng Relebetse Moeketsi, certify that the dissertation hereby submitted by me for the Magister in Nutrition at the University of the Free State is my independent effort and has not previously been submitted for a degree at another University or Faculty. I further waive copyright of the dissertation in favour of the University of the Free State.

Neheng Relebetse Moeketsi

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SUMMARY

The main aim of this study was to determine the nutritional status and lifestyle behaviors of HIV infected adults in Maseru Lesotho. Dietary intake, lifestyle (smoking and alcohol consumption), anthropometry, physical examination and associations between these variables were determined.

To determine the dietary intake, 24- hour recalls of usual food intake and food frequency questionnaires were used. To determine the adequacy of the diet, patient's intake was compared with the recommendations from the Food Guide Pyramid. For the anthropometric assessment weight and height was used to calculate BMI. Waist and hip circumferences were determined for waist circumference and waist-to-hip ratio (fat distribution) and skinfold measurements to determine percentage fat. All anthropometric variables were measured using standardised techniques. Lifestyle factors (including smoking and alcohol consumption), and socio-demographic factors were obtained using questionnaires completed in a personal interview with each patient. A nutrition related physical examination to determine signs of malnutrition was performed on each participant by the researcher.

The sample included 160 HIV-infected patients attending four different clinics in the Maseru district (Bophelong, Senkatana, Mabote and Ratjomose). Of these patients, 27.5% were males and 72.5% were females. The median age of the patients was 36 years. Fifty percent of patients were married and 55% were unemployed. Majority (82%) of patients had only primary education as their highest educational qualification.

In general dietary intake was below the recommendations. Over 90% of patients ate less than the recommended two servings of milk and milk products, 82.5% consumed less than the recommended two servings of meat and meat alternatives and more than 80% ate less than the recommended three servings of fruits and vegetables. Most patients ate the daily recommended fat intake and consumed the recommended number of bread and cereal exchanges. Median energy and macronutrient intakes were low (energy

3462.5kJ/day, carbohydrates 43g, proteins 35g and fats 13g).

Only ten percent of patients were underweight (BMI <18.5kg/m²), while 17% were overweight and 8.8% were obese (BMI ≥ 30kg/m²). Most patients (more than 60%) had a normal weight (BMI 18.5kg/m² – 24.5kg/m²). Almost fifty percent of women had a high risk waist-to-hip ratio (≥ 0.08). Only 9% of male patients had a waist circumference above 102cm.

The majority of patients did not smoke (82%). About 40% consumed alcohol and of those 78% consumed alcohol monthly with beer as the most consumed type of alcohol. The median number of drinks consumed was three drinks/day with eight drinks/day as the maximum. Patients with a dangerous to harmful consumption of alcohol had a significantly higher median energy intake than patients with a low to moderate alcohol consumption. The median BMI of low to moderate alcohol consumers and of the dangerous to harmful alcohol consumers differed significantly, with patients that used the most alcohol having a higher median BMI.

There was a tendency for subjects with lower room density to have higher energy intake. BMI was strongly associated with fat percentage, with patients that had the lowest BMI, also having the lowest percentage fat. Female patients had a significantly higher fat percentage than male patients.

More than 60% of patients had clinical signs of malnutrition, including symptoms related to the mouth (angular stomatitis, smooth and sore tongue and bleeding gums). Sixty percent of patients reported night blindness.

Nutrition interventions should be included in programmes aiming at improving the nutritional status of HIV-infected persons. Nutrition education programmes should be implemented at community level and should concentrate on improving knowledge related to nutrition, preserving locally available and affordable foods and encouraging production of different types of crops that can improve access to food in Lesotho.

OPSOMMING

Die hoofdoel van hierdie studie was om die voedingstatus en leefstyl van HIV geïnfekteerde volwassenes in Maseru, Lesotho te bepaal. Dieetinname, leefstyl (rook en alkoholinname), antropometrie, fisiese tekens van wanvoeding en verbande tussen hierdie veranderlikes is bepaal.

Om dieetinname te bepaal, is 'n 24-uur herroep van gewoontelike inname en 'n kort voedselfrekwensievraelys voltooi. Om toereikendheid van die dieet te bepaal, is die pasiënt se inname vergelyk met die aanbevelings van die voedselgidspiramiede. Vir die antropometriese evaluering is massa en lengte gemeet om liggaamsmassaindeks (LMI) te bereken. Middelen heupomtrekke is bepaal om middelomtrek en middel-heup-verhouding (vetverspreiding) te bereken en velvoumetings is gedoen om vetpersentasie te bereken. Alle antropometriese veranderlikes is volgens gestandardiseerde tegnieke gemeet. Leefstylfaktore (wat rook en alkoholinname ingesluit het), en sosio-demografiese inligting is dmv vraelyste, is deur die navorser in 'n gestruktureerde onderhoud met elke deelnemer ingesamel. 'n Fisies ondersoek, om kliniese tekens van wanvoeding te bepaal, is deur die navorser op elke deelnemer gedoen.

Die steekproef het 160 MIV-geïnfekteerde pasiënte, vanaf vier verskillende klinieke in die Maseru area (Bophelong, Senkatana, Mabote en Ratjomose), ingesluit. Van hierdie pasiënte was 27.5% manlik en 72.5% vroulik. Die median ouderdom van pasiënte was 36 jaar. Vyftig persent van pasiënte was getroud en 55% was werkloos. Die meerderheid (82%) het slegs primêre skoolopleiding gehad.

In die algemeen was dieetinname ontoereikend. Meer as 90% van pasiënte het minder as twee porsies uit die melk en melkproduktegroep geëet, 82.5% het minder as die aanbevole twee porsies uit die vleis en vleiservangersgroep geëet, en meer as 80% het minder as drie porsies vrugte en groente geëet. Meeste het voldoende hoeveelhede vet, brood en graanporsies ingeneem. Mediaan energie en makrovoedingstofinname was laag (energie 3462.5kJ/dag, koolhidrate 43g, proteïene 35g en vet 13g).

Slegs tien persent van pasiënte was ondergewig (LMI <18.5kg/m²), terwyl 17% oorgewig was en 8.8% vetsugtig (LMI ≥ 30kg/m²). Die meeste pasiënte (meer as 60%) het 'n normale LMI gehad (BMI 18.5kg/m² – 24.5kg/m²). Bykans vyftig persent van vroue het 'n hoë risiko middel-heup-verhouding gehad (≥0.8). Slegs 9% van die manlike deelnemers het 'n middelomtrek bo 102cm gehad.

Die meerderheid pasiënte het nie gerook nie (82%). Ongeveer 40% het wel alkohol gebruik en van die wat dit wel gebruik het, het 78% dit maandeliks gebruik. Bier was die tipe alkoholiese drankie wat mees algemeen ingeneem is. Die median hoeveelheid drankies wat gebruik is was drie drankies per dag. Pasiënte met 'n gevaarlik hoe" alkoholinname het 'n betekenisvolle hoër mediaan energieinname gehad as pasiënte wat alkohol min of matig gebruik het. Die mediaan LMI van min tot matige alkohol verbruikers was ook betekenisvol hoe'' as die van pasiënte met 'n gevaarlike alkoholinname.

Daar was 'n neiging vir persone wat in 'n huis met min verterkke gebly het om 'n hoer" energiei-nname te hê. LMI is sterk geassosieer met vetpersentasie en persone met die laagste LMI het ook die laagste persentasie vet gehad. Vroulike pasiënte het betekenisvol hoer" persentasies vet as mans gehad.

Meer as 60% van die pasiënte het kliniese tekens van wanvoeding getoon, wat hoofsaaklik simptome van die mond ingesluit het (angulêre stomatitis, gladde en seer tong en tandvleis wat bloei). Sestig persent het nagblindheid geraporteer.

Toepaslike voedingintervensies om die voedingstatus van HIV geinfekteerde persone te verbeter is dringend nodig. Voedingvoorligtingsprogramme behoort op gemeenskapsvlak geïmplimenteer te word en moet klem lê op die verbetering van kennis wat verband hou met voeding, die behoud van plaaslik beskikbare voedsel, en die bevordering van voedselproduksie wat toegang tot voedsel in Lesotho kan verbeter.

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LIST OF ABBREVIATIONS

ADA	American Dietetic Association
AIDS	Acquired Immune Deficiency Syndrome
ARV	Antiretroviral
ASSAf	Academy of Science of South Africa
BCM	Body Cell Mass
BMI	Body Mass Index
CDC	Centers for Disease Control
CI	Confidence Interval
COPD	Chronic Obstructive Lung Disease
DNA	Deoxyribonucleic acid
ETOVS	Ethics committee of the Faculty of Health Sciences, University of the Free State
FAO	Food and Agriculture Organization
FFQ	Food Frequency Questionnaire
HDL	High Density Lipoproteins
HIV	Human Immunodeficiency Virus
Kg	Kilogram
kg/m^2	Unit of body mass index
LBM	Lean Body Mass
LMI	Liggams Massa Indeks
m^2	Meters squared
MRC	Medical Research Council
n	Number
PEM	Protein-Energy Malnutrition

PLWHA	People Living with HIV and AIDS
RDA	Recommended Daily Allowances
REE	Resting Energy Expenditure
RNA	Ribonucleic acid
SADHS	South African Democratic Health Survey
TEE	Total Energy Expenditure
UK	United Kingdom
UNAIDS	Joint United Nations Program on HIV/AIDS
US	United States
USA	United States of America
USAID	United States Agency for International Development
WHO	World Health Organization
%	Percent
>	Is more than
<	Is less than
≥	Is more than or equal to

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Chapter 5: Discussion of Results

Chapter 1: Introduction and problem statement

1.1 Introduction

According to UNAIDS (2008, p.15), 33 million (30.3 million – 36.1 million) individuals were living with the Human Immunodeficiency Virus (HIV), 2.7 million (2.2 million – 3.2 million) people were infected and 2 million (1.8 million – 2.3 million) patients died due to HIV- related illnesses globally during 2007. During the same year, a 2.5 increase in the number of people using antiretroviral treatment was seen, but also an increase in the number of people in low- and middle-income countries in need of treatment and not currently receiving it. This indicates that the epidemic is growing at a faster rate than the rate at which drugs are being delivered.

Globally, the HIV incidence rate is believed to have maximised in the late 1990s and to have stabilised subsequently. In some countries, favorable trends in incidence are related to changes in behavior and prevention programmes. Rising Acquired Immune Deficiency Syndrome (AIDS) mortality however, is also responsible for the leveling off of global HIV prevalence. The number of people living with HIV and AIDS (PLWHA) continues to increase, due to population increases and the life prolonging effects of antiretroviral therapy in some countries (UNAIDS, 2008, pp16-18; ASSAf, 2007, p.1).

Sub-Saharan Africa is home to only ten percent of the world's population, but at the end of 2003 had the highest appearance of HIV/AIDS in the world (Anabwani and Navario, 2005). To date, HIV has orphaned almost 12 million children younger than 18 years of age. In countries like Lesotho, Namibia, South Africa and Swaziland the HIV prevalence has stabilised at high levels (UNAIDS, 2008).

Lesotho's epidemic is relatively stable at very high levels, with an estimated national adult HIV prevalence of 23.2%. High infection levels of 27% were seen among antenatal clinic attendees in 2004, when over one-third of pregnant women 25-34 years old tested HIV-positive (UNAIDS, 2006, p. 78).

Malnutrition refers to both undernutrition and overnutrition, involving deficit, excess or imbalance of one or more essential nutrients. Undernutrition occurs when energy intake is lower than total energy expenditure (TEE), resulting in clinically detectable weight loss over time. Overnutrition occurs when energy intake is higher than energy expenditure and this results in body fat accumulation. Any type of nutritional problem may interfere with body processes, and serious malnutrition can result in irreversible damage to the body and sometimes death (Pratt, 2003, pp. 320-323; Das and Roberts, 2001, p. 4; Suitor and Crowley, 1994, pp. 278).

Undernutrition and infection are key causes of morbidity and mortality in the developing world. Undernutrition weakens the barrier function, allowing easier access by pathogens, and thus alters immune function, decreasing the ability of the host to eliminate pathogens once they enter the body. As a result, malnutrition makes one vulnerable to infections. Infections alter nutritional status mediated by changes in dietary intake, absorption and nutrient requirements and losses of nutrient body stores (Manary and Solomons, 2004). Malnutrition may change immune function to ease disease progression, influence viral expression and play an important role in disease process and related morbidity and mortality (Baum and Shor-Posner, 2001).

A malnourished host is more vulnerable to loss of weight, body cell mass (BCM) and infections with relatively worse prognosis. It is, however difficult to indicate the specific nutritional deficiencies contributing to poor clinical outcomes. The identification and correlation of micronutrient deficiencies may become more important in developing countries where AIDS is spreading, nutritional problems occur commonly, and drugs are usually unavailable (ASSAf, 2007, p.14; Semba and Tang, 1999).

PLWHA frequently experience malnutrition and wasting, which increases their vulnerability to opportunistic infections. The wasting normally begins early in the disease and gradually becomes worse. The degree of wasting in people with HIV/AIDS, especially in the few months before death, is the same as the one seen in people who die from starvation.

In HIV, the type of malnutrition that results is usually secondary or conditional malnutrition, due to altered body function in ingestion, digestion, absorption, transport, utilisation and excretion of nutrients (Whitney and Rolfes, 2005, pp. 240-245; Sun and Sangweni, 1997; Suitor and Crowley, 1994, p. 279).

The resulting loss of weight and muscle mass is directly linked to deterioration in health and increased mortality. The loss of lean body mass (LBM) is associated with more incidence of opportunistic infections, further deterioration in immune function, and poorer nutritional status. Body wasting, especially BCM, is an important existing AIDS-defining condition and is a risk factor for death in HIV-infected patients (Lee *et al.* 2002, p. 57).

Poor oral intake can result from anorexia due to medication, depression, oral and oesophageal infection, and symptoms such as nausea, vomiting, diarrhea, dyspnoea, neurological disease, abdominal discomfort, dementia and fatigue (Fenton and Silverman, 2008, p.1008). Inadequate finances and inability to obtain food also decrease oral intake (ADA, 2000, p.432). Table 1.1 lists the causes of malnutrition as a result of anorexia and nutrient losses.

Table 1.1 Causes of malnutrition in HIV infection
(Whitney and Rolfes, 1999, p.586).

Anorexia due to:	**Nutrient losses due to:**
Depression, fever, pain	HIV infection
Altered taste perceptions	Gastro intestinal tract infections
Dry mouth	Cancer
Difficulty in swallowing	Cancer treatment
Mouth ulcers	Anti-infection drugs
Esophageal lesions and obstructions	Home made medication for AIDS Decreased gastric acid secretion
Drug therapy	Increased bacteria
Lethargy Dementia	

According to the American Dietetic Association (ADA, 2004), nutritional status refers to the "nutritional condition or nutritional level of the body." It is the end result of feeding processes and it relies on intake, digestion, absorption, circulation and removal." Reaching optimal nutritional status is a challenge for PLWHA and food security, food availability, stability, access and use of food are affected where the prevalence of HIV is high (ADA, 2004).

Kotler *et al.* (1989), state that attention to nutrition cannot change the final outcome of HIV, but can prevent and reverse malnutrition, which may improve the quality of life and slow disease advancement. Furthermore, good nutritional status can improve a person's response to drug therapy, reduce hospital stay, and promote physical independence. Meeting nutritional needs limits the additional stresses that results from malnutrition.

Assessment of nutritional status can be described as a procedure for gathering data about current nutritional status and adequacy of the diet (Gardner *et al.*, 1997). It includes analysing medical history, dietary history, social history, physical examination, and anthropometric measures (Hammond, 2008, p.383; Herrera *et al.*, 2002). The goal of nutrition assessment and intervention is to improve the nutritional status, improve quality of life, and prolong survival (Herrera *et al.*, 2002).

According to Herrera *et al.*, (2002), "body weight is an indicator of nutritional status, and reveals more accurately the short-term effects and alteration of body components". Nutritional deficiencies in adults do not affect height, but has a direct influence on weight. Skinfold measurement can give a good estimate of total body fat and a reasonable assessment of the fat location, obesity and undernutrition in the individual patient (Thomas, 1988).

Lifestyle, being the specific way of life for a person or group, often refers to health related behavior such as smoking, drinking and dietary intake and is also an important factor to consider in HIV infection. Smoking cigarettes and other tobacco use cause thousands of people to suffer from cancer and other diseases of the cardiovascular, digestive and respiratory systems. Smoking suppresses hunger and increases oxidative stress. Furthermore smoking may encourage growth of the virus and changes the patient's nutritional status (Sizer and Whitney, 2000, p. 466;

Romeyn, 1998).

Alcohol is also dangerous for HIV infected patients because it increases oxidative stress. The virus needs an area of oxidative damage to start reproduction and alcohol provides such an area. In chronic alcoholics, long term use of alcohol interferes with immune response, making people more susceptible to, and less resistant to infection. Chronic alcohol use also makes PLWHA more vulnerable to tuberculosis and bacterial pneumonia (Romeyn, 1998, pp. 108-113).

Because malnutrition and life-style has a direct impact on immune function, maintaining the nutritional status of HIV-infected patients is very important (Lee *et al.*, 2002, pp. 56-65). Good nutritional status in HIV-infected patients can improve the patient's response to drug treatment and delay the advancing of HIV to AIDS (ASSAf, 2007, p. 17).

Before relevant interventions to address nutritional problems in HIV can be implemented, it is necessary to determine nutritional status of HIV-infected patients, as well as the related lifestyle and socio-demographic factors. In Lesotho, relevant nutrition interventions are seldom implemented, or only at a late stage when patients are already diagnosed with AIDS.

1.2 Aim and objectives

1.2.1 Aim

To determine the nutritional status of HIV-infected adults in Maseru, Lesotho.

1.2.2 Objectives

To determine:

- Socio-demographic status;
- Habitual dietary intake (food, energy and macro-nutrient intake);
- Anthropometric nutritional status;
- Life-style (smoking and alcohol consumption); and
- Associations between the above.

1.3 Outline of the dissertation

Chapter 1:	Introduction and problem statement
Chapter 2:	Literature review
Chapter 3:	Methodology
Chapter 4:	Results
Chapter 5:	Discussion of results
Chapter 6:	Conclusions and recommendations

Chapter 2: Literature Review

2.1 Introduction

In 1981 the Centers for Disease Control and Prevention (CDC), first described AIDS. In 1983 researchers separated a retrovirus and named it HIV (Fenton and Silverman, 2008, p.992). HIV is a human retrovirus that contains ribonucleic acid (RNA) as its genetic material and the enzyme reverse transcriptase required in translating RNA into deoxyribonucleic acid (DNA) in the human cells (Thaler, 2000). HIV infects white blood cells, especially the CD4 cells. These cells are mostly found in blood and genital secretions, therefore HIV is transmitted when the CD4 cells of an infected individual's blood enters the body of another person (Bartlett and Finkbeiner, 2001). Immediately after infection with HIV, RNA is transcribed into the human DNA through a replication process, resulting in immune deficiency, especially cell-mediated immune dysfunction. This virus enters the cells, takes control of cellular mechanisms and uses them for its own reproduction (Thaler, 2000; Romeyn, 1998).

HIV has a fast rate of genetic mutation and HIV-1 is the form which causes disease in humans. The virus selectively infects certain cells in the human body, with target sites being the blood mononuclear cells (T-helper or CD4 cells), lymphocytes and lymphoid tissues. The virus then begins a process of fast replication, with billions of viral particles made soon after the infection, thus destroying the CD4 cells (Pratt, 2003, p. 321; Thaler, 2000).

The HIV virus finally destroys the individual's immune system; reduces marginal nutrient stores and as a result increases the process of malnutrition, which is a complicated end result of HIV infection (Insel *et al.*, 2001, p.718). Infection with HIV results in continuous impairment of the immune response leading to the development of AIDS (Lee and Watson, 2001, p. 56-61). AIDS indicates the late stage of the HIV infection when the bodies natural defense system is seriously damaged (immunodeficiency), and this stage is defined by certain disease and opportunistic infections (Laverty and Pugh, 2005, p. 158).

2.2 Transmission and clinical stages of HIV infection in adults

2.2.1 Transmission

HIV is a blood-born virus and has been isolated from blood, semen, pre-ejaculatory fluid, saliva, tears, breast milk and cerebrospinal fluid. It is mainly transmitted through sexual activity both in homosexual and heterosexual contact in adults. HIV can also be contracted through exposure to infected blood or blood components, and perinatally from mother to infant (Pratt, 2003, Fauci and Lane, 2001, p. 1855).

Sharing contaminated needles and injections of contaminated blood products also transmit the virus. The virus is not spread through casual contact such as touching, hugging, kissing or through using the same plates, silverware and drinking glasses. Saliva, tears and urine do not contain enough of the HIV virus. (Fenton and Silverman, 2008, p. 994).

2.2.2 Clinical stages of HIV infection

The clinical stages of HIV infection can be divided into the acute stage, asymptomatic stage, symptomatic stage and AIDS. HIV has different stages or phases and specific symptoms for each. The table below indicates these different phases of HIV infection in relation to the immune status (the CD4 count / lymphocyte count). The AIDS stage is the end stage of the HIV infection and it is associated with intense immune deficiency.

Table 2.1 Relationship between the immune status, CD4 count, Lymphocyte count and the presence of symptoms (Evian, 2003)

Clinical condition	CD4 count	Lymphocyte Count
-Healthy without symptoms, early - infection (sero-conversion illness), quiet or latent stage. (HIV negative to HIV positive)	More than 500 -600 cells/mm^3	More than 2500 cells/mm^3
-few symptoms	350-500 cells/mm^3	1250-2500 cells/mm^3
-Major symptoms and some opportunistic infections	200-350 cells/mm^3	500-1250 cells/mm^3
-AIDS stage	Less than 200 cells/mm^3	500-1250 cells/mm^3

2.2.2.1 Acute stage of HIV infection

After infection with HIV, the virus spreads throughout the body and blood CD4 cell counts drop continuously. The immune response follows and CD4 cells can return to almost normal counts and the level of the virus in the blood falls to undetectable levels (Fenton and Silverman, 2008, p.996).

This initial stage is described as the 'seroconversion' (the host produces circulating antibodies against HIV demonstrating a positive HIV antibody test). It coincides with an individual changing from not having antibodies in the serum, to being positive for HIV antibodies (Schoub, 1999). The two to four week period immediately after infection is characterised by rapid replication (about 800 billion virus particles per day). Thirty to sixty percent of newly infected persons develop an acute syndrome with fever, malaise, lymphadenopathy syndrome (LAS), pharyngitis, headache, myalgia and sometimes rash (Fenton and Silverman, 2008, p. 998; Pratt, 2003, p. 320; Schoub, 1999).

The period between the first HIV infection and seroconversion varies from one week to several months or more. When antibodies to HIV appear in the blood of individuals with or without symptoms these individuals will test positive for HIV. The viral load is very high and people are very infectious at this stage (Fenton and Silverman, 2008, p. 998).

2.2.2.2 Asymptomatic HIV infection

The asymptomatic phase is a stage when infected individuals experience few detectable symptoms and this stage can last from a few months to ten years. The majority of people stay without symptoms, and will only know that they are infected if they are tested for HIV infection (Fenton and Silverman, 2008, p. 998; Pratt, 2003).

During this quiet phase HIV can multiply to about ten billion new viruses and kills the CD4 cells in the process. Sometimes people experience some form of illness and recover, but some individuals suffer from a number of swollen lymph and sub clinical changes. The sub clinical changes sometimes involve a decrease in LBM without identifiable body weight change, vitamin B12 deficiency, and increased susceptibility to food borne and water borne pathogens (Fenton and Silverman, 2008, p. 998; Bartlett and Finkbeiner, 2001).

2.2.2.3 Symptomatic HIV infection and AIDS

During the symptomatic phase symptoms begin to show. This is the expected result of a progressing weakening of the immune system, identified by a continuous decrease in numbers of peripherally circulating CD4+ T-cells and an increasing level of viral activity, characterised by a continuous increase in viral load. This stage can be classified into early and late symptomatic disease (Pratt, 2003).

During the early phase of symptomatic disease, a large number of individuals develop a variety of symptoms of poor health due to HIV infection which may include fevers, sweats, skin problems, fatigue or other symptoms that may not be AIDS defining. A decline in nutritional status or body composition may also occur (Fenton and Silverman, 2008, p. 998; Pratt, 2003). During the late symptomatic phase, AIDS-defining conditions associated with late symptomatic stage are visible. These individuals suffer from one well-defined life-threatening clinical condition that is clearly associated with HIV-induced immunosuppression (Fenton and Silverman, 2008, p. 998).

2.3 Malnutrition in HIV-infected adults

HIV infected patients with malnutrition progress faster to the AIDS stage than patients who are well nourished, due to the weakened immune system (Brown, 2008). As with other infections, malnutrition associated with HIV has the same characteristics but some are more specific to HIV. Nutritional status therefore is an important factor in survival, and even in the absence of disease, starvation may lead to death when the HIV- infected person reaches 66% of ideal body weight (Fenton and Silverman, 2008, pp. 1008-1009).

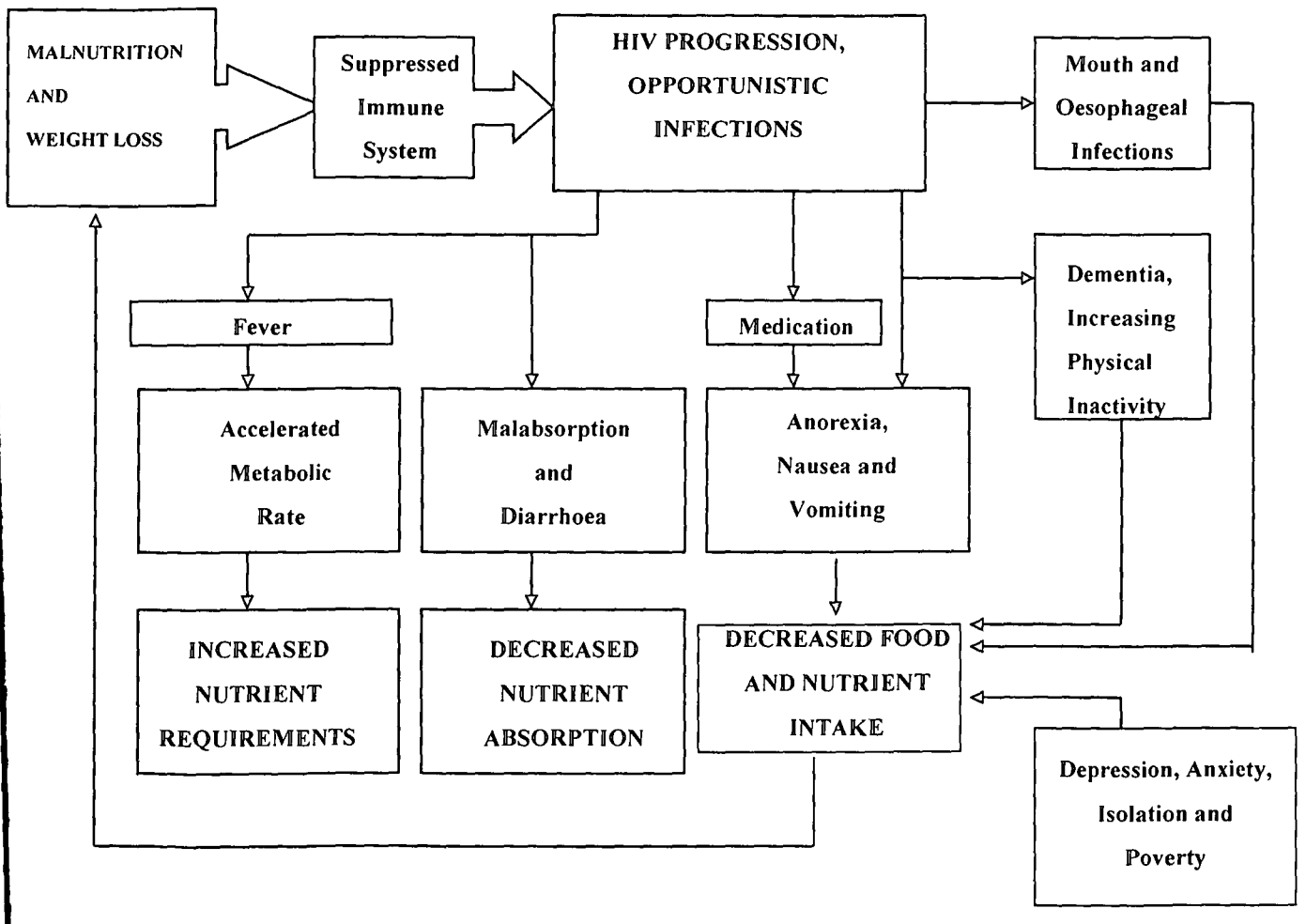

Figure 2.1 The cycle of malnutrition in HIV/AIDS (Kennedy, 2005, p. 269)

2.3.1 Types of malnutrition

The most common nutritional problem in Africa is protein-energy malnutrition (PEM) associated with A variety of opportunistic infections such as viral, bacterial, parasitic, and fungal infections. This is made worse by metabolic changes, and deficiencies of several micronutrients. A malnourished host is more susceptible to infections and has a worse prognosis than a well-nourished person. Inadequate dietary intake and malnutrition affect several parameters of specific and non specific defense systems resulting in more vulnerability to infections and as a result the severity of malnutrition is increased and this causes wasting (Fenton and Silverman, 2008, p.1009; Pratt, 2003). Different types of malnutrition in HIV infected patients are outlined in table 2.2.

Table 2.2: Different types of malnutrition (Pratt, 2003)

Protein-energy malnutrition	Lack of food and individuals needs for protein, energy nutrients, or bothare not achieved. Initial cause may be low intake or as a result of malabsorption, altered utilisation and changes in metabolism, resulting in weight loss and wasting
Acute phase response	Altered metabolism, due to tissue injury, infection, stress or inflammation and is characterised by weight loss and changes i.e. decreases in the circulating levels of various plasma proteins e.g. albumin.
Cachexia	A clinical syndrome characterized by a combination of metabolic abnormalities leading to a marked and sudden weight loss through increased wasting of host tissue mass, inadequate nutrient intake, absorption and use. Cachexia is often a feature of late HIV disease.

2.3.2 Weight loss and wasting

AIDS is usually complicated by unintentional weight loss, and when this exceeds ten percent of the baseline weight it is called wasting. Wasting is seen in twenty to thirty percent of patients who have AIDS in the last six months of their lives. Five percent weight loss is linked to increased risk of opportunistic infections and death. Weight loss, LBM depletion, decreased skinfold thickness and midarm circumferences are usually reported in AIDS patients (Fenton and Silverman, 2008, p. 1008; Cone, 2001, pp. 1-2).

Weight loss and wasting are common in all stages of HIV disease. In Africa, weight loss and wasting associated with diarrhea, also called 'slim disease', are some of the most obvious symptoms of HIV disease. Malnutrition also has a damaging impact on immune function, morbidity and mortality in HIV infected individuals (Cone, 2001, p.1).

Weight loss in patients with HIV infection can occur in intervals and similar to episodes of secondary infection or gastrointestinal disease. Loss of LBM and the presence of other nutritional deficiencies typical of malnutrition are linked with death due to AIDS (Fenton and Silverman, 2008, p. 1008; Cone, 2001, p. 2).

2.3.3 Causes of malnutrition in HIV

As discussed in the previous section, malnutrition is an important and complicated end result of HIV infection. Problems leading to malnutrition may include low oral intake, malabsorption, problems with metabolism and use of nutrients (Fenton and Silverman, 2008, p. 1008).

2.3.3.1 Low oral intake

About 44%of HIV infected individuals experience oral fungal, bacterial or viral infections early in the course of the disease (Petersen, 2006). Oral and peri-oral lesions usually appear and are considered the first indicators of the disease (Arotiba *et al.*, 2006). PLWHA often also experience loss of appetite, infections of the mouth and throat, fever and depression and inability to prepare meals (Department of Health South Africa, 2001). Low oral intake is an important factor and leads to the development of malnutrition and wasting in HIV-infection (ADA, 2000). Malnutrition and HIV infection negatively affect a persons absorption and this results in higher nutritional requirements and opportunistic infections (Bartlett and Finkbeiner 2001; Piwoz and Preble, 2000).

Opportunistic infections include fungal infections of the mouth and throat, causing discomfort and pain when eating and swallowing. These infections cause the release of pro-oxidant

cytokines and other oxygen reactive species by the immune system. The release of cytokines causes anorexia and fever, resulting in lower food intake together with increased energy requirements (Strobel *et al.*, 2005, p 486; USAID, 2001; Piwoz and Preble, 2000).

Symptomatic HIV- infected patients often have low appetite, and even the healthy, asymptomatic HIV-infected patients take fewer kilojoules (KJ) than healthy HIV-uninfected individuals. When energy expenditure is higher than energy intake due to low intake of macronutrients, weight loss takes place (USAID, 2001; Macallan, 1999).

Low oral intake can also result from anorexia secondary to depression, oral and esophageal infection, symptoms such as nausea, vomiting and diarrhea, dyspnea, fatigue, or neurologic disease (Fenton and Silverman, 2008, p.1008; Romeyn, 1998). Food intake decreases with progression to AIDS even when an active secondary infection is not present, and medication used to treat HIV and related infections can also lower appetite (Romeyn, 1998). Inadequate finances and lack of access to food, abdominal discomfort, dementia and fatigue can also lead to low oral intake (ADA, 2000, p. 432). Economic factors such as poverty (Babameto and Kotler, 1997) and limited food preparation facilities (Cimoch, 1997) further restrict the HIV–infected patient's ability to prepare food, and as a result influence food intake and nutrient intake negatively.

2.3.3.2 Malabsorption

The gastro-intestinal tract is the largest reservoir for HIV. The virus enters and lives in the cells of the gastro-intestinal tract wall, in the process changing its structure and interfering with its function to transport nutrients. The gastro-intestinal tract is the main lymphoid organ; and fifty to sixty percent of total body lymphocytes are located in the gastro-intestinal tract lymphoid tissue (Cimoch, 1997).

The lining of the gastro-intestinal tract deteriorates due to infection and the ability of the gastro-intestinal tract to digest and absorb food is also negatively affected. This then causes malabsorption and diarrhea and the nutrient losses lead to malnutrition, weight loss, a weakened

immune system and more opportunistic infections (Bartlett and Finkbeiner 2001; Piwoz and Preble, 2000). Opportunistic infections can cause inflammation, swelling, irritation and may reduce transit time by increasing movement in the gastro-intestinal tract and as a result the injured system has less time to absorb nutrients from food (Romeyn, 1998). Some of these infections are associated with diarrhea which further increases malabsorption and weight loss (Pratt, 2003). Nausea and vomiting also lead to malabsorption in patients with HIV infection (USAID, 2001).

About fifty percent of HIV/AIDS patients experience diarrhea at some stage during the course of disease (Baum *et al.*, 2001; Cimoch, 1997). Patients with CD4 counts less than 200-250/mm^3 are most at risk of developing diarrhea and malabsorption and often these are the most obvious and difficult nutritional problems to treat in HIV/AIDS patients (Fenton and Silverman, 2008, p. 1014).

Sitophobia is another problem with HIV/AIDS patients as they are afraid to eat because eating may cause abdominal pain or other gastrointestinal problems like diarrhea (Baum *et al.*, 2001). Another negative effect of HIV on the gastro-intestinal tract wall is the loss of the enzyme lactase, which causes lactose intolerance (Romeyn, 1998).

Patients with intestinal infections of the small bowel may also experience malabsorption of fats, monosaccharide, disaccharides, nitrogen, vitamin B12, folate, minerals and trace elements (Fenton and Silverman, 2008, p. 1014). Fat malabsorption reduces the absorption of fat soluble vitamins which play an important role in maintaining a healthy immune system (USAID, 2001; Semba and Tang, 1999). Patients with large bowel infections suffer from malabsorption of fluids and electrolytes (Fenton and Silverman, 2008, p. 1014).

2.3.3.3 Metabolism and use of nutrients

Opportunistic infections as a result of HIV infection can result in fever and hypermetabolic conditions in which more energy is lost, leading to rapid wasting (Pratt, 2003). Opportunistic infections in HIV also seem to cause a major increase in resting energy expenditure (REE) during the asymptomatic stage of HIV infection. Protein needs also increase, but these HIV induced metabolic changes are still not well understood (Fenton and Silverman, 2008, p. 1008; Smith and Lowry, 1999, p. 1556).

Wasting of LBM caused by altered metabolism and transport of nutrients also occurs in HIV infected patients. Macronutrients are used as energy sources by cells and their incorrect metabolism affects their use, thus contributing to wasting (Pratt, 2003; Keithley, 1998). As seen in other infections and injuries, HIV infection encourages the release of cytokines and these are usually produced in excess and change normal metabolic regulation, including lipid metabolism, leading to weight loss and wasting (Pratt, 2003).

Cachexia-related wasting is linked with metabolic alterations. Many studies investigating REE in HIV infected individuals support the opinion that HIV is a hypermetabolic disorder (Grinspoon *et al.*, 1998; Pratt, 2003). During the late stages of the infection, physical problems take place and people are unable to take care of themselves. This then causes inability to work due to illness, depression, fear, anxiety and a shorter lifespan (Strobel *et al.*, 2005, p.486; Piwoz and Preble, 2000).

2.3.4 Clinical signs of malnutrition

Clinical signs of malnutrition can be identified by a nutrition related physical examination. This is important since nutritional deficiencies cannot be identified by other assessment approaches. Special attention must be directed to areas such as the skin, hair, teeth, gums, lips, tongue and eyes. These areas are easily affected due to rapid cell replication of the epithelial tissue (Hammond, 2008, p. 406). Table 2.3 indicates the clinical signs and possible causes of malnutrition:

Table 2.3: Clinical signs of Malnutrition (Hammond, 2008, pp. 1223-1225)

System	Abnormal findings	Possible deficiencies
Hair	Lack of shine and luster, thin, sparse, loose, flag sign, falls out, easily pluckable	Protein, zink, or lenoleicacid
Eyes	Dry, grayish, yellow/white foamy spots on whites, Night blindness, redness, corneal xerosis, cracked and reddened corners of eyes	Iron, folate, or vitamin B12
Oral cavity	Lips- Angular stomatitis, cheilosis Tongue- magenta, smooth, decreased taste, red swollen Gums-spongy, bleeding Teeth- missing, poor repair, loose, caries	Riboflavin, folate niacin, iron , vitamin B12 pyridoxine, zink, vitamin C, excess sugar
Nose	Scaly, greasy, with gray or yellowish material around the nares	Riboflavin, niacin, pyridoxine
Skin	Dry and scaly(xerosis), yellowish pigmentation, poor wound healing	Essential fat / vitamin A, carotene excess, protein deficiency, vitamin C or zink
Nails	Spoon shaped, brittle, ridged, pale	Iron deficiency

2.4 Nutrition Management in HIV/AIDS infected patients

As previously mentioned, good nutritional status can improve an individual's response to drug therapy, reduce hospital stay, and promote physical independence. Therefore, meeting nutritional needs eliminates the additional stress caused by malnutrition (Kotler *et al.*, 1989).

Optimal nutrition is important for all patients infected with the HIV for a number of reasons. Weight loss is very common and at the later stage of infection many people lose a large amount of weight. Paying attention to nutritional status during the early stages of infection and improving it may delay weight loss. The immune system of a malnourished person does not perform well. As a result, maintaining optimal nutrition may help in sustaining a strong immune system, even in the absence of HIV infection (Bartlett and Finkbeiner, 2001).

2.4.1 Nutrient requirements

Energy requirements may increase by thirteen percent and protein by ten percent for each degree Celsius temperature increase above normal body temperature. Energy and protein needs are determined by the health status of a patient during the time of HIV infection, disease advancement and development of complications that affect nutrient intake and use (Fenton and Silverman, 2008, p.1011; ASSAf, 2007, p. 14).

PLWHA experience weight loss and loss of BCM and all are linked to increased energy loss, increased protein turnover, low energy intake, diarrhea and malabsorption (ASSAf, 2007, p.14). More than thirty percent of protein loss can result in reduced body strength for breathing, susceptibility to infection, abnormal organ function and sometimes death (Brown, 2008).

High intake of proteins can result in the development of weak bones, kidney stones, cancer and obesity and this is normally connected to high fat intake and low fiber intake, because foods high in protein are also high in fat. Inadequate protein intake leads to PEM as protein and energy deficiencies are linked. PEM therefore result in wasting in adults (ASSAf, 2007, p. 9; Trebble and Krauss, 2001, p. 546; Methews, 1999, p.44).

As already indicated, malnutrition is normally the PEM, and infected persons have to balance energy, proteins and vitamins (Bartlett and Finkbeiner, 2001). Recommendations state that energy requirements may increase by ten percent to maintain body weight and physical activity during the asymptomatic stage of HIV infection. In symptomatic and AIDS stage the energy requirements increase by roughly twenty to thirty percent to sustain adult body weight. There is limited data that support protein increase and there is no evidence that supports fat increases as a result of HIV infection (WHO, 2003).

In terms of recommended daily allowances (RDA) for people with HIV/AIDS, protein requirements may be estimated at 1.0 to 1.4g/kg for maintenance and 1.5 to 2.0g/kg for replication (Fenton and Silverman, 2008, p.1011). Persons with gastro-intestinal tract infections are advised to use medium-chain triglyceride oils, because long-chain triglycerides may cause

mucosal irritation, thus further compromising nutrient absorption (Pratt, 2003, p. 329).

HIV infected individuals with malnutrition usually have several micronutrient deficiencies that further depress the immune system and negatively affect patient's ability to recover from opportunistic infections (Pratt, 2003). Nutrient deficiencies such as vitamins A, E, B, and B12 accelerate progression from HIV to AIDS (Lee and Watson, 2001; Baum *et al.*, 2001).

2.5 Lifestyle factors that may impact on HIV/AIDS

Smoking and alcohol consumption will be discussed as lifestyle factors that can impact on HIV/AIDS.

2.5.1 Smoking

Smoking in HIV weakens and destroys the immune system causing a number of health complications and faster progression to AIDS. Smoking may cause oral lesions and thrush, bacterial pneumonia, oral candidiasis and AIDS dementia. Smoking may reduce lung function, promote pulmonary infections, cause heart disease, cancer and other health related problems, thus decreasing quality of life (Lucero and Watson, 2001).

2.5.1.1 Effects of smoking on health and nutritional status

Smoking has a major impact on hunger, body weight and nutrient status. Smokers usually have a low intake of dietary fiber, vitamin A, beta-carotene, folate and vitamin C, thus increasing chances of developing lung cancer (Rolfes *et al.*, 2006, pp.540-541).

Smoking decreases HDL cholesterol known to protect against heart disease. Smoking is also linked with lower intake of fruits, vegetables and dairy products. As a result of this low intake, smokers normally have lower plasma concentrations of nutrients such as vitamin C, folic acid and carotenoids than non smokers (Thurnham, 2005, p. 256; Handelsman, 1995).

The absorbed nicotine from cigarette smoke causes the release of adrenalin. The adrenalin affects the heart by causing an immediate rise in heart rate and blood pressure, which increase the metabolic rate of an individual. Smoking also affects the central nervous system, specifically the optic nerve, by causing optic neuropathy. Osteoporosis is more common in women who smoke than non smokers. Furthermore, smoking tobacco makes individuals vulnerable to cardiac arrhythmia, spasms of the coronary arteries, heart disease, stroke and angina (Handelsman, 1995).

Smoking also increases the risk of cancers such as cancer of the lips, oral cavity, pharynx, pancreas and others. Coronary heart disease can also develop as a result of smoking. It is estimated that cigarette smoking increases the individual's risk for stroke and smoking also causes abdominal aortic aneurysms. Furthermore, smoking causes chronic obstructive lung disease (COPD) and reduces blood circulation by narrowing the blood vessels South African Health survey, 2000 (SADHS).

The risk of dying from lung cancer is 22times higher among males smoking cigarettes and roughly twelve times higher among females than with non smokers. Smokers are more than ten times more likely to develop peripheral vascular disease than non smokers. In addition, cigarette smoking is associated with chronic coughing and wheezing among adults. Smoking suppresses the immune function and as a result upper and lower respiratory tract infections are common in smokers (SADHS, 2000).

Cigarette smoking poses several health complications for PLWHA (Tesorieero *et al.*, 2008). Smoking in HIV weakens and destroys the immune system, causing a number of health complications and a faster progression to the development of AIDS (Lucero and Watson, 2001).

2.5.2 Alcohol consumption

Alcohol can be classified as a nutrient because it provides energy (1gram of alcohol contains 7 calories, more than 1 gram protein and very little vitamins and minerals) and also as a drug because it affects the brain's function by acting as a depressant of the central nervous system. It

provides empty KJ which replaces the nutrient-rich calories of food and it also affects the body's absorption, storage and use of nutrients. Furthermore alcohol also increases basal metabolic rate (Suter, 2001, p. 71; Charles and Lieber, 1995, pp. 348-349).

Alcohol consumption has become a traditional part of lifestyle for many societies, but can have negative effects on health especially where abuse is common. Societies have different drinking patterns with beer and spirits being used more commonly in colder regions where cereals and tubers are sources of carbohydrates for fermentation, and in warmer climates where grapes are grown for wine, sherry and port production. High intakes of alcohol can lead to altered liver metabolism, causing liver damage. Furthermore, alcohol can cause several nutritional, social and physical health problems. The younger generation usually drinks more than the old and men more than women. Furthermore, poor people also tend to drink more alcohol (Brown, 2008; James and Ralph, 2000, pp. 121-133).

2.5.2.1 Effects of alcohol on health and nutritional status

Alcohol, when consumed moderately, may have positive health benefits, but HIV- infected patients are advised to abstain. Alcohol abuse, however, influences nutrient intake, the ability to use nutrients and causes organ damage. During pregnancy, alcohol can cause fetal alcohol syndrome characterised by poor growth, limited hand-eye coordination, characteristic abnormal facial features, and mental retardation (Insel *et,al.*, 2006).

Heavy drinking can also cause alcoholic fatty liver, alcoholic hepatitis, cirrhosis and liver cancer (Insel *et,al.*, 2006). Moderate to heavy drinking (e.g. more than 45g/day) has been associated with stroke after accounting for increased risk caused by hypertension and cigarette smoking (Whitney and Rolfes, 2005; Lieber, 2006).

Low food intake and impaired nutrient absorption together with alcohol abuse can lead to thiamin deficiency or in severe cases Wernicke-Korsakoff syndrome which is characterised by paralysis of eye muscles, poor muscle coordination, and impaired memory and damaged nerves. Acetaldehyde, an intermediate in alcohol metabolism, negatively affects nutrient use. The direct

toxic effects of alcohol cause stomach cells to over secrete gastric and histamine irritating, the lining of the stomach and esophagus leading to ulcer formation (Whitney and Rolfes, 2005, p. 240).

Alcohol also affects the liver's ability to retain folate and excretion of folate by the kidneys increases, thus causing a deficiency. The conversion of homocystein to methionine by folate is also affected, resulting in excess homocystein which is linked to heart disease. Furthermore an inadequate supply of methionine decreases the production and rapid division of new cells in the intestine and blood (Whitney and Rolfes, 2005, p.243). Conditions like osteoporosis, acute and chronic pancriatitis and inflammation of heart muscles, are common in heavy drinkers.

Alcohol weakens nutritional status and is linked to malnutrition due to gastrointestinal and metabolic complications caused by heavy drinking. Anorexia and vomiting from alcoholic gastritis cause inadequate food intake and malabsorption of almost all nutrients takes place due to mucosal dysfunction and pancreatic insufficiency (Suter, 2004, pp. 497-505; Lieber, 2006, p. 1248). Alcohol also causes loss of fluid through excretion and nutrients like calcium are lost through urine (Sizer and Whitney, 2000). High alcohol intakes stimulate HIV replication, weakens immune defense and accelerates progression to AIDS (Lee *et al.*, 2002. p. 61).

Chapter 3: Methodology

3.1 Introduction

In this chapter, the study design, population and sampling will be described. Furthermore, the operational definitions, measuring techniques, statistical analysis, reliability and validity of techniques/ instruments are outlined.

3.2 Study design

A descriptive cross-sectional study was conducted

3.3 Study population and sample selection

The study population comprised of all HIV-infected patients primarily seen at the Bophelong clinic at Queen Elizabeth Hospital in Maseru, the Mabote clinic, Ratjomose clinic and Senkatana center. Between eighty and a hundred HIV-infected patients visit the Bophelong clinic per day. These include newly diagnosed patients, patients returning for follow-up as well as patients on ARVs.

3.3.1 Sample selection

A sample of 160 patients was estimated to be representative of HIV-infected patients in Maseru, based on the number of HIV-infected patients visiting the clinics per day. A convenience sampling method was used to select patients visiting the Bophelong clinic and Senkatane center. The nurse asked patients attending the clinic for their second visit if they were willing to participate in the research project. When consent was obtained they were referred to the researcher and 7-10 patients per day were seen by the researcher between December 2007 and January 2008 until a total of 160 consecutive patients had been included.

3.3.2 Inclusion criteria

- HIV-infected patients who can read and write, not on ARVs and who are 18 years or older.
- Patients staying in the Maseru district and attending the Bophelong, Senkatana center, Mabote and Ratjomose clinics.
- Pregnant patients were excluded; and
- Only patients who gave written informed consent were included.

3.4 Operational definitions

3.4.1 Socio-demographic information

For the purpose of this study socio-demographic information included:
Age, sex, numbers of years residing in an area, household type and composition, marital status, family income, money spent on food weekly, employment and educational level.

3.4.2 Nutritional status

As part of nutritional status, a nutrition oriented physical signs of malnutrition, habitual diet and anthropometric measurements were determined. Lifestyle information and stage of HIV disease were also collected.

3.4.2.1 Nutrition oriented physical examination

For the purpose of this study, the physical examination included an evaluation of the following clinical signs and symptoms of malnutrition as illustrated in table 3.1:

Table 3.1 Nutrition oriented physical examination (Hammond, 2008, p. 1223-1225)

Hair		Lack of shine and luster, thin, sparse, Loose, flag sign, falls out.
Eyes		Dry, grayish, yellow or white foamy spots.
		Spots on whites of eyes, nightblindness, redness, corneal xerosis, cracked and reddened corners of eyes.
Oral cavity	Lips	Angular stomatitis, cheilosis.
	Tongue	Sore, smooth, purplish, decreased taste.
	Gums	Spongy, bleeding.
	Teeth	Missing, poor repair, caries, loose.
Nose		Scaly, greasy, with grey or yellowish material around nares (nasolabial seborrhea)
Skin		Dry and scaling (xerosis), yellowish pigmentation.
Nails		Spoon shaped, brittle, ridged, pale.

3.4.2.2 Habitual diet

Habitual diet included an assessment of the different types and quantities of food and drinks usually consumed during a 24 hour period of time as well as a short food frequency questionnaire. The 24-hour recall and food frequency questionnaire is considered to be fairly reliable in terms of obtaining information related to food intake (Lee and Nieman, 2003). The 24-hour recall is efficient in comparing groups of people, who differ according to age, sex, or other criteria (Johnson and Hankin, 2003, p. 227-230).

The 24-hour recall also requires only short-term memory and suitable for illiterate persons. It is also quick to administer (Lee and Nieman, 2003, p. 78). An intake less than the recommendations of the Food Guide Pyramid for each food group was considered inadequate, while an intake equal to the recommendations of the Food Guide Pyramid (USDA, 1992) was considered adequate (Table 3.2).

Table 3.2 Food guide pyramid serving recommendations (USDA, 1992)

Bread and cereals	6-11 servings per day
Fruit	2-4 servings per day 1vitamin C, 1beta-carotene
Vegetables	3-5 servings per day 1vitamin C, 1beta-carotene
Meat and alternatives	2-3 servings per day
Milk and milk products	2-3 servings per day
Fats and sweets	<4 Use sparingly
Alcohol	1-2

Portion sizes that were used to evaluate food intake:

Bread, cereal, rice and pasta: 1 slice of bread, ½ cup ready to eat cereal or ½ cup cooked white rice, pasta or porridge

Vegetable: ½ cup cooked or chopped raw or 1 cup raw leafy vegetables

Fruit: 1 medium fruit or ½ cup chopped fruit or ½ cup fruit juice, canned or dried fruit

Milk, yogurt and cheese: 1 cup milk, yogurt or 30g cheese

Meat, fish, poultry, dry beans, and eggs: 60-90g meat, fish or poultry, or 1 egg per week, ½ cooked dry beans

Fats, oils and sweets: use sparingly (5ml oil, 2 teaspoons sugar, 10ml mayonnaise, 2 hard boiled sweets).

3.4.2.3 Anthropometric measurements

Anthropometry is the science of measuring the size, weight, and proportions of the human body (Hammond, 2008, p.383). For the purpose of this study, anthropometric measurements included: height, weight, waist and hip circumferences and fat percentage.

i) BMI

Weight and height were used to determine BMI. BMI refers to current weight in kilograms divided by height in meters squared and is categorised as indicated in table 3.3.

Table 3.3: Classification of Overweight and Obesity (Gee *et al.* 2008, p. 540)

Classification	Body mass index (BMI) (kg/m²)
Underweight	BMI less than 18.5
Normal weight	BMI 18.5 to 24.9
Overweight	BMI 25.0 to 29.9
Obesity	BMI equal to or more than 30

ii) Waist circumference and waist-to-hip ratio

The waist circumference is the distance around the smallest area below the rib cage and above the belly button. It provides a risk prediction for obesity-related diseases (Hammond, 2008, p.402). When waist circumference is used as an independent predictor of risk, a waist circumference of >102cm in men and >88cm in women is considered a risk (Lee and Nieman, 2003, p.182). These were the cut off points that were applied in this study.

For the purpose of this study, waist-hip-ratio was determined by dividing the waist circumference by the hip circumference in order to determine body fat distribution. Waist-to-hip ratios of more than 0.80 in women and 0.95 in men were used to indicate central body fat distribution (Brown, 2002, p. 9-10;).

iii) Fat percentage

The thickness of a fold of skin picked up at strategic sites indicates the amount of subcutaneous fat. Various sites for measurement have been suggested, and probably the best established system is that of using four sites: biceps, triceps, subscapular and suprailiac. The four skinfolds were used for this study to determine fat percentage and were interpreted as follows (Table 3.4):

Table 3.4: Body fat ranges for persons 18 years and older (Lee and Nieman, 2003)

Classification	Males %	Females %
Lean	Less than 8	less than 15
Optimal health	8-15	15-22
Slightly overweight	6-20	23-26
Fat	21-24	27-32
Obese (over fat)	more than 25	more than 32

3.4.3 Lifestyle behaviors

The particular way of life of a person or group, often refers to health related behavior such as smoking and alcohol consumption. For the purpose of this study, lifestyle behaviors included smoking and alcohol consumption.

3.4.3.1 Smoking

For the purpose of this study smoking was categorised as follows (Russo *et al.*, 2001; Hill, *et al.*, 1998):

- Non=smoker — never smoked
- Former smoker — smoked previously but stopped one year before the study
- Current smoker — smoking at present, at least one cigarette per day
- Light smoker — smokes< 14 cigarettes per day
- Moderate smoker — smokes < 29 cigarettes per day
- Heavy smoker — smokes 30 or more cigarettes per day

3.4.3.2 Alcohol consumption

For the purpose of this study alcohol consumption indicates the amount of alcohol consumed per day. The following categories of daily alcohol consumption for males and females were applied (Rimm and Temple, 2004, p. 21-28):

- Low to moderate drinking — men; two drinks/day
  women; one drink/day

○	Hazardous or risky drinking	men; three drinks/day women; two drinks /day
○	Dangerous or harmful drinking	men and women; >three drinks/day

3.4.4 Stage of HIV infection

For the purpose of this study, stage of HIV infection was categorised according to the following CD4 cell count categories (Fenton and Silverman, 2008, p. 993):

- CD4 count above 500 cells/mm3
- CD4 count 200-499 cells/mm3
- CD4 count 199 cells/mm3 and below

3.5 Pilot study

Five individuals that were similar to the target population from the same clinic were included in a pilot study to ensure that all questions were clearly understood and to determine the length of time needed to complete each questionnaire. No changes to questionnaires were made after the pilot study and thus the data of these patients were included in the main study.

3.6 Procedures of data collection

- Permission to undertake the study was obtained from the Ethics Committee of the Faculty of Health Sciences at the University of the Free State (ETOVS number- 157/07).
- Permission was also obtained from the Ministry of Health in Lesotho (Maseru).
- An appointment was made with the head of the clinic and the final arrangements in regard to meeting with the patients (time, date, and specific place in the clinic).
- The consulting doctor and nurse confidentially asked patients if they would agree to participate in the research project. Those were referred to the researcher.
- During the agreed date and time, all procedures and relevant information were explained thoroughly by the researcher to the patients in the patient's preferred language (the information document was attached to the consent form).

- Participants were asked to read the informed consent form, ask any questions and then sign it.
- The pilot study was completed.
- Participants were informed about the date and time to be at the clinic to participate in the study (interviews and the measurements were taken in the private room at the clinic).
- Patients were compensated for transport costs to come to the clinic.
- Taking of anthropometric measurements was done by the researcher between 8:30am and 4:00pm from Monday to Friday between December 2007 and January 2008. Each interview took approximately 35 minutes. During this interview anthropometric measurements were taken, a physical examination was performed, 24-hour recall and food frequency questionnaire completed, socio-demographic questionnaire completed, HIV status was determined (using the CD4+ cell counts) and the lifestyle questionnaire was completed. Seven to ten patients were interviewed per day.
- CD4 cell counts of each patient were obtained from the patient's medical records (these were one week old.
- Reliability interviews were done with 16 patients one month after the main study.

3.7 Techniques

Information regarding the patient's diet, socio-demographic conditions, and life-style was obtained from patients during a structured personal interview with the researcher (appendix A to E).

3.7.1 Socio-demographic information

A standardised questionnaire was used to collect socio-demographic information (appendix D). The questionnaire was compiled and completed in a structured interview with each patient by the researcher.

3.7.2 Physical examination

All areas of the body, including the mouth, skin, hair, eyes, and fingernails were examined by the researcher for indications of poor nutritional status according to the categories indicated in table 3.1 under operational definitions (Hammond, 2008, p. 1223-1225) and noted on a standardized form (appendix B).

3.7.3 24-Hour recall and food frequency questionnaire

A standardized 24-hour recall questionnaire was used to evaluate what individuals typically eat (food intake) and a short food frequency questionnaire was used to assess frequency of food intake. Detailed information of all foods and beverages and the way in which they were prepared or cooked was collected (Johnson and Hankin, 2005, pp. 227-237).

The estimated amounts consumed during the past 24 hours as well as frequency of food intake was obtained using a questionnaire completed during an interview with each participant (appendix A). Visual aids including food models and household measuring utensils were used to help patients estimate the quantities consumed (Monsen, 1992, p. 176.).

3.7.4 Anthropometric measurements

Weight, height, and waist and hip circumference were measured as follows and noted on a standard form (appendix C).

3.7.4.1 Weight

Subjects were measured with only light clothing such as an examination gown and without shoes using an electronic scale. They stood still over the center of the platform-beam scale with body weight evenly distributed between both feet, and without touching anything. The weight was recorded to the nearest 100g (Lee and Nieman, 2003).

3.7.4.2 Height

Patients were measured using a stadiometer. They stood with heels together and their back as straight as possible; heels, buttocks, shoulders, and head should touch the vertical surface of the measuring device and head positioned in the Frankfort horizontal plane. The arms hang freely by the sides with palms facing the thighs. Subjects inhaled deeply and maintained a fully erect position. The movable block was brought down until it touched the head; sufficient pressure was used to compress hair. The measurement was recorded to the nearest 0.1cm (Lee and Nieman, 2003, p. 165-166).

3.7.4.3 Waist and hip circumference

The patient wearing minimal clothing stood straight with abdomen relaxed; feet together and arms hanging at sides (ADA, 2000, p.16). The measurer faced the subject, placed an in=elastic measuring tape around the subject, in a horizontal plane at the natural waist and also for the hip. Measurement was recorded to the nearest 0.1cm (Lee and Nieman, 2003, pp. 182-183; Lohman *et al.*, 1991).

3.7.4.4 Skinfolds

The position of triceps, biceps, subscapular and supraileac skinfolds was determined as recommended by Lee and Nieman (2003, p.95). The skinfold was picked up between the forefinger and thumb of the left hand, the caliper was applied so that it closed under the spring pressure, and the reading was taken on the micrometer dial as soon as the rapid phase of compression was over (after 5 seconds) (Lee and Nieman, 2003, p.95; Garrow, 2000, p.17).

3.7.5 HIV status

The stage of HIV by CD4 cell count was obtained from the blood test results available in the records of patients and all these were recorded on a standard form (appendix E).

3.7.6 Life-style

Smoking and alcohol consumption was determined using a questionnaire completed in a structured interview with each participant (appendix F).

3.8 Statistical analyses

Ten percent of participants were re-interviewed to determine the reliability of the socio-demographic and lifestyle questionnaires. Where answers to questions differed by 20% the questions were considered unreliable.

Dietary intake was evaluated by comparing the intake of food groups of each participant with the recommendations in the Food Guide Pyramid.

The data was described by means of frequencies and percentages for categorical data and means and standard deviations or medians and percentages for continuous data.

The prevalence of the following was calculated and described by means of 95% confidence intervals: underweight, low fat percentage, clinical signs of malnutrition, and inadequate dietary intake.

Associations between variables were calculated and described by means of 95% confidence intervals. All statistical analyses were performed by the Department of Biostatistics at the University of the Free State.

3.9 Reliability and Validity

Reliability refers to "the ability of a procedure to produce the same results when used repeatedly in the same situation" (Monsen, 1992, p. 123). The reliability of a measure indicates the consistency of measures obtained in the use of a particular instrument and shows the extent of random error in measurement method (Burns and Grove, 2005).

Validity refers to the extent to which an instrument actually measures what it is in fact meant to measure (Katzenellenbogen *et al.* 1997, p. 90). It is the measure of the truth or accuracy of a claim (Burns and Grove, 2005).

3.9.1 Socio-demographic questionnaire

Reliability was ensured by re-interviewing 10% (16 patients) at random one month after the main study. Answers to questions that differed by 20% or more were considered unreliable and the results were not reported (no questions were unreliable).

To ensure validity, questions were designed in such a way that all issues addressed by the questionnaires were related to the aim and objectives of the study.

3.9.2 Habitual diet

Reliability was ensured by re-interviewing 10% (16 patients) at random one month after the main study. Answers to questions which differed by 20% or more were considered unreliable and the results were not reported (42% of the questions were not reported and these were alcohol, fruits, vegetable and salt/royco/stock consumption).
To ensure validity the intakes were compared to the recommendations of the relevant literature (Food Guide Pyramid).

3.9.3 Anthropometric measurements

To ensure reliability, four (height, weight, waist to hip circumferences and skinfols) anthropometric measurements were taken by the researcher according to standard procedures recommended by Lee and Nieman (2003).

3.9.4 Lifestyle

Reliability of alcohol consumption and smoking was determined by repeating the questionnaires in 10% of the interviewed patients one month after the main study and the answers to questions which differed by twenty percent or more were considered unreliable. These results are not reported (alcohol consumption was unreliable).

3.10 Ethical aspects

Research which involves human subjects must be ethically conducted to protect the subjects' human rights (Burns and Grove, 2005). Approval to undertake this study was obtained from the Ethics Committee of the Faculty of Health Sciences at the University of the Free State (ETOVS number 157/07). Permission to perform the study was also obtained from the Ministry of Health and Social welfare center in Lesotho (Appendix F).

Informed consent was obtained from participants in their preferred language (Sesotho or English) and the procedures thoroughly explained to them (Appendix G). The researcher notified the patients that the results of the study may be published for the group, but information of individual patients will not be made public. All information collected during the study were handled confidentially; this was ensured by only using coding on questionnaires, not patient's names. Patients found to be nutritionally compromised were referred to the hospital nutritionist for nutritional support and counseling. Participation in the study was voluntary and participants were free to withdraw from the study at any time.

Chapter 4: Results

4.1 Introduction

In chapter 4 the results of the socio-demographic information, dietary intake and frequency of consumption, nutrition related physical examination, HIV status (according to CD4 cell count), anthropometric and lifestyle factors of patients are included as well as the associations between the above.

4.2 Socio-demographic information

The total number of patients interviewed for this study was 160. Of these, 27.5% were males and 72.5% were female. The median age of patients was 35.8 years for both males and females. The majority (83.8%) of these patients had been staying in Maseru for more than ten years and all patients spoke Sesotho. More than 50% of patients were married. The majority of patients were unemployed (55%). Paraffin was the type of fuel mostly used for cooking. A large percentage (90.63%) of patients lived in brick houses and the median number of rooms was 2.00. (Table 4.1).

Table 4.1: **Socio-demographic information**

Variable	Category	N	%	Median
Age and gender (n=160)	Male	44	27.50	35.83
	Female	116	72.50	
Years in Maseru (n=160)	1. Mazenod-Morija	6	3.75	
	2. Abia – Nelese	17	10.63	
	3. Tsolo-Lithoteng	26	16.25	
	4. Ratjomose-Thamaae	24	15.00	
	5. Nyakosoba-Leqele	10	6.25	
	6. Foso-Khubetsoana	16	10.00	
	7. Tsenola-Motimposo	20	12.50	
	8. Sebaboleng-Tsosane	31	19.38	
	9. Ha-rastimela-Kena	10	6.25	
Language (spoken)	Sesotho (n=60)	160	100	
Marital status (n=160)	Single	24	15.00	
	Married	85	53.13	
	Divorced	5	3.13	
	Separated	12	7.50	
	Widowed	33	20.63	
	Living with a partner	1	0.63	
Employment level (n=160)	House wife	1	0.63	
	Unemployed	88	55.00	
	Self employed	15	9.38	
	Piece job	38	23.75	
	Other	18	11.25	
Cooking fuel (n=160)	Electricity	19	11.88	
	Paraffin	78	48.75	
	Wood and coal	0	0	
	Open fire	19	11.88	
	Gas	64	40.00	
Type of household (n=160)	Mud	6	3.75	
	Brick	145	90.63	
	Tin	9	5.63	
Number of rooms (n=160)	**Median**	**Minimum**	**Maximum**	
	2.00	1.00	9.00	

As seen in table 4.2, the median number of persons per household was 5.0, with a median number of 3 children and 2 adults. Median room density was 2.3 persons per room. The majority of patients had only primary education as their highest level of education and the median amount of money spent on food weekly was only R60.00.

Table 4.2: **Household composition, educational level, and money spent on food**

Number of people in a household	Median	Minimum	Maximum
Total number of people (n=160)	5.00	1.00	12.00
Children (n=159)	3.00	0.00	9.00
Adults (n=160)	2.00	0.00	5.00
Room density (n=160)	2.33	0.25	9.00
Educational grade (n=159)	7.00	1.00	13.00
Amount of money (n=160)	R60.00	R20.00	R200.00

4.3 Dietary intake

The results of the 24-hour recall and frequency of consumption will be discussed in the following section.

4.3.1 24-hour recall

The percentages of patients who consumed below, within and above the recommended number of exchanges (per day) are given in table 4.3.

Table 4.3: **24-hour recall**

Variables and Number of patients	Recommended servings/day	Below n	%	Within n	%	Above n	%
Milk and products(n=160)	2-3	145	90.6	14	8.8	1	0.6
Meat and alternatives(n=160)	2-3	114	71.3	28	17.5	18	11.3
Legumes(n=160)	1	136	85.0	23	14.4	1	0.6
Soy beans(n=160)	1	160	100	0	0.00	0	0.00
ß-carotene-rich fruits(n=160)	1	160	100	0	0.00	0	0.00
ß-carotene-rich vegs(n=160)	1	160	100	0	0.00	0	0.00
Vitamin C-rich fruit(n=160)	1	140	87.5	20	12.5	0	0.00
Vitamin C-rich vegs(n=160)	1	97	60.6	56	35	7	4.4
Other fruit(n=160)	2-4	159	99.4	1	0.6	0	0.00
Starchy vegs (vegB)(n=160)	1	152	95	7	4.4	1	0.6
Bread and cereal(n=160)	6-11	34	21.3	87	54.4	39	24.4
Fats and oils(n=160)	<4	58	36.25	87	54.4	5	9.4
Sweets or sugar(n=160)	<4	84	52.9	71	44.7	4	2.3
Alcohol(n=1)	1-2	0	0	0	0	1	100

Over 90% of patients ate less than the recommended two to three servings of milk and milk products daily and only 17.5% of patients ate the recommended two to three servings of meat and meat alternatives. For legumes, 14.4% of patients ate within the recommended 1 serving of dried beans and peas. More than 80% of patients ate less than three servings of vegetables (ß-carotene rich vegetables, vitamin C rich vegetables and starchy vegetables) per day and more than 90% ate less than the recommended two servings per day of fruits (ß-carotene rich fruits, vitamin C rich fruits and other fruits). More than 50% of patients ate within the recommended 6-11 servings of bread and cereals, while more than 80% ate the recommended number of servings for fats and oils. Forty four point seven of patients did not exceed the recommended intake (1-2 servings) of sweets and sugar.

Table 4.4: Total energy and macronutrient intake

Variable (n=160)	Low quartiles	Median	Upper quartiles
Carbohydrates(g)	90.0	143.0	194.5
Protein(g)	21.0	35.0	49.5
Fat(g)	5.0	13.0	20.0
Energy(kJ)	2327.5	3462.5	4592.5

For carbohydrates, the median intake for patients was 143g/day, for proteins it was 35g/day, for fat it was 13g/day and the median energy intake was 3462.5kJ/day.

4.3.2 Frequency of Food Consumption

The dietary intake of foods such as sweets, sugar, chips, biscuits, cooldrinks and tea was high for most patients. About 90% of patient's used full cream milk only. Eggs, soy mince and chicken were mostly consumed by these patients. Table 4.5 also indicates that 94% of patients ate bread daily, 67% ate porridge, and 84% ate samp. Coffee, coffee creamer, peanut butter, fruit juice, cereals and fish were food items consumed least often. Consumption frequencies of food items such as fruits, vegetables, salt/stock/Royco and alcohol are not indicated because of poor reliability.

Table 4.5: Types of food and frequency of consumption (n=160)

Type of food	Frequency	Patients N	%
Sweets/ chocolate	Never	71	44.38
	Daily	88	55.00
	Weekly	1	0.63
Chips (crisp)	Never	79	49.38
	Daily	88	50.00
	Weekly	0	0
Cake/ biscuits	Never	72	45.00
	Daily	86	53.75
	Weekly	2	1
Cool drinks	Never	78	48.75
	Daily	82	51.25
	Weekly	0	0
Cremora	Never	99	61.88
	Daily	61	38.13
	Weekly	0	0
Coffee	Never	110	68.75
	Daily	50	31.25
	Weekly	0	0
Tea	Never	19	11.88
	Daily	139	86.88
	Weekly	2	1.25
Sugar	Never	3	1.88
	Daily	145	90.63
	Weekly	12	7.5
Full cream milk	Never	8	5.00
	Daily	150	93.75
	Weekly	2	1.25
Low fat milk	Never	158	98.75
	Daily	2	1.25
	Weekly	0	0
Eggs	Never	9	5.63
	Daily	151	94.38
	Weekly	0	0
Peanut butter	Never	104	65.00
	Daily	56	35.00
	Weekly	0	0
Soya mince or legumes	Never	9	5.63
	Daily	151	94.38
	Weekly	0	0
Chicken	Never	10	6.25
	Daily	150	93.75
	Weekly	0	0
Red meat	Never	44	27.50
	Daily	116	72.50
	Weekly	0	0
Fish	Never	118	73.75
	Daily	42	26.25
	Weekly	0	0

Table 4.5 Types of food and frequency of consumption, cont....

Type of food	Frequency	Patients N	Patients %
Bread	Never	0	1.88
	Daily	151	94.38
	Weekly	6	3.75
Porridge cooked	Never	4	2.50
	Daily	107	66.88
	Weekly	49	30.63
Cereal (e.g. Morevite)	Never	116	72.50
	Daily	43	26.88
	Weekly	1	0.63
Samp / mielie rice	Never	25	15.63
	Daily	135	84.38
	Weekly	0	0
Margarine/ oil/ fat	Never	24	15.00
	Daily	132	82.50
	Weekly	4	2.50
Fruit juice	Never	122	76.25
	Daily	38	84.38
	Weekly	0	0

4.4 Nutrition related physical examination

The results in table 4.6 indicate very few clinical signs of malnutrition related to hair. Clinical signs of malnutrition related to eyes included foamy and white spots, brown and black spots on whites of eyes and 88.8% of patients showed these signs.

Sixty percent of patients reported night blindness, and 69% had red eyes. Over 50% (66.3%) of patients had angular stomatitis, 55% of patients had bleeding gums, 51.9% had smooth tongue and 70% had sores on their tongues. More than 50% of patients had pale and brittle fingernails.

Table 4.6: **Nutritional related physical examination**

Variable	Category	N	%
Hair (n=160)	No shine and luster	76	47.50
	Thin and sparse	39	17.50
	Loose	28	17.50
	Flag sign	7	4.38
	Falls out	22	13.75
Variable	**Category**	**N**	**%**
Spots on eyes (n=160)	Dry and grey	20	12.50
	Foamy yellow/white	142	88.75
	On whites of eyes	115	71.88
	Night blindness	97	60.63
	Redness on eyes	110	68.75
	Corneal xerosis	1	0.63
	Cracked red corners	15	9.38
Nose (n=160)	Greasy with grey or yellow material around the nares	5	3.13
	Scaly	75	46.87
Mouth (n=160)	Lips-angular stomatitis	106	66.25
	Cheilosis	10	6.25
Teeth (n=160)	Missing	66	41.25
	Caries and poor repair	45	3.13
	Loose	5	3.13
Gums (n=160)	Spongy	25	15.63
	Bleeding	89	55.63
Tongue (n=160)	Decreased taste	17	10.63
	Purplish	10	6.25
	Smooth	83	51.88
	Sore	112	70.00
Skin (n=160)	Dry and scaling	56	35.00
	Yellowish pigmentation	1	0.63
Finger nails (n=160)	Spoon shaped	2	1.25
	Ridged	10	6.25
	Pale and brittle	88	55.00

4.5 Number of years living with HIV and CD4+ cell cell

The median number of years that patients included in this study had known that they were HIV-infected was 0.61 years or about 7 months. The maximum number of years that patients had known that they were HIV-infected was 3.5 years.

The median CD4+ cell count of patients was 291cells/mm^3, with a minimum of 160cells/mm^3 and a maximum of 933cells/mm^3.

Table 4.7: Number of years living with HIV and CD4 counts

Variable	N	Median	Minimum	Maximum
Years living with HIV infection	159	0.61	0.0082	3.53
CD4+ (cell/mm^3)	160	291.00	6.00	933.00

4.6 Anthropometry

BMI, waist circumference, waist-to-hip ratio, and skinfolds (fat percentage) were included in the anthropometric assessment of patients.

4.6.1 BMI of male and female patients

The results in table 4.8 indicated that 10% of patients were underweight (BMI< 18kg/m^2), 64% had a normal weight, 17% were overweight (BMI =25-29.9kg/m^2) and 9% were obese (BMI ≥30kg/m^2).

Table 4.8: Body mass index of male and female patients

BMI(kg/m^2)	Category	N	%
<18.5	Underweight	16	10
18.5 - 24.9	Normal weight	103	64.38
25 – 29.9	Overweight	27	16.88
≥ 30	Obese	14	8.75

4.6.2 Waist circumference and waist-to-hip ratio

Only 9% of male patients interviewed had a waist circumference above 102 cm and only 2% of female patients had a waist circumference above 88 cm. As far as waist-to-hip ratio is concerned, 2% of males had a ratio above 0.95 and 46% of females had a ratio above 0.8 indicating risk for chronic disease (table 4.9).

Table 4.9: **Waist circumference and waist to hip ratio**

Variable n=160	Category		N	%
Waist circumference	Risk – Male		4	9.1
	Risk – Females		2	1.7
Waist to hip ratio	Central body fat	Males	1	2.3
		Females	53	45.7

4.6.3 Fat percentage

Of the 160 patients interviewed, about 50% (46.25%) showed optimal health according to fat percentages, 31% of the patients were lean, 16% of patients were overweight and 7% of the patients were fat.

Table 4.10: **Fat percentages**

Variable	Males	Females	N	%
Lean (Unhealthy range)	≤5%	≤8%	50	31.25
Optimal health	6-15%	9-23%	74	46.25
Slightly overweight (Acceptable range)	16-24%	24-31%	25	15.63
Fat (Unhealthy)	≥ 25%	≥ 32%	11	6.88

4.7 Lifestyle information

4.7.1 Smoking and alcohol consumption

Tables 4.11 and 4.12 indicate the lifestyle behaviors of both males and females which include smoking and alcohol consumption. Of the 160 patients interviewed, 81.88% were non smokers, 8.13% were former smokers and 10 % were light smokers. Seventy four patients were current smokers. Of those 20.27% were smoking at present, 39.13% were cigarette smokers and 40.54% were snuff users. The median age that patients started smoking was 19 years and the median number of cigarettes smoked per day was 4.

The percentage of patients that used snuff was 18.9% and the median number of times these patients used snuff was 3 times per day. About forty percent of patients consumed alcohol. Of these, 33% were moderate alcohol consumers, 23% were hazardous alcohol consumers and 43% were dangerous alcohol consumers. Seventy eight percent consumed alcohol monthly and beer was the most commonly consumed type of alcohol. The median number of drinks consumed per day was 3.

Table 4.11: Smoking

Variable	Category	N	%
Smoking (n=160)	Non smokers	131	81.88
	Former smokers	13	8.13
	Light smokers	16	10.00
Current smokers (n=74)	Smoking at present	15	20.27
	Cigarette	29	39.19
	Snuff users	30	40.54

Variable	Median	Minimum	Maximum
Number of cigarettes/day	4.00	1.00	10.00
Number of times one snuffs/day	3.00	1.00	4.00
Age started smoking	19.00	13.00	32.00

Table 4.12: Alcohol consumption

Variable	Category	N	%
Alcohol consumption (n=160)	Yes	64	40.00
How often alcohol is consumed (n=64)	Daily	2	3.13
	Weekly	12	18.75
	Monthly	50	78.13
Kind of alcohol consumed (n=64)	Wine	15	23.44
	Beer	38	59.38
	Home made beer	11	17.19
Alcohol consumption	Low to moderate	21	33.33
	Hazardous or risky	15	23.81
	Dangerous or harmful	27	42.86

Number of drinks consumed /day	Median	Minimum	Maximum
	3.00	1.00	8.00

4.8 Stage of HIV infection

Table 4.13: Stage of HIV infection

Variable	Category	N	%
Stage of HIV infection	CD4 above 500cells/mm ^{3}	54	33.75
	CD4 200 to 499cells/mm^3	78	48.75
	CD4 199cell/mm^3 and below	28	17.50

Close to 50% (48.8%) of patients had CD4 cell count between 200 and 499cell/mm^3, 33.8% above 500cells/mm^3 and 17.5% 199cells/mm^3 and below.

4.9: Differences between variables

Table 4.14: Difference between BMI of males and females (n=160)

Categories	Minimum	25% L-Q	Median	75%U-Q	Maximum
Males (n=44)	17.37	20.79	21.73	23.67	33.45
Females (n=116)	14.26	20.35	22.79	26.00	35.96

L-Q= Lower quartile

U-P= Upper quartile

The median BMI of males (n=44) was 21kg/m^2 and for women (n=116) it was 22.79kg/m^2. No significant difference between median BMI of the two genders was found, with a 95% CI of [-450; 690].

Table 4.15: Difference between energy intake of employed and unemployed patients (n=160)

Categories	Minimum	25% L-Q	Median	75% U-Q	Maximum
Employed (n=88)	0	2348	3448	4563	7575
Unemployed (n=72)	0	2328	3473	4593	7090

Median energy intake of patients was very similar for both employed (3448kJ) and unemployed (3473kJ) patients. The median energy intake of employed and unemployed patients did not differ significantly.

Table 4.16: Difference between BMI and energy intake (kg/m²) (n=160)

Categories BMI (kg/m²)	Minimum	25% L-Q	Median	75% U-Q	Maximum
<18.5kg/m² (n=16)	0	2047	3408	4555	6845
18.5-24.9kg/m² (n=103)	0	2280	3280	4440	7090
25.0-29.9kg/m² (n=27)	0	2465	3610	4655	6590
≥30kg/m² (n=14)	1650	3135	4137	5465	7575

Although energy intake of obese patients was higher than that of other patients, no significant difference in median energy intake of patients in the different BMI categories was found (table 4.16) with a 95% CI of [-1410; 880].

Table 4.17: Difference between BMI and smoking (n=160)

Categories (n=160)	Minimum	25% L-Q	Median	75% U-Q	Maximum
Non smokers (n=131)	14.26	20.65	22.48	25.68	35.96
Light smokers (n=13)	17.37	21.24	21.77	24.51	33.27
Moderate smokers (n=16)	18.25	19.52	21.32	22.89	33.45

Median BMI of non smokers (22.48kg/m²) was slightly higher than that of light smokers (21.77kg/m²) and the 95% CI seems to indicate a trend [-2055; 150].

Table 4.18: Difference between BMI and alcohol consumption (n=160)

Categories (n=160)	Minimum	25% L-Q	Median	75% U-Q	Maximum
Non alcohol consumers (n=97)	14.26	20.96	22.91	25.54	35.54
Low to moderate consumers (n=21)	17.37	20.16	21.71	23.17	32.54
Hazardous to risky consumers (n=16)	18.25	20.77	22.17	24.19	35.96
Dangerous to harmful consumers (n=27)	18.25	20.04	22.39	25.89	31.80

No significant difference in the median BMI of non-alcohol consumers and low to moderate alcohol consumers was found. However, the median BMI of low to moderate alcohol consumers and of the dangerous to harmful alcohol consumers differed significantly with a 95% CI of [-1950; -150], with patients that used the most alcohol having a higher median BMI.

Table 4.19: Difference between room density and energy intake (n=160)

Categories (n=160)	Minimum	25% L-Q	Median	75% U-Q	Maximum
Room density <2.5 (n=81)	0	2525	3610	4840	7575
Room density ≥2.5 (n=79)	0	2090	3400	4230	6990

Although there was no significant difference in the median energy intake of patients with a higher room density (3400kJ), there was a tendency for people with lower room density to have higher energy intake (3610kJ) with a 95% CI of [-90; 1010].

Table 4.20: Difference between energy intake (kJ) and alcohol consumption for current alcohol consumers (n=160)

Categories (n=44)	Minimum	25% L-Q	Median	75% U-Q	Maximum
Non alcohol consumers(n=21)	0	2635	3685	5065	7090
Low-moderate consumers(n=10)	0	2090	2915*	3840	6945
Hazardous-risky consumers(n=6)	0	2525	2857.5	4585	5105
Dangerous-harmful consumers(n=7)	3400	3420	3990*	6355	6900

*significant difference

Patients with a dangerous to harmful consumption of alcohol had a significantly higher median energy intake (3990 kJ) than patients with a low to moderate alcohol consumption (2915kJ) with a 95% CI of [-3605; -55].

Table 4.21: The difference between different HIV stages (CD4 cell count) and median energy intake for males (n=44) and females (n=116)

Categories (CD4 and Energy)	Minimum	25% L-Q	Median	75% U-Q	Maximum
CD4 cell counts of males <200cells/mm³ (n=17)	0	2525	3420	4290	7090
CD4 cell counts of males 200-500cells/mm³ (n=20)	0	2657.5	3485	5567.5	6900
CD4 cell counts of males >500cells/mm³ (n=7)	0	2090	3480	5105	6440
CD4 cell counts of female <200cells/mm³ (n=17)	0	2565	3730	4840	6105
CD4 cell counts of females 200-500cells/mm³ (n=20)	0	2235	3240	4170	7575
CD4 cell counts of females >500cells/mm³ (n=7)	170	2465	3685	4445	6540

No significant differences between median energy intake of patients in different stages of HIV (CD4 cell count) were found with a 95% CI of [-405; 1055].

Table 4.22: The difference between different HIV stages (CD4 cell count), median BMI for males (n=44) and females (n=116)

Categories (CD4 and BMI)	Minimum	25% L-Q	Median	75% U-Q	Maximum
CD4 cell counts of males <200cells/mm³ (n=17)	18.25	21.13	2168	22.39	23.79
CD4 cell counts of males 200-500cells/mm³ (n=20)	17.37	2064	21.80	24.73	32.54
CD4 cell counts of males >500cells/mm³ (n=7)	18.26	19.74	21.71	27.55	33.45
CD4 cell counts of females <200cells/mm³ (n=17)	14.26	20.91	22.48	25.31	35.54
CD4 cell counts of females 200-500cells/mm³ (n=20)	16.33	20.63	22.70	26.14	3596
CD4 cell counts of females >500cells/mm³ (n=7)	17.4	20.34	23.09	25.89	32.76

There was no significant difference between the median BMI of patients with different stages of HIV (CD4 cell count) with a 95% CI of [-1120; 665].

Table 4.23: The difference between median BMI and fat percentage (n=160)

Categories	Minimum	25% L-Q	Median	75%U-Q	Maximum
Lean (n=16)	0	0	4.05*-o	11.35	21.8
Optimal health (n=103)	0	0	16.8*□#	19.8	26.6
Slightly overweight (n=27)	0	16.8	21.5-□+	25.0	29.6
Fat (n=14)	17.7	24.5	27.3o#+	28.5	31.9

*, -, o, □, #, □, and + indicate median numbers with a significant difference.

As expected, BMI was strongly associated with fat percentage, with patients that had the lowest BMI, also having the lowest percentage fat. As BMI increased so too did percentage fat. Significant differences in BMI of patients with lean and optimal health fat percentages were noted [4.05; 16.8], lean and slightly overweight fat percentages [4.05; 21.5], as well as lean and fat percentages [4.05; 27.3].

In addition, BMI of patients with optimal fat percentage differed significantly from slightly overweight [16.8; 21.5]. The slightly overweight patients also had a significantly lower BMI than the fat patients [21.5; 27.3].

Table 4.24: The difference between fat percentages of males and females (n=160)

Categories	Minimum	25% L-Q	Median	75%U-Q	Maximum
Males (n=43)	0	0	18.1*	14.2	24.5
Females (n=116)	0	14.1	19.5*	22.2	31.9

Table 4.24 indicates the difference between the fat percentage categories of males and females. Women had a significantly higher fat percentage (19.5%) than men (18.1%) with a 95% CI for the median difference of [-14.1; -7.3].

Chapter 5: Discussion of results

5.1 Introduction

The objective of this study was to determine the nutritional status and the lifestyle behaviors of HIV-infected adults residing in the Maseru district in Lesotho. Results will be discussed according to socio-demographic, dietary intake, anthropometry, lifestyle information and associations.

5.2 Socio-demographic status

5.2.1 Unemployment

Unemployment is associated with decreased quality of life and in the current study 55% of patients were unemployed. In a study carried out by Nojomi *et al.*, (2008) in Iran, it was reported that 65.4% of patients were unemployed. Similar results were also reported by Fogarty *et al.*, (2007) where it was reported that unemployment was more common in people who experienced HIV/AIDS related illness than those with better self-reported health.

5.2.2 Education

Education is another important factor related to HIV infection. In the current study the majority of patients (82%) had primary education as their highest qualification. Barnighausen *et al.* (2007), reported that one additional year of education can decrease the danger of acquiring HIV infection by 7% regardless of sex, age, wealth, household expenditure, rural vs. urban or periurban residence, migration status and partnership status in a multivariable survival analysis carried out in South Africa. Nojomi *et al.*, (2008) also reported that 45.3% of HIV-infected patients in Iran only had secondary education. According to Pettifor *et al.* (2008), young women who did not complete high school were more likely to be HIV infected compared with those who completed high school in South Africa.

5.2.3 Marital status and HIV status

In the current study patients had known about their HIV status for a median period of 7 months and the median CD4 cell count was 291cells/mm^3. Fifty percent of patients were married. Shisana *et al.* (2004), reported that HIV infection was higher in married than unmarried persons and that the relationship between HIV infection and marriage is complex. According to Pettifor *et al.* (2008), CD4 count and clinical stage of disease and marital status have a significant effect on the quality of life of HIV infected patients in South Africa. In this study, 15% of young South African women who had one lifetime partner were HIV-infected.

5.3 Dietary Intake

5.3.1 Food intake

Infection with HIV results in the immune system having to work extra hard to fight opportunistic infections. Because of this, more energy and nutrients are required and the bodies need for food therefore increases. As a result, HIV- infected individuals are forced to increase food intake to meet these needs (FAO, 2002).

Meeting immediate food, nutrition and other basic needs is vital for individuals living with HIV infection. These individuals need to adopt a healthy and balanced diet which comprises of consumption of fruits, vegetables, milk and milk products and whole grains (WHO, 2003; Wildman and Miller, 2004, pp. 139-166). Consuming adequate nutrients helps maintain the functional components of the immune system, strengthens immune function and reduces risk of chronic diseases such as diabetes and cardiovascular disease (Anamu and Jeyakumar, 2008).

Good nutrition can help people living with HIV infection to maintain a healthy lifestyle and achieve a better overall quality of life (UNAIDS, 2008; San Francisco AIDS Foundation 2006). Nutritional status strongly influences the survival and functional status of people living with HIV/AIDS.

Nutritional problems can occur at any stage of HIV infection and can add to impaired immune function, increased disease progression and opportunistic infections (Nerad *et al.*, 2003).

In the current study, about 50% of patients ate within the recommended 6-11 servings of bread and cereals. On the other hand, consumption of animal and plant proteins was not frequent and was also below the daily recommendation of 2-3 servings per day.

On average, the intakes of fruits and vegetables were below the daily recommendation of 2-4 servings per day. The overall food intake of the most patients was below the daily recommendations. The results of nutrient intake from different studies have shown conflicting results. Kim *et al.* (2001) reported that HIV-infected women had inadequate overall nutrient intakes in the study undertaken in Boston. Mean scores of people living with HIV/AIDS indicated low intake of fruits and vegetables, dairy products and dietary fiber, and high meat and eggs in a study done in Brazil by Duran *et al.* (2008).

In a study carried out in Ghana on 50 HIV-infected adults by Wiig and Smith (2007), the intake of fruits, vegetables and dairy products was low for the whole study sample with no significant difference between men and women. Wig *et al.* (2008) reported that the intake of major nutrients was significantly lower when compared with the national standards in a study carried out on Asian Indians with HIV. Anamu and Jeyakumar (2008), reported that the dietary habits of 65% of HIV infected individuals in India consumed rice, pulses and legumes, eggs, milk and products at least once a day.

5.3.2 Energy and Macronutrient Intake

Energy is derived from energy providing nutrients which include carbohydrates, fats and proteins. These nutrients are called macronutrients because a human body needs them in large quantities daily (Brown, 2008; ASSAf, 2007, p.2). Carbohydrates are the major sources of energy and starchy foods are the main source of glucose in the diet, the most preferred fuel for body functions (Sizer and Whitney, 2003, p.104). Carbohydrates containing foods include cereals (rice, wheat, maize), barley, rye, oats, millet and sorghum.

It is recommended that a healthy diet for a healthy person should contain roughly 45-65% of total energy from carbohydrates, 10-35% from protein and 20-35% of total energy from fats (Wildman and Miller, 2004. pp. 139 and 166).

In the current study median energy intake was very low at 3463 kJ. Median macronutrient intake was 43g for carbohydrates, 35g for proteins and 13g for fats, all of which are lower than the daily recommendations. Kim *et al.* (2001) also reported inadequate energy intake in 38% of female HIV-infected persons. In addition, the recommended protein intake was reached by only 43% of males and 44% women and in the same study 42% males and 39% of females consumed more than the upper limit for fat. Protein is not a preferred source of energy, but if consumption of carbohydrates is inadequate, proteins are sacrificed for energy.

Hattingh *et al.* (2006) have reported that the total energy, protein and carbohydrate intake of HIV-infected women in Mangaung exceeded the daily recommended allowance and the fat intake was high. In that study, dietary fiber intake was below the recommended intake. Arendt *et al.* (2008) reported an adequate intake for proteins, high intake of fat and cholesterol, and very low fiber intake. Duran *et al.* (2008) also reported high intake of total fat and cholesterol in a study conducted in Brazil on people living with HIV. Hendricks *et al.* (2006) reported that the mean total fat and saturated fat intakes were above the recommendations for both men and women in a study conducted in Boston.

5.4 Nutrition related physical examination

In this study it was found that over 50% of patient's showed clinical signs of malnutrition related to mouth, 66% had angular stomatitis and bleeding gums and 70% had sores on their tongues. Sixty percent of patients reported night blindness. In a study conducted in the United States of America by Gennaro *et al.* (2008), it was reported that oral lesions are common in women and children with HIV and may decrease the overall quality of life in these patients because of pain, dry mouth and difficulty in eating.

In a study conducted in Russia among HIV infected patients, Gileva *et al.* (2004), found that the most common oral mucosal lesions in HIV infected groups were candidiasis which was found in 32.7% of patients, herpetic lesions in 15.4%, cheilitis glandlaris in 3.9% and recurrent ophthous stomatitis in 2%.

In a study done in China by Tao *et al.* (2005) with 64 HIV-infected Chinese population, it was reported that candidiasis was the most common oral lesion and six cases of herpetic stomatitis were also reported. The author concluded that there was a high prevalence of candidiasis and salivary gland disease in HIV infected individuals. In addition Taiwo *et al.* (2006) reported that oral lesions due to HIV/AIDS infection were found in 4.8% of patients and 34.9% of these patients had multiple lesions in a study conducted in Nigeria.

5.5 Anthropometric status

The information in regard to BMI, waist circumference and waist-to-hip ratio will be discussed in the following section.

5.5.1 BMI

BMI shows body weight in relation to height and is normally used in measuring overweight and obesity in adults (Gibson, 2005, p. 159; Hammond, 2008, p. 400). Calculating BMI is considered one of the best methods for population assessment of weight status (U.S, CDS, 2004) and provides a good estimate of body fat content (Brown, 2008).

In the current study only 10% of patients were underweight, 17% overweight and 9% obese, with the majority having normal BMI. Amorosa *et al.* (2005) reported that overweight and obesity were more prevalent than wasting and that women were more obese than men in a study conducted in Philadelphia. In addition, obesity is not uncommon among HIV-positive individuals and this was observed in 20.6% of women and 6.7% men in a study carried out in Boston by Kim *et al.* (2001). Similar results were also found in a study conducted by Hendricks *et al.* (2006) amongst HIV-infected persons. Maas *et al.* (1998) reported 3% males and 29% women being obese in a study conducted with HIV-infected persons in Netherlands.

On the other hand, underweight and wasting are common in illnesses like HIV. Individuals who are thin and unhealthy usually take a longer time to recover from illness. These people also have an increased risk for wasting disease which is a major problem in HIV infected individuals (Brown, 2008). In a study conducted in Boston on HIV-infected women it was reported that underweight and normal weight women had increased risk of clinical acquired immune deficiency syndrome, and underweight women had increased risk of HIV- related death compared with patients who are obese (Jones *et al.*, 2003).

5.5.2 Waist circumference and waist-to-hip ratio

Waist circumference can be used to estimate abdominal fat and to predict the risk of cardiovascular disease (Gibson, 2005). Fat that collects deep within the central abdominal area of the body (visceral fat) is a risk factor for diabetes which is characterised by insulin resistance associated with abdominal adiposity, stroke, hypertension, and coronary artery disease (Sizer and Whitney, 2003; Tribble and Krauss, 2001. pp. 543-545).

In the current study, nine percent of males and two percent of females had a waist circumference above the cut off point and 46% of women had a waist-to-hip ratio above 0.8cm. These results indicated increased risk for cardiovascular and heart disease in these individuals. Gerrior *et al.* (2001) reported that the mean waist-to-hip ratio was above normal in a study done in Boston.

Different results were reported by Brown *et al.* (2007) in a study carried out in the United States of America. Circumference measurements were significantly greater in HIV-uninfected males than HIV infected males (96.4 versus 90.2 cm for waist circumference and 101.3 versus 95cm for hip circumference).

5.6 Lifestyle factors that can impact on HIV

5.6.1 Alcohol consumption

According to the Medical research council (MRC), about 30%of males and 10% of women in South Africa have high intakes of alcoholic beverages (Stein *et al.*, 2005). In the United States only 5%of women and 72%of males drink alcoholic beverages and among these 17% are classified as heavy alcohol consumers.

In the current study 43% of the patients were classified as dangerous consumers and 23% as hazardous consumers with beer as the most frequently consumed alcoholic beverage. Similar results were reported in a study carried out on HIV-infected individuals in the United States where 36% of the subjects consumed alcohol and 34% were hazardous drinkers, 46% were binge

drinkers and 26 % had a diagnose of alcohol abuse (Gordon *et al.*, 2006). Chander *et al.* (2006) also reported prevalence of alcohol use being 45%, with 10% classified as hazardous drinkers in a study conducted on HIV-infected individuals in Boston. Sullivan *et al.*, (2008) stated that alcohol use is usually associated with more depressive symptoms in HIV-infected patients.

5.6.2 Smoking

In the current study 39.19% of patients smoked cigarettes, 10% were light smokers and 20.27% currently smoke. The 2007 National Health Interview Survey (NHIS) also indicated that approximately 19.8% of adults in the United States were current cigarette smokers. Furthermore, it was also indicated that 77.8% of current smokers smoked every day and 22.2% smoked on some days. Tesoriero *et al.* (2008) reported that in people living with HIV/AIDS smoking prevalence was 59%, and this was three times that of the general population in the United States of America. In the same study, it was also reported that over 50% of current smokers were moderately or highly dependent on nicotine. The South African Democratic Health Survey (2000) reported that the smoking rate in South Africa is 31% in males, 8% in women and 10% in adolescents (15-19 years).

5.7 Associations between variables

5.8.1 BMI and gender

In the current study no significant difference was found between the median BMI of males and females. Different results were reported by Wiig and Smith (2007) in a study carried out in Accra, Ghana. They reported that the median BMI of female participants was higher and these participants were able to maintain their BMI as the disease progressed when compared to male participants. In addition, Tedaldi *et al.* (2006) also reported that 43% of patients had a BMI of more than 25 (overweight-obese) and this was related to being female. Furthermore Dannhauser *et al.* (1999), reported that male participants were leaner (BMI= 18.9) than females (BMI= 22.7) in a study carried out in Mangaung amongst HIV-infected patients.

5.8.2 Alcohol consumption and energy intake

In the present study patients with dangerous alcohol consumption had higher energy intake than patients with low to moderate alcohol consumption. Similar results were also reported by Kim *et al.* (2007), who found that energy intake showed a significant increasing trend across alcohol consumption categories in both genders and binge drinking categories in men. In addition, women who were binge drinkers also showed a higher energy intake compared to nonbinge drinkers in a study conducted in United States of America (USA). Schoder *et al.* (2007), also reported that consumption of alcohol was directly associated with total energy intake in males and females.

5.7.3 BMI and alcohol consumption

In this study the BMI of low to moderate alcohol consumers and dangerous to hazardous alcohol consumers differed significantly, with patients who used the most alcohol having the highest BMI. Similar results were also reported by Tolstrup *et al.* (2005), who reported that among males, the total alcohol intake was positively associated with BMI in the obese category. For females the total alcohol intake was associated with high BMI. In a study carried out in London amongst middle aged men, it was reported that the prevalence of overweight and obesity increased significantly from light to moderate to heavy alcohol intake groups even after adjustments were made for potential confounders. Similar results were seen for all types and combinations of alcohol by Wannamethee and Shaper (2003). In contrast Bobak *et al.* (2003) found that beer intake was not related to BMI in the United Kingdom (UK) males. With women there was a weak inverse association with BMI. Lukasiewicz *et al.* (2005) reported no relationship between beer intake and BMI.

5.7.4 BMI and percentage fat

In the current study it was found that patients with a low BMI also had low percentage fat. As BMI increased so did the percentage fat. In a study conducted by Kagawa *et al.* (2006) in Australia, it was reported that there was a significant ethnic difference in BMI and percentage fat

and that Japanese men are likely to have a greater percentage body fat than Australian men at any given BMI value.

Furthermore, Rush *et al.* (2007), concluded that the relationship between percentage body fat and BMI varies with ethnicity and this may be due, in part, to differences in central fatness and muscularity in a study carried out in London. He *et al.* (2001), also concluded that the Hong Kong Chinese population had a higher percentage fat for a given BMI which would partly explain why the health risks associated with obesity occur at lower BMI, in a study carried out in China. In a study conducted in the USA by Flegal *et al.* (2009) it was reported that percentage fat was more correlated with BMI than waist circumference in women.

5.8 Limitations

Limitations encountered during this study:

5.8.1 Dietary intake

According to Hammond (2008, p.397), participants tend to be unable to remember correctly the kinds and amounts of food eaten. In this study some patients were too sick and it was difficult for them to remember. Some participants tend to hold back or change information about what they actually ate and underreport alcohol intake. Furthermore, the reported information may also include missing foods (foods eaten and not reported) (Lee and Nieman, 2003, pp. 78-79). In order to ensure that a complete record of dietary intake was obtained in this study, participants were informed that all information was confidential and encouraged to answer truthfully. The researcher prompted participants to give information about additions to foods (such as fat and sugar added during preparation) as well as foods and drinks eaten between meals.

5.8.2 Portion sizes and nutrient values

Obtaining accurate information related to dietary intake depends heavily on correct portion sizes and this is often a limitation (Hammond, 2008, p. 399). In this study food samples and models

were used to obtain the correct information about portion sizes because some patients were unable to give portion sizes.

Both instruments used in this study (24-hour recall of usual food intake and FFQ) were not developed with the aim of determining intake of specific nutrients, but rather of food intake and frequency of consumption. For this reason the information is general and not specific for especially micronutrients.

Chapter 6: Conclusions and Recommendations

6.1 Introduction

In this chapter, the conclusions that could be drawn from the study, as well as recommendations are discussed.

6.2 Conclusions

6.2.1 Dietary intake

The following conclusions related to dietary intake could be drawn from the study:

- More than 90% of patients consumed less than the recommended intakes of milk and milk products daily.
- More than 80% of patients consumed less than the daily recommendations of vegetables.
- More than 90% of patients ate less than the daily recommendation of fruits.
- Almost 55% of patients ate the recommended number of servings of bread and cereals per day and 45% less than the recommended intake.
- Thirty six point five of patients consumed less than the recommended (<4 servings per day)fat intake per day.
- Food items like samp, bread, cooked porridge, eggs, were consumed by a large percentage of patients on a daily basis.
- Full cream milk was the only milk used.
- Food items like coffee, coffee creamer, peanut butter, fruit juice, cereals and fish were rarely consumed by the majority of patients.
- The median carbohydrate, protein and fat intake was lower than the daily recommendations.
- Patients with high alcohol intake had a significantly higher median energy intake than low alcohol consumers.
- There was a tendency for patients with low room density to have high energy intake.

6.2.2 Nutrition related physical examination and HIV status

- The majority of patients had very few signs of malnutrition related to hair.
- More than 80% of patients had clinical signs of malnutrition related to eyes (foamy and white spots, brown and black spots on whites of eyes, 60% reported night blindness and almost 70% had red eyes).
- About 70% of patients had angular stomatitis, more than 50% had bleeding gums, 51% had smooth tongue and 70% had sores on their tongue.
- Fifty percent of patients had pale and brittle nails.
- The median time patients had known about their HIV status was 7 months.
- The patient's median CD4 cell count was generally low at 291cells/mm^3.

6.2.3 Anthropometry

- Most patients had a normal BMI.
- Seventeen percent and 9% of patients were overweight (BMI >24.9-29.9kg/m^2) and obese (BMI $\geq$ 30kg/m^2) respectively.
- Patients with low BMI also had lower percentages of body fat.
- Women had a significantly higher percentage of fat than men.
- Forty six percent of female patients had a waist-to-hip ratio above 0.8 indicating a risk for chronic diseases.
- Median BMI of low to moderate alcohol consumers and of dangerous to harmful alcohol consumers differed significantly with dangerous to harmful alcohol consumers having a higher BMI.

6.2.4 Smoking and alcohol consumption

- Eighteen percent of patients smoked cigarettes and 19 % snuffed.
- The median number of cigarettes smoked per day was 4 and the median number of times patients used snuff was 3.
- Seventy eight percent of patients consumed alcohol on a monthly basis.
- Beer was the most frequently consumed type of alcohol.
- The median number of drinks patients consumed was three per day.
- More than 40% of patients were dangerous/ harmful alcohol consumers.

6.3 Recommendations

Nutrition interventions should consist of integrated approaches that need to include the public and health practitioners to ensure the best outcomes for HIV infected individuals. These interventions should aim to be culturally sensitive and take into account local available resources (ASSAf, 2007). Optimal nutritional status can help to slow infection progression, decrease hospital stay, improve response to drug treatment and promote physical independence.

Recommendations related to dietary intake, lifestyle and anthropometry will be discussed in the next section.

6.3.1 Dietary intake

Nutrients are needed in all stages of life and the needs are influenced by factors such as gender, state of health, lifestyle and eating behaviors. In HIV the needs vary according to the development of the disease. Optimal nutrition can add to a sense of wellbeing for PLWHA in all stages of the disease and may even prolong life (Dodd, 2008, p. 270; Department of Health, 2001).

The sooner PLWHA start making the right dietary choices the more successful they will be in staying healthy and this can be achieved through an adequate diversified diet which includes locally available, affordable and traditional foods (ASSAf, 2007, p.20; Department of Health, 2001). PLWHA are advised to make healthy food choices from what is available and affordable and to eat a variety of foods because no single food contains all nutrients (ASSAf, 2007, p. 20).

Patients with HIV normally encounter problems with food intake so eating small frequent meals can help them consume adequate nutrients (USAID, 2001). Solids and liquids should be taken at intervals (Pratt, 2003, p. 322), to allow ease of digestion. Avoiding very fatty or spiced food and increasing the intake of bland, cold foods can also aid in improved digestion (Romeyn, 1998, p. 73).

As far as food intake is concerned, patients should also make starchy foods the basis of each meal as these are cheap, supply a lot of energy and are readily available. They should also eat lots of fruits and vegetables every day. Fruits and vegetables supply vitamins and other essential substances that keep the immune system strong (Wildman and Miller, 2004, p.5; Department of Health, 2001). Meat and dairy foods may be eaten daily because these animal products can provide the patients body with proteins to build strong muscles and to keep the immune system strong. They should also eat dried beans, peas, lentils, peanuts or soya, which are good sources of proteins regularly. Sugars, fats and oils should be included in the diet as they are also part of a healthy balanced eating pattern and provide energy for PLWHA. Salt should be limited as salt plays a role in the development of high blood pressure. Patients must drink lots of clean fresh water, roughly eight cups per day for body hydration and also be active in order to keep muscles active and strong and to remain healthy (ASSAf, 2007, p.20; Department of Health, 2001).

The improvement of the quality of the diets of PLWHA is not only the responsibility of the patient, but also of the health care system and health care professionals that treat these patients. Nutrition interventions (such as information on sound budgeting and improving knowledge of nutrition) should all be included in programmes aiming at improving the dietary quality of PLWHA. Nutrition education programmes should be implemented at community level and should concentrate on preserving locally available and affordable foods (ASSAf, 2007, p. 20).

Agricultural activities that encourage production of different types of crops can improve access to food (USAIDS, 2001; FAO, 2001).

6.3.2 Anthropometry

Anthropometric assessments in HIV infected patients should include measurements such as BMI, waist circumference measurements and waist-to-hip ratio and these should be carried out at all institutions that treat HIV-infected patients.

6.3.3 Lifestyle

Smoking in HIV weakens and destroys the immune system causing a number of health complications and quicker progression to the development of AIDS (Lucero and Watson, 2001). PLWHA are strongly advised to quit because the risk of coronary heart disease decreases one year after quitting and ten to fifteen years after quitting, the risk of shorter life expectancy and different cancers is close to that of an individual who never smoked (Handelsman, 1995).

Alcohol is another critical factor and HIV infected patients are strongly advised not drink any alcoholic drinks due to the negative effects of alcohol consumption such as development of alcoholic fatty liver, alcoholic hepatitis, cirrhosis and liver cancer and others (Insel *et al.* 2006; Department of Health, 2001).

6.3.4 Recommendations for further studies

According to the Academy of Science in South Africa (ASSAf, 2007) "Well-designed and informative clinical and epidemiological studies are urgently needed to generate and test hypotheses in relation to nutritional support for HIV-infected subjects".

Further studies investigating the food intake, lifestyle and ways in which these can be improved in HIV-infected patients are recommended. Comparisons of the conditions in urban and rural areas are also necessary.

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LESOTHO

Ministry of Health and Social Welfare
P.O. Box 514,
Maseru 100
Lesotho

08th November 2007

Ms. Neheng Relebetse Moeketsi
The Principal Investigator
P. O. Box 1645
Maseru 100
Lesotho

Dear. Ms. N. Moeketsi

Re: NUTRITIONAL STATUS OF HIV-INFECTED ADULTS IN MASERU

Reference is made to your letter requesting ethical approval of the above mentioned research study.

The Ministry of Health and Social Welfare Research and Ethics Committee having reviewed your protocol hereby authorizes you to conduct this study among the specified population. The study is authorized with an understanding that the protocol will be followed as stated. Departure from the stipulated protocol will constitute a breach of the permission.

Regards

(Signature)

Dr. M. Moteetee
Director General Health Services

UNIVERSITEIT VAN DIE VRYSTAAT
UNIVERSITY OF THE FREE STATE
YUNIVESITHI YA FREISTATA

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Ms H Strauss

2007-10-25

MS NR MOEKETSI
PO BOX 1645
MASERU 100
LESOTHO

Dear Ms Moeketsi

ETOVS NR 157/07
RESEARCHER: **MS NR MOEKETSI**
PROJECT TITLE: **NUTRITIONAL STATUS OF HIV-INFECTED ADULTS IN MASERU, LESOTHO.**

- You are hereby informed that the study was approved by the Ethics Committee at the meeting held on 23 October 2007.
- Committee guidance documents: Declaration of Helsinki, ICH, GCP and MRC Guidelines on Bio Medical Research. Clinical Trial Guidelines 2000 Department of Health RSA; Ethics in Health Research: Principles Structure and Processes Department of Health RSA 2004; the Constitution of the Ethics Committee of the Faculty of Health Sciences and the Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines.
- Any amendment, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.
- The Committee must be informed of any serious adverse event and/or termination of the study.
- A progress report should be submitted within one year of approval of long-term studies and a final report at completion of both short term and long term studies.
- Please refer to the ETOVS reference number in correspondence to the Ethics Committee secretariat.

Yours faithfully

.....

for **PROF BB HOEK**
CHAIR: ETHICS COMMITTEE

Cc Dr C Walsh, Dept of Human Nutrition, UFS

Appendix A

Nutritional status of HIV infected adults in Lesotho (Maseru)

Village: _____ ☐ 1

Dietary intake questionnaire
24-hour recall

Patient number: ☐☐☐ 2-4

Food and fluid intake (expressed in exchanges):

Food/Drinks and amounts	Milk and milk products	Meat and meat alternatives	Legumes	Fruit ß-carotene	Vegetables ß-carotene	Fruit Vit C	Vegetables Vit C	Fruit other	Vegetables other	Bread and cereals	Fats and oils	Sweets/Sugar	Alcohol
Breakfast and mid-morning													
Lunch and mid afternoon													
Supper and late night													
Total:													

Evaluation of dietary intake

	Quantity	Energy	Protein	CHO	Fat	Below requirement 1	Within requirement 2	Above requirement 3	
Milk and milk products		530	8	12	5				5
Meat and meat alternatives		315	7		5				6
Legumes		500	7	21	1				7
Soy beans		630	13	8	7				8
Fruit β-carotene		250		15					9
Vegetables β-carotene									10
Fruit vit C		250		15					11
Vegetables vit C									12
Fruit other		250		15					13
Vegetables B		150	2	7					14
Bread and cereal		285	3	15					15
Fats and oils		190			5				16
Sweets/Sugar		170		10					17
Alcohol									18
TOTAL									

Calculated estimated total values for:

Carbohydrate (g): 19-21

Protein (g): 22-24

Fat (g): 25-27

Energy (kJ): 28-32

Food frequency questionnaire

Number of times per day, per week or per month (only use one option)

Food	/day	/week	/month	
Sweets/ chocolates				33-38
Chips (crisp)				39-44
Cake/ biscuits				45-50
Cool drinks				51-56
Cremora				57-62
Coffee				63-68
Tea				69-74
Sugar				1-6
Full-cream milk				7-12
Low fat/ skim milk				13-18
Eggs				19-24
Peanut butter				25-30
Soya mince/ legumes (baked beans, dried beans/peas, lentils)				31-36
Chicken				37-42
Red meat				43-48
Fish				49-54
Bread				55-60
Porridge, cooked				61-66
Cereal (eg. Morevite/ Pronutro)				67-72
Samp/ mielie rice				73-78
Margarine/ oil/ fat				1-6
Fruit juice				7-12
Fruit				13-18
Vegetables				19-24
Salt/ stock/ Royco				25-30
Alcohol _____				31-36

Appendix B

Nutritional status assessment of HIV positive adults in Maseru

Physical Examination

Patient no: ☐☐☐ 1-3

Village: ☐ 4

Interview Date (ddmmyy) ☐☐☐☐☐☐ 5-10

Physical signs:

1. Hair

Lack of shine and luster ☐ 11
1 yes
2 no

Thin and sparse ☐ 12
1 yes
2 no

Loose ☐ 13
1 yes
2 no

Flag sign ☐ 14
1 yes
2 no

Falls out ☐ 15
1 yes
2 no

2. Spots on eyes

Dry and greyish spots ☐ 16
1 yes
2 no

Yellow or white foamy spots ☐ 17
1 yes
2 no

Spots on whites of eyes
1 yes
2 no

18

Nightblindness
1 yes
2 no

19

Eyes
Redness
1 yes
2 no

20

Corneal xerosis
1 yes
2 no

21

Cracked reddened corners of eyes
1 yes
2 no

22

3. Nose

Greasy with grey or yellowish material around nares
1 yes
2 no

23

Scaly
1 yes
2 no

24

4. Mouth

Lips
Angular stomatitis
1 yes
2 no

25

Cheilosis
1 yes
2 no

26

5. Teeth

Missing

1 yes
2 no

27

Caries and poor repair

1 yes
2 no

28

Loose

1 yes
2 no

29

6. Gums

Spongy

1 yes
2 no

30

Bleeding

1 yes
2 no

31

7. Tongue

Decreased taste

1 yes
2 no

32

Purplish

1 yes
2 no

33

Smooth

1 yes
2 no

34

Sore

1 yes
2 no

35

8. Skin

Dry and scaling

1 yes
2 no

☐ 36

Yellowish pigmentation

1 yes
2 no

☐ 37

9. Nails (finger nails)

Spoon shaped

1 yes
2 no

☐ 38

Ridged

1 yes
2 no

☐ 39

Pale and brittle

1 yes
2 no

☐ 40

10. HIV status

Date of diagnosis (ddmmyy) ☐☐☐☐☐☐ 41-46

11.CD4 count ☐☐☐☐ 47-50

Appendix C

Nuritional status assessment of HIV infected adults in Maseru

Patient no: [ ][ ][ ] 1-3

Village: [ ] 4

Anthropomentry

Weight (kg) _____ [ ][ ][ ].[ ] 5-9

Height (cm) _____ [ ][ ][ ].[ ] 10-14

Circumferences (cm)

1. Upper arm _____ [ ][ ][ ].[ ] 15-19
2. Waist _____ [ ][ ][ ].[ ] 20-24
3. Hips _____ [ ][ ][ ].[ ] 25-29
4. Wrist _____ [ ][ ][ ].[ ] 30-34

Skinfold thicknesses (mm)

1. Biceps _____ [ ][ ].[ ] 35-38
2. Triceps _____ [ ][ ].[ ] 39-42
3. Subscapular _____ [ ][ ].[ ] 43-46
4. Suprailliac _____ [ ][ ].[ ] 47-50

Appendix D

Nuritional status assessment of HIV infected adults in Maseru

Patient no: ☐☐☐ 1-3

Village: ☐ 4

Socio-demographic and education

1.Birth date (ddmmyy) ☐☐☐☐☐☐ 5-10

2.Sex ☐ 11

1 Male
2 Female

3.How many years have you been staying in Maseru ☐☐ 12-13

4.Language ☐ 14

1 Sesotho
2 English
3 Other (specify) _____

5.Household composition

How many people in total are staying in the house ☐☐ 15-16

Children (number) ☐☐ 17-18

Adults (number) ☐☐ 19-20

6.Marital status ☐ 21

1 Single
2 Married
3 Divorced
4 separated
5 widowed
6 living together

7.Highest level of education ☐☐ 22-23

8. Main employment level ☐ 24

1 Housewife by choice
2 Unemployed
3 Self employed
4 Piece job or part time
5 Other (Specify) _____

9.Type of household

1 Mud ☐ 25
2 Brick ☐ 26
3 Tin ☐ 27

10.Number of rooms ☐☐ 28-29

11.Amount of money spent on food per week ☐☐☐ 30-32

12.Type of fuel used for cooking in the household

1 Electricity ☐ 33
2 Parrafin ☐ 34
3 Wood and coal ☐ 35
4 Open fire ☐ 36
5 Gas ☐ 37

Appendix E

Nuritional status assessment of HIV infected adults in Maseru

Villege ☐ 1

Patient no. ☐☐☐ 2-4

Life Style

1.Have you ever smoked? ☐ 5
1 yes
2 no

2. If yes, at what age did you start smoking? ___☐☐ 6-7

3.Are you currently smoking? ☐ 8
1 yes
2 no

4.If yes, approximate number of cigarettes smoked per day? ___☐☐ 9-10

5.Do you use snuff? ☐ 11
1 yes
2 no

6.If yes, number of times per day do you snuff? ___☐☐ 12-13

7.Have you ever used alcohol? ☐ 14
1 yes
2 no

8.If yes, how often do you use alcohol? ☐ 15
1 daily
2 weekly
3 monthly

9.What kind of alcohol do you use more often? ☐ 16
1 wine
2 beer
3 home made beer
4 other(specify) _____ **88**

10.Approximate number of drinks perday? _____ [ ][ ] 17-18

11.If you are smoking or drinking would you like to quit? [ ] 19

[1] yes
[2] no
[3] not sure

Appendix F

Ministry of Health
Maseru
Lesotho

Re: Request to undertake research study concerning Nutritional status of HIV infected adults in Maseru, Lesotho.

I Relebetse Neheng Moeketsi contact number 0725443268/+26663107027 would like to undertake a study on HIV-infected adults in Lesotho (Maseru) in fulfillment of my Masters Degree in Nutrition at the University of the Free State. I hereby ask for permission to allow me access to the Bophelong Clinic in Maseru.

The study is related to the assessment of nutritional status of HIV-infected patients and the study will take seven weeks.

Assessment will involve:

-A structured interview will be completed with each participant to determine habitual diet, socio-demographic status and factors related to lifestyle (smoking and alcohol consumption).

-Body weight, height, waist and hip circumference and skinfolds will be measured.

-A physical examination will be performed to identify clinical signs of malnutrition and

-CD4 count as noted in patient files.

All the data collected will be strictly confidential and will be used only for the purposes of the research project.

Participants take part in the study voluntarily and are allowed to withdraw at any time from the study should they so wish.

The results of this study may be published in peer reviewed scientific journals.

Signed at_____.

On: date_____month_____2007.

Appendix G

Superintendent, Bophelong Clinic
Queen Elizabeth Hospital
Maseru
Lesotho

Re: Request to undertake research study concerning Nutritional status of HIV infected adults in Maseru, Lesotho.

I Relebetse Neheng Moeketsi contact number 0725443268/+26663107027 would like to undertake a study on HIV-infected adults in Lesotho (Maseru) in fulfillment of my Masters Degree in Nutrition at the University of the Free State. I hereby ask permission to allow me access to the Bophelong Clinic.

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Assessment will involve:

-A structured interview will be completed with each participant to determine habitual diet, socio-demographic status and factors related to lifestyle (smoking and alcohol consumption)

-Body weight, height, waist and hip circumference and skinfolds will be measured

-A physical examination will be performed to identify clinical signs of malnutrition.

-CD4 count as noted in patient files

All the data collected will be strictly confidential and will be used only for the purposes of the research project.

Participants take part in the study voluntarily and are allowed to withdraw at any time from the study should they so wish.

The results of this study may be published in peer reviewed scientific journals.

Signed at_____.

On: date_____month_____2007.

Appendix H

Head of Senkatana Center

Maseru

Lesotho

Re: Request to undertake research study concerning Nutritional status of HIV infected adults in Maseru, Lesotho.

I Relebetse Neheng Moeketsi contact number 0725443268/+26663107027 would like to undertake a study on HIV-infected adults in Lesotho (Maseru) in fulfillment of my Masters Degree in Nutrition at the University of the Free State. I hereby ask permission to allow me access to the Senkatana Center.

The study is related to the assessment of nutritional status of HIV-infected patients and the study will take seven weeks.

Assessment will involve:

-A structured interview will be completed with each participant to determine habitual diet, socio-demographic status and factors related to lifestyle (smoking and alcohol consumption)

-Body weight, height, waist and hip circumference and skinfolds will be measured

-A physical examination will be performed to identify clinical signs of malnutrition.

-CD4 count as noted in patient files

All the data collected will be strictly confidential and will be used only for the purposes of the research project.

Participants take part in the study voluntarily and are allowed to withdraw at any time from the study should they so wish.

The results of this study may be published in peer reviewed scientific journals.

Signed at_____.

On: date_____month_____2007.

Appendix I

Consent Form

You have been asked to participate in the research study concerning the Nutritional status of HIV infected adults in Maseru, Lesotho.

by .....

You may contact Miss N.R Moeketsi at 0026622312307/63107027 any time if you have questions or need clarifications regarding your participation.

You may contact the Secretariat of the Ethics Committee of the Faculty of Health Sciences, UFS at telephone number (051) 4052812 or the Ministry of Health if you have questions about your rights as a research subject.

Your participation in this research is voluntary, and you will not be penalized if you refuse to participate or decide to terminate participation.

If you agree to participate, you will be given a signed copy of this document as well as the participant information sheet, which is a written summary of the research. You are also giving permission that some information will be taken from your medical record in regard to your CD4 count.

The results from this study may be published in peer reviewed scientific journals.

The research study, including the attached information, has been verbally described to me. I understand what my involvement in the study means and I voluntarily agree to participate.

_____ _____

Signature of Participant Date

I have explained this study to the above participant and ensured that he or she understands before he or she signs.

_____. _____.

Investigators signature Date

Lengolo la tumellano

O kupuoa ho nka karolo lipatlisisong tse mabapi le hlahlobo ea boemo ba Phepo e Nepahetseng ho batho ba baholo ba nang le tsoaetso ea HIV seterekeng sa Maseru.

Ke .....

O ka ikopanya le N.R Moeketsi linomorong tsena 00266 22312307/ 63107027 nako engoe le engoe ha o nale lipotso mabapi le ho nkeng karolo.

Hape o ka ikopanya le mongoli oa Ethics Committee lefapheng la lithuto tsa bophelo Univesithing ea Freistata linomorong tsena (051) 4052812 kapa lakala la Muso la Bophelo ha o nale lipotso mabapi le litokelo tsa hao lipatlisisong tsena.

Ho nka karolo lipatlisisong tsena ke ka boithaopo hape o keke oa ba ka mosing ha o ka oa hana ho nka karolo kappa oa ikhula ho nkeng karolo.

Ha o lumela ho nka karolo, o tla fuoa tokomane ena e tekennoeng le lengolo la thlahiso leseling eleng kakaretso ea lipatlisiso tsena.

O fana ka tumello hore litaba tsa hao tse mabapi le lipalopalo tsa CD4 li nkuoe.

Liphetho tsa lipatlisiso tsena litla fuoa tliliniki le lefapha la bophelo.

Lipatlisiso tsena le litaba tsena ke li hlaloselitsoe. Ke utloisisa hore na ho nka karolo lipatlisisong tsena ho bolelang mm eke ithaopa ho nka karolo.

_____ _____.

Motekeno oa ea nkang karolo Letsatsi

Ke hlaloselitse ea nkang karolo lipatlisisong tsena, mme ka ikholisa hore o utloisisa tsohle pele a tekena.

_____.

Motekeno oa mohlahlobi Letsatsi

Appendix J

Nutritional Status of HIV-infected adults in Maseru, Lesotho

INFORMATION DOCUMENT

Study title: Nutritional Status of HIV infected adults in Maseru, Lesotho

RESEARCHER: N.R MOEKETSI

Registered for Masters in Human Nutrition at The University of the Free State.

The aim of this study is to obtain information regarding the nutritional status of HIV infected adults in our district (Maseru), in order to plan relevant interventions.

For this study I need 100 HIV infected patients. The study will take place from November-December 2007.

You will be asked to visit the Bophelong clinic for a day to take the measurement and to complete a questionnaire in an interview and you will be compensated for transport costs.

The assessment will include the following:

An interview with each patient, during which three questionnaires will be completed in regard to the patient's socio-demographic status, habitual diet and life-style (smoking and alcohol consumption).

Height, body weight, skinfolds, waist and hip circumference will be measured.

A physical examination for signs of malnutrition will also be carried out by the researcher on each patient.

Information obtained will be kept strictly confidential and will not be used for any purposes except for the research project.

There will be no risks but only benefits as the patients will be assessed to determine their nutritional status.

Participation in this study is voluntary and patients are allowed to withdraw at any time from the study.

Kind regards,

Neheng Relebetse Moeketsi

Contact numbers: (0027) 0725443268 or (00266) 22312307.

Hlahlobo ea Boemo ba Phepo e Nepahetseng ho batho ba baholo ba nang le tsoaetso ea HIV seterekeng sa Maseru.

LENGOLO LA TLHAHISO LESELING

Sehloho sa lipatlisiso- Nutritional Status Assessment of HIV Positive Adults in the Maseru District

Mohlahlobi - N.R MOEKETSI

Moithuti Yunivesithing ea Foreisetata lefapheng la tsa Maphelo.

Ke mosali oa Mosotho ea o kopang ka boikokobetso hore o nke karolo lipatlisisong tsena.

Sepheo sa lipatlisiso tsena ke ho fumana boemo ba phepo ho bakuli ba nang le tsoaetso ea HIV. Hore na boemo ba bona ba phepo bo botle kapa che. Haeba bose botle na ho ka etsoa eng hore bo be bottle.

Bakeng sa lipatlisiso tsena ho hlokahala bakuli ba lekholo. Lipatlisiso litla qala ka Pudungoane ho isa ho Tshitoe 2007.

O tla kupuoa ho tla tliliniking ea Bophelong ka letsatsi le baliloeng, ho tla methoa le ho tlatsa liforomo tse nang le lipotsonyana mabapi le bophelo ba hao ka tataiso ea mohlahlobi.

Bakuli batla khahlanyetsoa ka chelete ea ho palama ho tla tliliniking.

Lipatlisiso litla tsamaea tjena:

-bakuli ba khethiloeng batla kopuoa ho tlatsa liforomo tse tharo mabapi le maemo a bona a lapeng, lijo tseo ba tloaetseng ho lija, boemo ba bona ba HIV le litloaelo tsa bona tsa bophelo (ho tsuba le ho noa joala),

-bolelele, boima, botenya ba mameno a letlalo, le bophara ba letheka le lithopola li tla methoa,

-hlahlobo e akaretsang e tla etsoa ho bona boemo ba hao ba phepo.

Mekhoa eohle e teng e tla etsoa ho boloka linthla tsohle tse fumanoeng lipatlisisong tsena ele lekunutu 'me linthla tse fumanoeng litla sebelisetsoa lipatlisisiso tsena feela.

Hahona kotsi ho nkeng karolo lipatlisisong tsena, empa e le litholoana tse monate feela kaha bakuli batla tseba boemo ba bona ba phepo.

Ho nka karolo lipatlisisong tsena ke ka boithaopo 'me mokuli o lumeletsoe ho ikhula ka nako efe kapa efe ha a batla.

Liphetho litla fuoa tliliniki ea Bophelong le lekala la 'Muso la Bophelo.

Ka hlompho le boikokobetso,

Neheng Relebetse Moeketsi

Mohala: (0027) 0725443268 kapa (00266) 22312307.