

**Nutritional status, dietary practices and clinical factors of people
living with HIV/AIDS attending Riruta Health Centre, Nairobi,
Kenya**

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

To my late mother, mama Sarah Mochache for the foundation you laid for me, and my father for giving me a vision.

To my husband, John Mwaniki and my children Mike, Mark, Maureen and Michelle for the sacrifices you made during the course of this work.

You all made this work possible, am forever indebted to you. I will always love you.

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ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ART	Anti-Retroviral Therapy
ARV	Anti-Retroviral
BMI	Body Mass Index
CCC	Comprehensive Care Clinic
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
COR	Crude Odds Ratio
FELTP	Field Epidemiology and Laboratory Training Programme
GIT	Gastrointestinal Tract
HB	Hemoglobin
H/C	Health Centre
HIV	Human Immunodeficiency Virus
ITROMID	Institute of Tropical Medicine and Infectious Diseases
IDU	Injection Drug Users
JKUAT	Jomo Kenyatta University of Agriculture and Technology

KEMRI	Kenya Medical Research Institute
LVCT	Liverpool VCT, Care and Treatment
MOPHS	Ministry of Public Health and Sanitation
MUAC	Mid-Upper Arm Circumference
NASCOP	National AIDS and STI Control Programme
PEM	Protein Energy Malnutrition
RDA	Recommended Dietary Allowance
SSA	Sub-Saharan Africa
UN	United Nations
VAD	Vitamin A Deficiency
VCT	Voluntary Counseling and Testing

ABSTRACT

Nutritional status is a significant predictor of survival rate in adult People Living with HIV/AIDS (PLWHA). While public opinion assumes that PLWHA are prone to malnutrition, there is very little documented data about their nutritional status, dietary practices and clinical factors specifically in urban poor settings in Kenya. This study considered the nutritional status, dietary practices and clinical factors of adult PLWHA in an urban poor setting. The main objective was to determine the nutritional status, dietary practices and clinical factors of adult PLWHA attending Riruta Health Centre (H/C), Nairobi, Kenya. It was a cross sectional study conducted at Riruta Health Centre, Nairobi, Kenya. Systematic sampling of adult PLWHA attending the clinic was used to select study participants. A semi-structured questionnaire was pretested and used to collect data. A written informed consent was sought and obtained prior to the interview. The study protocol was reviewed and approved by the Kenyatta National Hospital/ University of Nairobi (KNH/UON) Ethics Review Committee. Nutritional status was determined by Mid Upper Arm Circumference (MUAC) and Body Mass Index (BMI). The results showed that the mean age for the study participants was 36 ± 9 years. Seventy percent of them were females among whom 60% were married. Fifty seven percent of PLWHA attending Riruta Health Centre were unemployed. Majority (88.8%) of the study participants were from Nairobi West District. Their diets were most frequently staples that were predominantly carbohydrate rich foods. The diets were also limited in variety. The study participants consumed very little animal protein source foods and fruits. Overall, 25.8% of the study participants were undernourished. The proportion of males who were undernourished (42.3%) was about two times that of the females

(18.7%). The clinical factors that were independently associated with being underweight were poor appetite ($p = 0.0002$, Crude Odds Ratio = 4.0885) and occurrence of opportunistic infections ($p = 0.0027$, Crude Odds Ratio = 2.9308). In conclusion, PLWHA attending Riruta Health Centre were mainly of low level education with high level of unemployment. They also had poor dietary practices. The prevalence of undernourishment among PLWHA was found to be 25.8 %. Nutrition interventions for PLWHA should focus on regular nutrition and health education, blending of locally available foods in the market to enrich their nutrient value and food fortification with selected micronutrients so as to improve the nutritional status of PLWHA.

CHAPTER ONE

INTRODUCTION

1.1 Background

Nutritional status is the state of the body in relation to the consumption and utilization of nutrients. It is also the extent to which nutrients are available to meet the metabolic needs. It results from the intake and use of nutrients (Mosby's Medical Dictionary, 2009). In adults nutritional status is assessed by measuring anthropometric, biochemical, clinical and dietary parameters (Shevtz and Knox, 2001).

Nutritional status of an individual is affected by several factors, one of them being the immune/disease status such as in Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) (Pickering et al, 2006). Kenya is one of the many countries affected by the HIV pandemic and malnutrition with an HIV prevalence of 7.1% (NASCOP Kenya, 2009). The period of time it takes for HIV infection to become full-blown AIDS depends on the general health and nutritional status of a person before and during the infection period (MOH GOK, 2007).

Malnutrition occurs frequently during HIV infection and increases with disease progress. It strongly predicts patient survival independent of CD4+ lymphocyte counts (Suttman et al, 1995). Weight loss is a prominent feature of HIV-associated disease (Kotler et al, 1989). In fact, AIDS was once commonly known in Uganda as 'slim' disease (Serwadda et al, 1985).

Various mechanisms for this deterioration in nutritional status have been identified, and they include insufficient food/nutrient intake, impaired nutrient digestion and absorption as well as increased requirements for nutrients with increased losses and catabolism. Insufficient food intake is the main cause of disease-related malnutrition (Meier and Stratton, 2008). Generally, PLWHA are at a higher risk of malnutrition (Kuria, 2009). Nutritional status assessment in PLWHA can identify those groups at risk for adverse outcomes, including death, from nutritional deficiencies (Knox et al, 2003).

1.2 Statement of the problem

Despite the impact of HIV/AIDS on nutritional status being documented in other parts of the world, few studies have been documented specifically in urban poor settings in Kenya. A study in Iran found that 77% of newly diagnosed HIV infected patients who were not in advanced phase of the disease had some degree of malnutrition (Khalili et al., 2008). A similar study in Kenya found that 23.6% of the study participants were underweight (Kuria, 2009). Current knowledge of nutritional status, dietary practices and clinical factors of PLWHA will provide data that will guide policy decisions that result in targeted nutritional interventions for PLWHA.

In Africa, where more than 25 million people are living with HIV/AIDS; poverty, food insecurity and malnutrition are endemic (Heymann, 2004; UNAIDS, 2004). Underweight, an indicator of chronic and acute malnutrition, was the leading cause of mortality worldwide; responsible for 3.7 million deaths in 2000. Nearly half of these deaths (48.6%) occurred in Sub-Saharan Africa (SSA) (WHO, 2002). In Kenya, there are about 1.42 million PLWHA (NASCOP Kenya, 2009).

Malnutrition continues to be a major public health problem throughout the developing world, particularly in southern Asia and Sub Saharan Africa where diets are frequently deficient in both macronutrients (leading to protein energy malnutrition) and micronutrients (leading to micronutrient deficiencies) (Muller & Krawinkel, 2005; FAO, 2004). In developing countries, a high prevalence of poor diets and infectious diseases regularly unite into a vicious cycle. It was estimated that by 2005 the prevalence of malnutrition for all developing countries would be about 29% (Antonino et al, 2001; WHO, 2005). With the advent of HIV pandemic, there is need to know the current nutritional status, dietary practices and clinical factors of adult PLWHA. This is because it has been established that there is a vicious cycle between malnutrition and HIV/AIDS (Edwards, 2006)

1.3 Justification of the study

While public opinion assumes that PLWHA are prone to malnutrition, there is very little documented data about their nutritional status, dietary practices and clinical factors. Hence there is need to elicit current information objectively through this study. The study will determine the nutritional status, dietary practices and clinical factors of adult PLWHA in an urban poor setting in Kenya.

HIV causes high morbidity and mortality in the world especially Sub-Saharan Africa. The functional status and survival of HIV infected patients are affected by their nutritional status (MOH GOK, 2007). Good nutrition may help prolong the period of time between HIV infection and the onset of opportunistic infections (MOH Kenya, 2008). Although adequate and appropriate nutrition cannot cure HIV infection, it is essential to maintain a person's immune system, sustain healthy levels of physical activity, and for optimal quality of life. It is also necessary to ensure optimal benefits from the use of antiretroviral treatment (WHO, 2005).

The progress made in the field of treatment in the form of antiretroviral therapy (ART) for HIV /AIDS has prolonged as well as improved the quality of life of HIV-infected individuals. However, access to such treatment remains a major concern in most parts of the world, especially in the developing countries. Nutritional interventions have the potential to be a low-cost method to complement the role of ART in prevention of HIV infection and slowing the clinical disease progression (Mehta and Fawzi, 2007).

1.4 Significance of the study

This study aims at generating current knowledge on the nutritional status, dietary practices and clinical factors for adult PLWHA attending Riruta Health Centre. Given that nutritional care and support should be an integral component of the HIV/AIDS comprehensive care package (MOH GOK, 2007), the findings will help inform policy on how best to incorporate nutrition and food based interventions into HIV prevention, care and treatment programs in this area.

The findings will be used to make recommendations that will be the foundation for focusing of nutritional interventions such as training PLWHA on good nutrition practices using the locally available foods and food fortification programs so as to maintain good nutritional status.

1.5 Objectives

1.5.1 General objective

To determine the nutritional status, dietary practices and clinical factors of PLWHA attending Riruta Health Centre, Kenya.

1.5.2 Specific objectives

1.5.2.1 To determine socio-demographic characteristics of PLWHA attending Riruta Health Centre, Kenya.

1.5.2.2 To determine the nutritional status of PLWHA attending Riruta Health Centre, Kenya.

1.5.2.3 To determine the dietary practices of PLWHA attending Riruta Health Centre, Kenya.

1.5.2.4 To determine the clinical factors among PLWHA attending Riruta Health Centre, Kenya.

1.5.2.5 To determine the factors associated with undernutrition among PLWHA attending Riruta Health Centre, Kenya.

1.6 Hypotheses

1.6.1 Null hypothesis

There are no factors associated with the nutritional status, dietary practices and clinical factors of PLWHA attending Riruta Health Centre

1.6.2 Alternate hypothesis

There are factors associated with the nutritional status, dietary practices and clinical factors of PLWHA attending Riruta Health Centre

CHAPTER TWO

LITERATURE REVIEW

2.1 HIV/AIDS, food security and nutritional status situation in Kenya

2.1.1 HIV/AIDS situation in Kenya

Estimates indicate that over 40 million people are currently living with HIV/AIDS worldwide and 25-28.2 million of these are in Sub-Saharan Africa (Heymann, 2004). The HIV prevalence in Kenya is 7.1% among adults aged 15-64 years (NAS COP Kenya). There was an increase in the prevalence of HIV/AIDS in Kenya from 6.7% among 15-49 year olds in 2003 to 7.8% in 2007 for the same age group. There were significant regional differences in HIV prevalence, ranging from 0.81% in North Eastern province to 14.9% in Nyanza province. The HIV prevalence in Nairobi was 8.8% (NAS COP, 2009; CBS, 2003).

2.1.2 Food security and HIV/AIDS

Food security is the state in which all people have both physical and economic access to sufficient and safe food to meet their dietary needs for a productive and healthy life at all times. Achieving this state is contingent on food being available, accessible, and utilized by the body. Food security is affected by factors such as poverty, health, food production, political stability, infrastructure, access to markets and natural hazards (Parliamentary Office of Science and Technology, 2006). In Africa, where more than 25 million people are living with HIV/AIDS, malnutrition and food insecurity are endemic (WHO, 2002).

The high level of food insecurity in Kenya is related to poverty and reduction in agricultural production. Over 50% of Kenyans live below the absolute poverty level (Central Bureau of Statistics, 2003). Approximately 47% of the Kenyan population does not have access to food resources to adequately meet their daily needs. HIV/AIDS also reduces a household's ability to produce and buy food as it mostly devastates the productive age group of 15- 50 years. Also, PLWHA are in frequent need of health care which is costly and often cripples the affected families financially (MOH GOK, 2007).

2.1.3 Nutritional status situation in Kenya

In Kenya, the most pressing form of malnutrition is protein-energy malnutrition (Ngare and Muttunga, 1999). About 31% of children below five years are stunted and 20% are underweight. Vitamin A, Zinc and Iron deficiencies underlie widespread multiple micronutrient deficiencies that constitute significant public health problems (MOH GOK, 2007).

Vitamin A deficiency (VAD), iron deficiency disorders (IDD) such as anemia, zinc deficiency, iodine deficiency, selenium deficiency and low plasma or serum albumin concentration are the key nutrient deficiencies in HIV/AIDS (Baum et al, 1997; Semba & Tang, 1999). Despite the paucity of documented data on the nutritional status of PLWHA in Kenya, some studies have shown that up to 25.7% of the PLWHA are underweight (Kuria, 2009).

2.2 Nutritional status and HIV/AIDS

2.2.1 Interaction between HIV/AIDS and nutrition

The interaction between HIV/AIDS and nutrition is significant because malnutrition and infectious diseases are common in Sub-Saharan Africa. They may occur simultaneously, sequentially or repeatedly in HIV-infected persons (Anabwani and Navario, 2005).

This interaction has biological and social consequences which affect the individual, household, community and nations. At individual level, the consequences affect one's ability to acquire, consume and utilize food leading to poor nutritional status and weight loss (Colecraft 2008). While research is still needed to better understand these processes, the evidence available suggests that nutrition is critical in the fight against HIV/AIDS.

Severe malnutrition impairs the immune function and decreases resistance to infections (Scrishaw & SanGiovanni, 1997). Nutritional deprivation results in lymphoid atrophy. This is because all types of immune cells and their products (i.e., interleukins, interferons and complements) depend on metabolic pathways that use various nutrients as critical cofactors for their actions and activities. Thus, host defense mechanisms are altered in both protein-energy malnutrition and micronutrient deficiencies.

HIV has similar deleterious effects on the immune system as malnutrition. (Beisel, 1996; Piwoz, 2004). In both malnutrition and HIV there is reduced CD4 and CD8 T-lymphocyte numbers, suppression of delayed hypersensitivity, and abnormal B-cell responses (Gorbach et al, 1993; Scrimshaw and SanGiovanni, 1997).

2.2.2 The vicious cycle of HIV/AIDS and malnutrition

When HIV/AIDS and malnutrition are concurrent, their effect on the immune system is synergistic (Anabwani and Navario, 2005). The synergistic effects occur in a vicious cycle (Figure 2.1) in which the decreased immunity associated with both conditions leads to increased susceptibility to infections that in turn lead to increased nutrient requirements, which if not adequately met lead to more malnutrition (Piwoz and Preble, 2000; Semba and Tang, 1999).

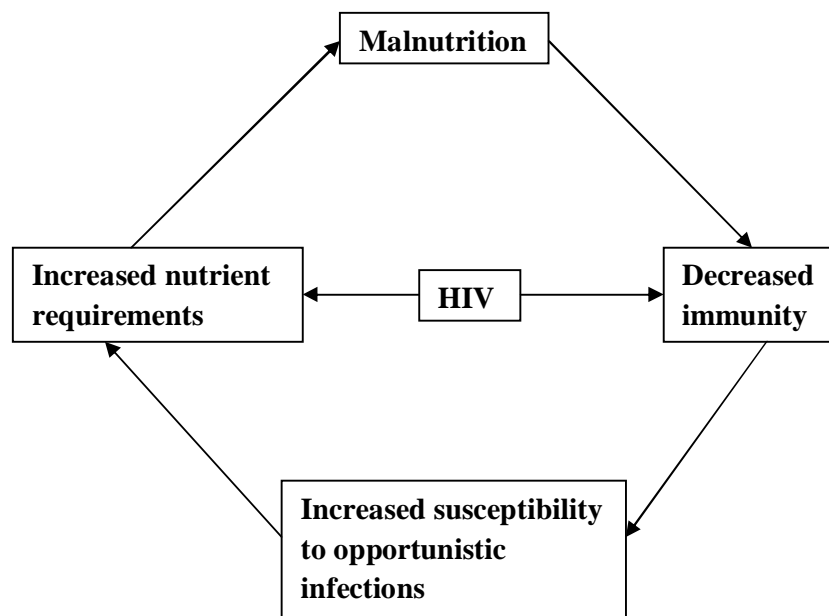


Figure 2.1: Vicious cycle of HIV and malnutrition (Edwards 2006)

2.2.3 Causes of malnutrition in HIV

2.2.3.1 Inadequate dietary intake

In HIV infected persons, several factors present in relation to the illness put the patient at risk of developing malnutrition. These include: inadequate dietary intakes; nutrient losses; metabolic changes and increased energy requirements.

Biological factors: HIV is associated with various biological factors that affect the individual's desire for food and ability to eat, leading to decreased food consumption. Loss of appetite as a result of depression, fatigue and other changes in the mental state and social stigma; taste disturbances, nausea and vomiting; eating and swallowing difficulties due to oral and oesophageal sores lower dietary intake of food/nutrients (Piwoz & Preble, 2000).

Drug and treatment induced side effects: A range of drugs are used to manage the symptoms of HIV infection, opportunistic infections and other common infections. ARV drugs may interact with food, with other ARV drugs, or with drugs used to treat opportunistic infections. For instance, protease inhibitors often cause nausea and diarrhea; nucleoside reverse transcriptase inhibitors are associated with headache, nausea, anemia, and fatigue; and one of the non-nucleoside reverse transcriptase inhibitors, efavirenz, is associated with central nervous system changes. These side effects in turn may lower food intake resulting in poor nutritional status (MOH GOK, 2007).

Food insecurity: In developing countries, these effects are exacerbated by the social consequences of the disease, culminating in food insecurity. HIV/AIDS mainly affects economically active adults, undermining the capacity of households to work and produce or buy food thereby contributing to worsening and widespread food insecurity. Households affected by HIV/AIDS face severe decline in availability of food, both quantity and quality (MOH GOK, 2007).

2.2.3.2 Nutrient losses

Nutrient losses mainly result from malabsorption and diarrhea. Poor absorption of carbohydrates and fats can occur at any stage of HIV infection, even in asymptomatic individuals due to changes in the intestinal lining resulting from the infection (Piwoz & Preble, 2000). Poor absorption of fats reduces absorption of fat soluble vitamins such as A and E (Semba & Tang, 1999). This further compromises the nutrition and immune status.

Persistent diarrhea may be induced by Highly Active Anti Retroviral Treatment. Diarrhea and vomiting also result from opportunistic infections (MOH GOK, 2007), leading to excess nutrient losses.

2.2.3.3 Changes in metabolism

In HIV infection, there are changes in metabolism which promote protein catabolism and changes in fatty acids as a result of the immune system's response to the infection. Pro-oxidant cytokines are produced during the acute-phase response, leading to increased utilization of antioxidant vitamins such as E and C, beta-carotene, Zinc and Selenium (Friis, 2005).

The metabolic changes associated with HIV infection lead to increased energy and protein requirements coupled with inefficient utilization of nutrients (Edwards, 2006).

2.2.3.4 Increased energy and nutrient requirements

There's increased requirements for both macro- and micro-nutrients due to nutrient losses and changes in metabolism in HIV infection. For PLWHA energy needs increase with the progression of the disease, especially during episodes of opportunistic infection. During the asymptomatic phase, energy requirements increase by 10% in PLWHA over the requirement of non-infected persons, while it increases by 20-30% in the symptomatic phase (WHO, 2003). At the asymptomatic phase; when the symptoms have not manifested, a balanced diet and good nutrition practices will delay the onset of full blown AIDS. Even at the symptomatic phase which is characterized by presence of opportunistic infections, a balanced diet and good nutrition practices will aid in minimizing the frequency and severity of morbidity (MOH Kenya, 2008).

2.2.4 Recommended intake of nutrients for PLWHA

2.2.4.1 Energy

To maintain good nutrition, an adequate intake of energy-giving foods, proteins, vitamins and minerals, fiber and water are vital. The fundamental concerns are to maintain a balance of foods from each food group, and to consume a variety within each food group (MOH GOK, 2007).

Healthy HIV-uninfected adults require between 1,990 and 2,580 kilocalories per day. Based on increased resting energy expenditure (REE) observed in studies of HIV-infected adults, it is recommended that energy be increased by 10% (for asymptomatic PLWHA) and 20-30% (for symptomatic PLWHA) over accepted levels for otherwise healthy people. The goal is to maintain body weight in asymptomatic HIV-infected adults (WHO, 2003).

2.2.4.2 Protein

There is insufficient evidence to support the need for increased protein requirements for PLWHA over and above that of un-infected persons. Therefore protein intake is recommended at 12% to 15% of the total energy intake. On average, this means 50-80 grams of protein daily. Combining sources of protein (i.e. meat, dairy and legumes) helps to ensure adequacy of essential amino acids (MOH GOK, 2007).

2.2.4.3 Vitamin and minerals

Consumption of one Recommended Daily Allowance (RDA) of all micronutrients (vitamins and minerals) for both PLWHA and those not infected is recommended. However, therapeutic intervention (>1 RDA supplementation) should be considered, with a multiple micronutrient supplement, for those with a vitamin or mineral deficiency, or those who are vulnerable to a micronutrient deficiency. An adequate micronutrient intake is achieved through a healthy, balanced diet that includes a minimum of 400 grams of vegetables and fruits daily (MOH GOK, 2007).

2.2.4.4 Dietary fibre and water

Fibre from fruit is recommended for individuals with diarrhea while those with constipation should eat foods high in whole fibre. PLWHA should drink a lot of safe,

clean water. The recommended water intake is at least two (2) litres (or 8 glasses of 250 ml) per day (MOH GOK, 2007).

2.2.5 Manifestations of poor nutritional status and key nutrient deficiencies in HIV/AIDS

Poor nutrition status in PLWHA manifests itself in weight loss, muscle wasting, mineral and vitamin deficiencies, reduced immune competence and increased susceptibility to infections.(Wanke et al, 2000, Semba & Tang, 1999)

There are two main types of nutrient deficiencies: Protein Energy Malnutrition (PEM) and micronutrient deficiencies. Severe and chronic infections-particularly those producing diarrhea such as HIV/AIDS are the next major cause of PEM after insufficient supply of proteins and carbohydrates (Muller & Krawinkel, 2005). In Kenya undernutrition is widespread and often thought of as the same as malnutrition (MOH GOK, 2007). Whereas undernutrition refers to inadequate intake of nutrients and energy, malnutrition is a much wider concept that includes undernutrition, overnutrition and micronutrient deficiencies.

The key micronutrient deficiencies in HIV/AIDS include Vitamin A deficiency (VAD), iron deficiency and zinc deficiency (Baum et al, 1997; MOH GOK, 2007; Semba and Tang, 1999)

2.2.6 Nutritional status and ART

ART improves nutritional status, independent of its effects on viral suppression and immune status, although wasting still develops in some patients. This is because some of the Anti-Retroviral (ARV) drugs are associated with side effects such as

nausea, vomiting, diarrhea and fatigue which may in turn affect food intake and nutrition in general (Anabwani and Navario, 2005; McMahon, 1997). This also affects adherence to therapy, particularly in the first months of treatment. All PLWHA qualify for ARVs, but those with BMI less than 16 kg/m² should be nutritionally stabilized before starting ARVs (MOH GOK, 2007)

2.2.7 Nutritional status and HIV/AIDS progression and outcome

Nutritional status is a significant predictor of survival rate in adults with HIV infection. Weight loss is associated with significant morbidity and mortality in populations living with HIV/AIDS. A 5% loss in weight is associated with risk for wasting, opportunistic infections and mortality (Wheeler, 1998). Weight loss and wasting have been associated with shorter survival time in HIV-positive adults, independent of their immune status (Kotler et al, 1989.; Suttman et al, 1995).

Micronutrient status is a determinant of the progression of human immunodeficiency virus (HIV) disease (Fawzi et al., 2004). Deficiencies of anti-oxidant vitamins and minerals contribute to oxidative stress, a condition that may accelerate immune cell death and increase the rate of HIV replication. Clinical outcome is poorer and risk of death is higher in HIV-positive adults with compromised micronutrient intake or status (Baum , Shor-Posner , Lu Y et al,1995.; Tang , Graham , Kirby et al,1993.; Tang , Graham and Saah ,1996.; Tang, Graham , Chandra ,1997.; Tang , Graham , Semba et al, 1997.; Baum and Shor-Posner , 1998). Therefore malnutrition is an important predictor of HIV progression to AIDS.

2.2.8 Nutritional care and support for PLWHA

2.2.8.1 Goals of nutritional care and support for PLWHA

The goals of nutritional care and support for people living with HIV/AIDS are to improve nutritional status, ensure adequate nutrient intake, prevent food-borne illnesses, enhance the quality of life as well as provide palliative care during the advanced stages of the disease (Piwoz & Preble, 2000).

2.2.8.2 Components of nutritional care and support for PLWHA

There are three components of nutritional care and support: periodic nutritional assessment, intervention selection and design, and follow up and review.

Measurements commonly used in nutritional assessments include: anthropometry (e.g., weight, height); biochemical tests for blood sugar, lipids, cholesterol, protein, and micronutrient status (e.g., serum levels, Hb, B12); clinical assessment of symptoms and illnesses associated with HIV/AIDS infection such as oral thrush and diarrhea, review of dietary history such as appetite, food habits, and stress or depression that may affect eating; and lifestyle practices such as smoking, drinking alcohol and caffeine and using drugs that may affect food intake or utilization (Shevtz and Knox, 2001).

Nutritional care and support interventions and strategies should be based on the nutritional assessment. Key actions to prevent weight loss include promoting adequate calorie and protein intake (e.g., creating an individualized meal plan based on the patient's food security and needs) and advising on lifestyle changes to avoid practices that negatively influence food intake, nutrient use, disease condition, and recovery.

Promoting regular exercise to preserve muscle mass and at times using steroids and other growth stimulants to preserve or increase body cell mass will improve body composition. Increased micronutrient (vitamin and mineral) intake should be promoted to improve immunity and prevent infections, as well as encouraging the observation of food safety and handling practices to prevent food borne illnesses, and promoting the use of ARVs to reduce viral load where necessary and possible (MOH GOK, 2007)

Multiple micronutrient supplementation enhances the survival of HIV- infected individuals. However, Vitamin A appeared to reduce the effect of multivitamins and, when given alone, had some negative effects (Fawzi et al 2004)

Recommendations should be guided by the condition of the patient's disease state and body composition, other symptoms, and social, economic, physical, and biological ability to comply with the recommendations. The first key action is to assess the patient's nutritional status periodically.

2.3 Dietary practices among PLWHA

The eating patterns of individuals can be viewed in at least two ways: the frequency and spacing of eating occasions and the types of foods most characteristic of the patterns (Swan, 1983). HIV-infected adults should consume diets that ensure micronutrients intake at Recommended Dietary Allowance (RDA) levels (WHO 2003). No single food is sufficiently rich in all vitamins and minerals, hence taking a variety of foods creates an opportunity to receive as many vitamins and minerals as needed (MOH GOK, 2007).

Animal foods are associated with improved nutritional status in HIV-infected persons. A study in South Africa showed that asymptomatic HIV-infected subjects who followed a diet rich in animal foods had smaller decreases in serum albumin, hemoglobin and lipid variables, and smaller increases in liver enzymes, than those who consumed a diet based on staple foods (Vorster et al 2004). This suggests that animal foods are associated with improved nutritional status in HIV-infected persons. Previously, it has been shown that PLWHA consume foods that are low in nutrients to build up the immune system, help maintain adequate weight and there is little variety of foods consumed (Kuria, 2009).

2.4 Clinical risk factors for malnutrition in HIV infection

Malnutrition is not only the result of HIV infection but also of numerous associated complications. Although disease-related malnutrition has multiple causes, the main cause is inadequate food intake/absorption which may be due to factors such as gastrointestinal problems and side effects of drugs among others (Meier and Stratton, 2008). Nausea, vomiting, anorexia, diarrhea and opportunistic infections are some of the clinical risk factors for malnutrition in HIV infection (Karlsson and Nordstroëm, 2001; Schwenk et al, 1993).

Two patterns of weight loss have been observed in HIV: acute or rapid weight loss from secondary or opportunistic infections; chronic or slow weight loss from anorexia and gastrointestinal disease (Macallan, 1993).

CHAPTER THREE

METHODS

3.1 Study site

The study was carried out at Riruta Health Centre (H/C). This health facility is in Nairobi West District, one of the districts that form Nairobi Province, Kenya. The district covers an area of 359.7 Km² and is situated between longitude 36°40' East and 1°25' South. The population in the district is relatively quite high with population projections of 1,151,278 persons in 2010. It borders Kiambu district to the North, Nairobi North district to the East, Kajiado district to the South and Nairobi East district to the Southwest. Administratively, the district is divided into two divisions: Dagoretti and Kibera as shown on Appendix I (Ministry of State for Planning, National Development and Vision 2030, Kenya, 2009).

Riruta H/C has an outpatient clinic that provides free care and treatment services to HIV/AIDS patients also known as the comprehensive care clinic (CCC). The clinic is supported by Nairobi City Council and Liverpool VCT, Care and Treatment (LVCT). Its catchment population is mainly from Kawangware, an urban low income setting and the neighboring estates such as Riruta and Dagoretti (all of Dagoretti Division). The low socioeconomic status characteristic of the catchment population predisposes them to malnutrition.

3.2 Study design

This was a cross-sectional descriptive study. The study was designed to obtain data on nutritional status, dietary practices and clinical factors of adult PLWHA attending the comprehensive care clinic at Riruta Health Centre at one point in time. This design was suitable as the relevant factors that were to be determined were not known for this specific population.

3.3 Study population

The study population was adult PLWHA (18 years and above) outpatients attending the comprehensive care clinic at Riruta Health Centre, Nairobi, Kenya. The adult PLWHA attending this clinic are provided with free HIV prevention, care and treatment outpatient services. Approximately, 6 000 adult PLWHA attend this clinic.

Inclusion criteria

- All adult PLWHA (aged 18 and above) attending Riruta Health Centre CCC
- Those adult PLWHA attending Riruta Health Centre CCC who gave consent
- Those adult PLWHA who had been attending Riruta Health Centre CCC for atleast one month

Exclusion criteria

- PLWHA below 18years attending Riruta Health Centre CCC
- Those adult PLWHA attending Riruta Health Centre CCC who did not give consent

- Those adult PLWHA who had attended Riruta Health Centre CCC for a period less than one month

3.4 Sample size

The sample size required was 322, which was determined using the formula below (Cochran, 1963);

$$n = Z^2 \cdot p \cdot q / d^2$$

Where n= sample size; confidence level = 95%, $\alpha=0.05$; $Z= 1.96$

Assuming a 30% prevalence of poor nutrition status among PLWHA (Kuria, 2009)

Then $P=0.30$, $q=0.70$, and d (precision level) = 5%

$$n = 1.96^2 * 0.30 * 0.70 / 0.05^2,$$

Therefore $n=322$

Assuming 10% non-attendance rate at the clinic, the sample size was increased as follows: $322+32=354$

3.5 Sampling method

Systematic sampling of adult PLWHA attending Riruta Health Centre was used to select participants into the study. A list of the total number of PLWHA booked to attend clinic for two months was obtained and used as a sampling frame. Approximately 1000 PLWHA attend clinic per month. The sampling interval for two months was $6(2000/354)$. From the first six patients on the clinic attendance list, the first patient was randomly selected; thereafter every 6th patient was selected until the desired sample was achieved. The interviews were conducted at Riruta Health Centre HIV clinic. Since a non-attendance rate of 10% was anticipated earlier, the minimum sample size required was increased by 10% to 354. Recruiting was done until the desired sample size of 322 was obtained.

3.6 Data collection

A semi-structured questionnaire was pretested and used to collect data from the study subjects (Appendix II). A written informed consent was sought and obtained from each study participant prior to the interview (Appendix III). Data on the socio-demographic factors, dietary practices, clinical factors affecting food intake/absorption, and anthropometric characteristics were collected during the interview.

The nutritional status of each participant was assessed using anthropometry: Weight, Height, Body Mass Index and Mid Upper Arm Circumference (MUAC), which are the most common methods used in HIV/AIDS research (Smit and Tang, 2000). Anthropometry is also the single universally applicable, inexpensive and non-invasive technique for assessing the size, proportion and composition of the human

body (WHO, 1995). For pregnant women and lactating mothers MUAC was used as BMI is not applicable (MOH GOK, 2007). Body weight to the nearest 0.1 kilogram (kg) was determined using an adult standardized bathroom scale, and standing height using a stadiometre to the nearest one centimetre (cm).

The Body Mass Index (BMI) was calculated using the formula: BMI= Body weight (kg) divided by Height (m²). Interpretation of BMI was done according to World Health Organization (WHO) classification (principal cut- off points) as follows: Severe underweight, BMI <16.00; Moderate/mild underweight, BMI 16.00-18.49; Normal range, BMI 18.50-24.99; Overweight, BMI 25.00-29.99; Obese, BMI ≥ 30 (WHO 1995)

Mid Upper Arm Circumference was taken by measuring the circumference of the left upper arm at the midpoint between the tip of the shoulder and the tip of the elbow, with the arm hanging down. MUAC of 23.0 cm in men and 22.0 cm in women were considered normal cut-off points (James and Ferro-Luzzi et al, 1994)

Food consumption was determined by a weekly food frequency and 24 hour dietary recall. For the 24 hour dietary recall, participants were asked what they ate in 24 hours in direct chronological order from the first foods in the morning to the last foods on the previous day. Data on the weekly food frequency was obtained by asking the participants how often they consumed various types of foods. Adequacy of energy and nutrient intake was estimated using food composition tables (Appendix IV) (Sehmi, 1993)

3.7 Data management and analyses

Data was entered into a computerized database using *Epi info* for Windows version 3.5.1. It was stored in a password protected computer. Backup data and filled questionnaires were stored under lock for safety. Data were validated; cleaned and statistical analyses performed using *Epi- info* software (2008) version 3.5.1. Univariate analyses were done for the descriptive variables. Frequencies and percentages were used to describe categorical data and measures of central tendency for continuous data. Crude Odds Ratios (COR) and 95% confidence intervals (CI) were calculated for various exposure variables. Differences were considered significant if $p \leq 0.05$. Factors that had a $p \leq 0.1$ during bivariate analysis were taken to multivariate analysis to control for potential confounders. During multivariate analysis, unconditional logistic regression was used. A stepwise backward elimination method was employed to obtain the final best model. Initially all the variables were entered into the model and the model run, and the variable with the highest p-value was removed; the model was re-run again until all remaining variables were significant at $p \leq 0.05$.

3.8 Ethical issues

A research protocol approval was obtained from the Board of Postgraduate Studies, Jomo Kenyatta University of Agriculture and Technology (JKUAT). Ethical clearance was sought and obtained from Kenyatta National Hospital/University of Nairobi Ethical Review Committee (Appendix V). Further research authorization was sought and obtained from the National Council for Science and Technology (Appendix VI). Clearance was also sought and obtained from the Nairobi City Council and Liverpool VCT, Care and Treatment (LVCT) administration and the local administration for Nairobi West District.

The purpose, risks and/ benefits of the study were explained to each participant and a written informed consent obtained before being enrolled into the study. Confidentiality was guaranteed throughout data management by removal of personal identifiers.

CHAPTER FOUR

RESULTS

4.1 Descriptive analysis

4.1.1 Socio - demographic factors

4.1.1.1 Age and sex

The respondents' mean age was 36 years and the range was 19-63 years. Most respondents (69%) were in the middle age groups 25 – 34 and 35 – 44 (Figure 4.1).

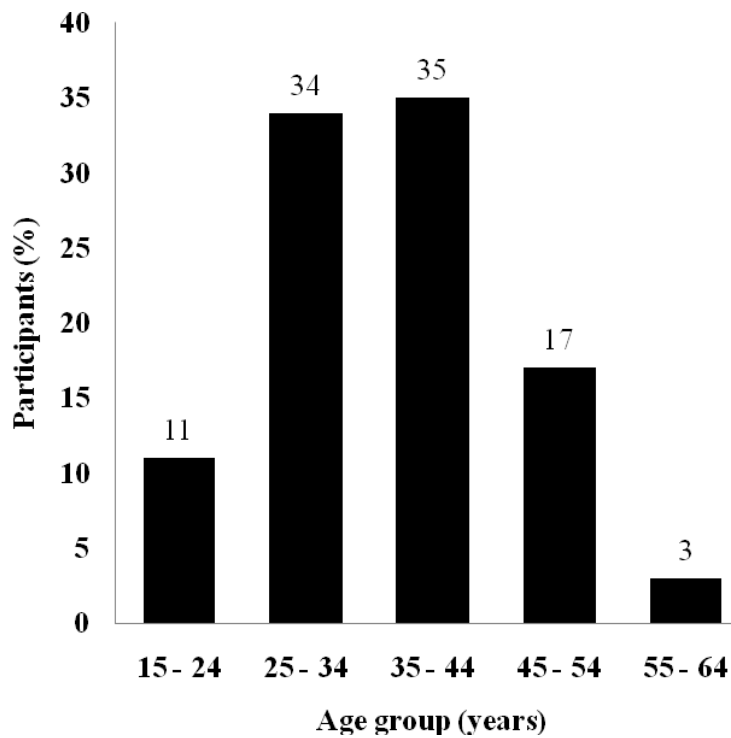


Figure 4.1: Age group distribution for PLWHA attending Riruta H/C

Majority of the respondents (70%) were female (Figure 4.2). Male: Female sex ratio was 1:2.

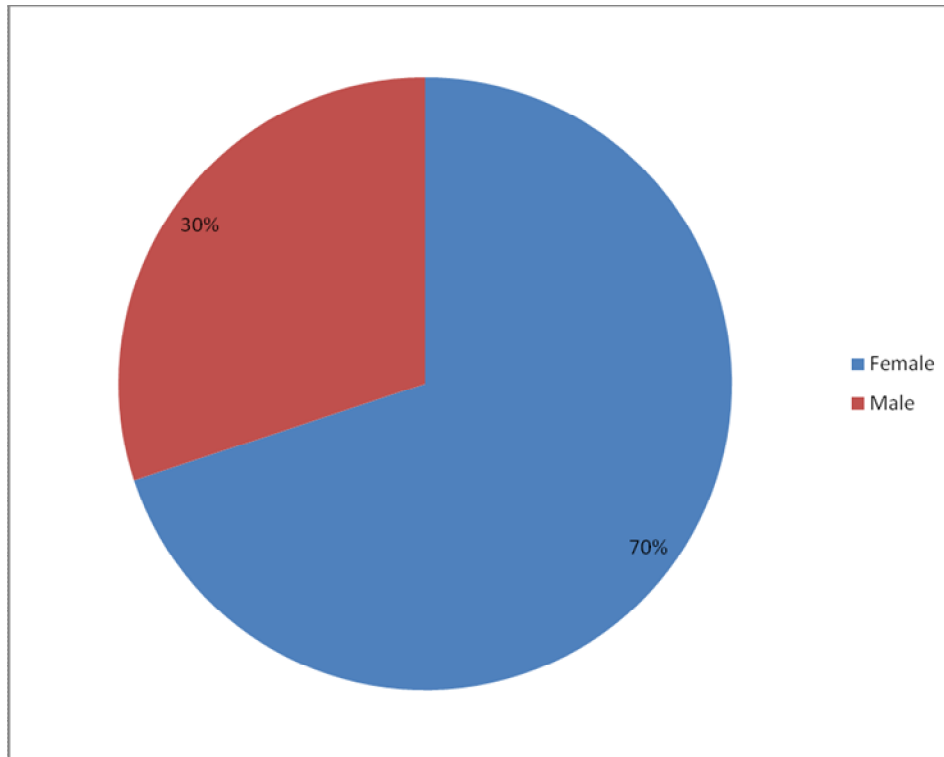


Figure 4.2: Gender

4.1.1.2 Education

Most (59%) of the participants had primary level education. Only 5% had tertiary level education (Table 4.1).

4.1.1.3 Marital status and religion

Sixty percent of the respondents were married (Table 4.1). Majority of them (98%) were Christian by religion.

4.1.1.4 Employment status

Fifty seven percent were unemployed (had no regular income) at the time of the study. The proportion of females unemployed (64.4%) was more than the males (40.2%). Only about 10% had permanent employment (Table 4.1).

Table 4.1: Socio-demographic characteristics of PLWHA attending Riruta H/C

Parameter	Female No. (%)	Male No. (%)	Total No. (%)
Education level			
None	12 (5.3)	5 (5.2)	17 (5.3)
Primary	145 (64.4)	45 (46.4)	190 (59.0)
Secondary	59 (26.2)	40 (41.2)	99 (30.7)
Tertiary	9 (4.0)	7 (7.2)	16 (5)
Marital status			
Single	48 (21.3)	4 (4.1)	52 (16.2)
Married	112 (49.8)	82 (84.5)	194 (60.3)
Cohabiting	4 (1.8)	0	4 (1.2)
Divorced/separated	42 (18.7)	7 (7.2)	49 (15.2)
Widowed	19 (8.4)	4 (4.1)	23 (7.1)
Employment status			
Casual	40 (17.8)	24 (24.7)	64 (19.9)
Contract	1 (0.3)	0	1 (0.3)
Permanent	11 (4.9)	20 (20.6)	31 (9.6)
Self employed	28 (12.4)	14 (14.4)	42 (13.0)
Unemployed	145 (64.4)	39 (40.2)	184 (57.1)

4.1.1.5 Residence and house hold size

Majority of the respondents (88.8%) were from Nairobi West District as shown in Figure 4.3. Some respondents (8.7%) were from other districts outside Nairobi Province such as Kajiado, Kiambu, Machakos, Kangudo, Kisii and Kakamega. The mean number of people in the household/family setting at the time of the interview was 4 and SD 2 (range 1-10 people).

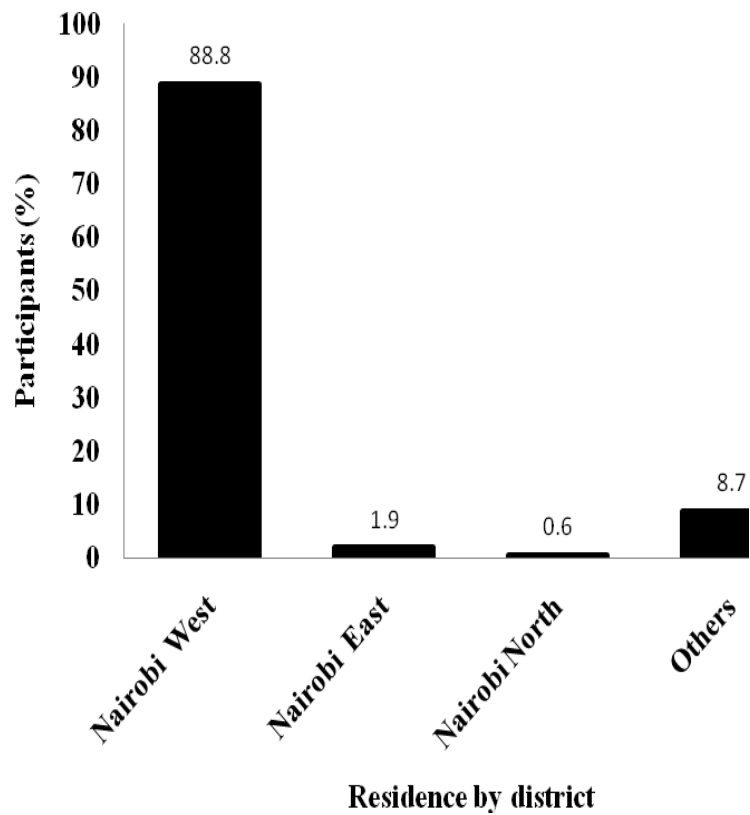


Figure 4.3: Residence by district for PLWHA attending Riruta H/C

4.1.2 Nutritional status

4.1.2.1 Nutritional status by MUAC

Using MUAC, 25.8% of the study participants were undernourished. The proportion of males who were undernourished (42.3%) was about two times that of the females (18.7%) as shown on table 4.2.

Table 4.2: Nutritional status by MUAC for PLWHA attending Riruta H/C

	Frequency	Percent
Male		
Normal (MUAC \geq 23 cm)	56	57.7
Undernourished (MUAC < 23 cm)	41	42.3
Female		
Normal (MUAC \geq 22 cm)	183	81.3
Undernourished (MUAC < 22 cm)	42	18.7

(Using cut-off points by James and Ferro-Luzzi et al, 1994)

4.1.2.2 Nutritional status by BMI

Data on weight and height of the study participants were collected and used to derive the BMI. Table 4.3 shows the nutritional status by BMI of the study participants using WHO recommended cut-off points (Appendix VII). The proportion of study participants who were underweight was 16.3%. The proportion of males who were underweight (22.8%) was about twice that of the females (12.9%).

Table 4.3: Nutritional status by BMI for PLWHA attending Riruta H/C

Nutrition Status by BMI					
	Severe underweight	Moderate underweight	Normal weight	Over weight	Obese
BMI	≤ 16	16-18.4	18.5-24.9	25-29.9	≥ 30
Gender (n)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Female (186)	7 (3.8)	17 (9.1)	104 (55.9)	46 (24.7)	12 (6.5)
Male (96)	2 (2.1)	20 (20.8)	63 (65.6)	10 (10.4)	1 (1.0)
Total	9 (3.2)	37 (13.1)	167 (59.2)	56 (19.9)	13 (4.6)

*Excludes pregnant women (22), lactating mothers (16) and physically disabled persons (2) on wheel chair

4.1.3 Dietary practices

4.1.3.1 Food consumption in the last 24 hours

The most common beverage taken for breakfast was tea/coffee with milk (74.5%) followed by porridge (12.7%), accompanied with bread (24.2%) or mandazi (30.4%). Some skipped breakfast (2.2%).

Half of the respondents (50.6%) ate ugali (thick porridge), 16.8% ate rice, 10.2% ate githeri (cooked mixture of maize and beans) and 7.8% potatoes accompanied with side dishes such as green vegetables (55%) and/ beans (12.4%)/ beef (7.8%) /fish (3.7%)/chicken (1.6%) for lunch. Only 1.2% ate fruits at lunch time.

Majority of the respondents ate ugali for supper (63.4%) and the rest ate rice (11.5%), potatoes (1.9%), githeri (6.8%), bananas (0.3%) accompanied with side dishes such as green vegetables (43.2%) and/ beef (6.2%)/ beans (9.3%)/ fish (6.5%)/ chicken (0.9%). Others skipped supper (5.6%).

Overall, the foods most frequently consumed foods for breakfast were tea (with milk) and mandazi. For lunch and supper, the predominant foods were ugali and vegetables. Consumption of fruits was very low, as was that of meat (Table 4.4).

Table 4.4: Food items consumed in the last 24 hours by participants

Food items	Breakfast (%)	Lunch (%)	Supper (%)
Porridge (maize flour)	12.7	-	-
Tea (with milk)	74.5	-	-
Tea (without milk)	5.0	-	-
Mandazi	30.4	-	-
Bread	24.2	-	-
Sweet potatoes	2.2	-	-
Chapati	1.6	3.4	4
Ugali	-	50.6	63.4
Rice	-	16.8	11.5
Githeri	-	10.2	6.8
Potatoes	-	7.8	1.9
Milk	-	0	1.2
Beef/fish/chicken	-	13.1	13.6
Beans	-	12.4	9.3
Vegetables	-	55	43.2
Fruits	-	1.2	0.3

4.1.3.2 Food consumption in the past one week

All the respondents ate carbohydrates rich foods daily and 94.7% ate green vegetables daily. About 66% reported daily consumption of milk and/or its products. More than half (55.6%) consumed legume grains at least thrice a week. Only a quarter (25.1%) ate meat three or more times a week as shown on table 4.5 below.

Table 4.5: Food consumption in the past one week by participants

	Frequency per week			
	Daily (%)	Thrice (%)	Twice (%)	Once / Less (%)
Carbohydrate rich foods	100	0	0	0
Plant proteins	19.9	35.7	17.7	26.7
Vegetables	94.7	3.4	1.6	0.3
Meat	9	16.1	19.6	54.3
Fish & its products	2.8	7.5	12.2	77.5
Milk & its products	66.1	11.2	12.7	9.9
Chicken	0	0.6	1.6	97.8
Eggs	7.5	10.6	19.0	63.0
Fruits	35.4	22.0	18.0	24.5

4.1.3.3 Frequency of meals per day

About 2/3 of the respondents (69.9%) said they usually ate three meals per day, 23.9% ate two meals per day, 1.2% ate more than three meals per day and 5% ate one meal per day. The mean number of glasses of water taken in 24 hours was 3.5.

4.1.3.4 Other habits

Nine percent reported alcohol consumption while 4% reported smoking cigarettes.

4.1.4 Clinical factors

4.1.4.1 Duration of HIV status

The mean duration of HIV status was 2 years and the range 0 – 12 years (Table 4.6).

4.1.4.2 Hospitalization history

Only 9.6% (31) of the respondents reported having been hospitalized since knowledge of HIV status. Majority of them (87%) had been hospitalized once (Table 4.5).

4.1.4.3 ART use

About half of all the respondents (52%) were on ART at the time of the interview. All the respondents were on cotrimoxazole and multivitamin tablets for prophylaxis.

Table 4.6: Clinical factors for PLWHA attending Riruta H/C

Variable	Male (97)	Female (225)
Duration of HIV status (years)	2.5 ± 3	1.8 ± 2.5
Duration on ART (years)	2.9 ± 2.1	2.0 ± 1.9
Number of times hospitalized (No.)	1.0 ± 0	1.3 ± 0.6

4.1.4.4 Opportunistic infections

About one third (30%) of the respondents reported having been diagnosed with an opportunistic infection since knowledge of HIV status. Majority of these (75.8%) had been diagnosed with tuberculosis (Figure 4.4).

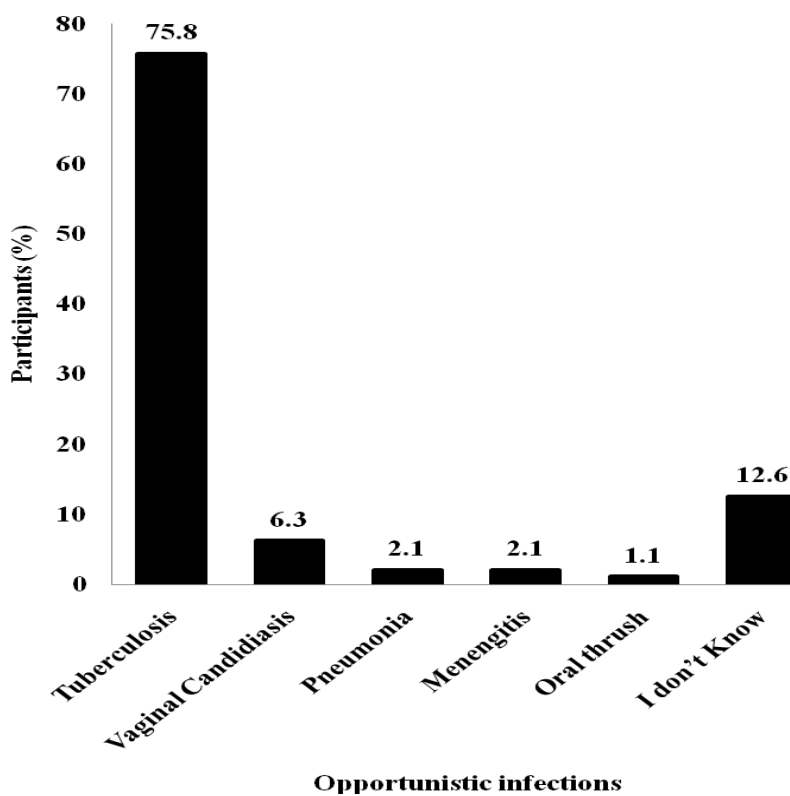


Figure 4.4: Opportunistic infections among PLWHA attending Riruta H/C

4.1.4.5 Food intake, absorption and gastrointestinal problems

Thirty one percent of the respondents reported having food intake, absorption and gastrointestinal problems at the time of the study. Majority (67%) reported poor appetite, 11% had nausea, 11% vomiting, 7% diarrhea and 4% mouth sores.

4.2 Bivariate Analysis

4.2.1 Socio-demographic factors associated with underweight

There were no socio-demographic factors associated with being underweight ($p \leq 0.05$) (Table 4.7)

Table 4.7: Socio-demographic factors associated with underweight

Exposure Variable	Nutritional Status			COR	95% C.I	p-value
	Underweight No. (%)	Normal No. (%)	Total No. (%)			
Gender				0.68	0.36-1.32	0.333
Female	25 (53)	106 (62)	131 (60)			
Male	22 (47)	64 (38)	86 (40)			
Marital Status				0.71	0.37-1.37	0.3922
Married	26 (55)	108 (64)	134 (62)			
Unmarried	21 (45)	62 (36)	83 (38)			
Employment Status				1.23	0.64-2.35	0.6513
Employed	22 (47)	71 (42)	93 (43)			
Unemployed	25 (53)	99 (58)	124 (57)			
No. of people in household				0.57	0.27-1.21	0.2000
> Four	11 (23)	59 (35)	70 (32)			
≤ Four	36 (77)	111 (65)	147 (68)			

4.2.2 Clinical factors associated with underweight

Among the clinical factors, occurrence of an opportunistic infection, poor appetite and nausea were associated with being underweight ($p \leq 0.05$). The prevalence of underweight was more among non-ART users than among ART users (Table 4.8).

Table 4.8: Clinical factors associated with underweight

Nutritional Status						
Exposure Variable	Under weight N (%)	Normal N (%)	Total N (%)	COR	95% C.I	p - value
Opportunistic infections				2.43	1.26 - 4.71	0.0119*
Yes	24 (51)	51 (30)	75 (35)			
No	23 (49)	119 (70)	142 (65)			
Poor appetite				3.44	1.69 - 6.99	0.0009*
Yes	19 (40)	28 (17)	47 (22)			
No	28 (60)	142 (83)	170 (78)			
Anti-Retroviral Therapy				0.83	0.44 - 1.59	0.6942
Yes	23 (49)	91 (54)	114 (53)			
No	24 (51)	79 (46)	103 (47)			
Hospitalized since diagnosis				2.64	0.93 - 7.1	0.0600
Yes	9 (19)	14 (8)	23 (11)			
No	38 (81)	156 (92)	194 (89)			
Co - infection with TB				1.9	0.95 - 3.81	0.1000
Yes	17 (36)	39 (23)	56 (26)			
No	30 (64)	131 (77)	161 (74)			
Nausea				3.93	0.85 - 17.79	0.0080*
Yes	5 (11)	5 (3)	10 (5)			
No	42 (89)	165 (97)	207 (95)			
Diarrhea				5.18	0.83 - 36.31	0.0800
Yes	4 (9)	3 (2)	7 (3)			
No	43 (91)	167 (98)	210 (97)			

4.3 Multivariate analysis

Although several clinical factors (opportunistic infections, hospitalization history, poor appetite, nausea, diarrhea and co-infection with TB) were entered into the unconditional logistic regression model, the final best model showed that only two factors; poor appetite ($p=0.0002$) and occurrence of opportunistic infections ($p=0.0027$) were independently associated with being underweight (Table 4.9). The steps of this analysis are as presented in Appendix VIII.

Table 4.9: Multivariate analysis for factors associated with underweight

Exposure Variables	Odds Ratio	95% C.I.	P-Value
Poor appetite	4.0885	1.9352-8.6380	0.0002
Opportunistic infections	2.9308	1.4529-5.9122	0.0027

CHAPTER FIVE

DISCUSSION

5.1 Overview

Malnutrition occurs frequently during HIV infection and increases with disease progress. It strongly predicts patient survival independent of CD4+ lymphocyte counts (Suttman et al, 1995). Weight loss is a prominent feature of HIV-associated disease (Kotler et al, 1989). In fact, AIDS was once commonly known in Uganda as 'slim' disease (Serwadda et al, 1985). Various mechanisms for this deterioration in nutritional status have been identified and include insufficient food/nutrient intake, impaired nutrient digestion and absorption and increased requirements for nutrients with increased losses and catabolism (Macallan, 1999; WHO, 2003). Insufficient food intake is the main cause of disease-related malnutrition (Meier and Stratton, 2008). Generally, PLWHA are at a higher risk of malnutrition (Kuria, 2009)

5.2 Socio-demographic factors

The findings of this study showed that there were more females than males (M: F sex ratio 1:2) among adult PLWHA attending Riruta Health Centre. This is similar to the findings of Kuria (2009) in a study carried out in Bungoma and Thika districts in Kenya. It was also a key finding by NASCOP Kenya (2009) that women were more likely to be infected (8.4%) than men (5.4%). This is because heterosexual sexual contact is the primary mode of HIV transmission in Kenya (Okeyo et al., 1998).

More than half (69%) of the respondents were in the middle age groups 25-34 years and 35-44 years. This trend is also in agreement with that found by NASCOP Kenya (2009).

The largest proportion (60.2%) of PLWHA in this study was married, which was contrary to the findings of NASCOP (2009), that HIV prevalence was highest among widowed and separated/divorced people than other adults. Probably there is a difference in the health seeking behavior among PLWHA, with those married more likely to seek health care than the unmarried.

Most participants (59%) had primary level education at the time of the study, with only 5% having tertiary level education. This is likely to have an implication with respect to the design and implementation of nutritional programs. A higher proportion of PLWHA were unemployed (57.1%) compared to the employed. This is similar to the findings of Khalili et al (2008). This may be a limiting factor in their ability to purchase food thereby predisposing them to malnutrition.

5.3 Nutritional status

Anthropometry provides a universally applicable, inexpensive and non-invasive technique and is the most common method used in HIV/AIDS research (WHO, 1995; Smit and Tang, 2000). Therefore, anthropometric parameters were used in this study to evaluate nutritional status of PLWHA: The results of this study showed that using MUAC, overall, about a quarter (25.8%) of the study participants was undernourished. The proportion of males who were undernourished was more than twice that of females. MUAC was used in this study as it is a good indicator of muscle wasting that was applicable to all the study participants.

However, there is variation in the figures for prevalence of malnutrition depending on the criteria and cut-off values used to define it. Estimates of the extent of malnutrition using a variety of different criteria (including anthropometric, biochemical or immunological parameters) suggest that malnutrition is a problem in HIV/AIDS ranging from 8-98% (Meier and Stratton, 2008). Both BMI and MUAC are sometimes used as in this study to complement each other. BMI is also not applicable to pregnant and lactating women.

Using BMI, 16.3% of the study participants (excluding pregnant women, lactating mothers and disabled persons) were underweight (BMI <18.5kg/m²). This is slightly lower than findings of a similar study in two districts in Kenya among HIV-positive adults; those with a BMI of ≤ 18.5 kg/m² were 23.6 % (Thika 20.0 % and Bungoma 25.7 %). The level of malnutrition in this study is also far much below that found by Khalili et al (2008) (77%).

This difference could have been due to differences in the socioeconomic and behavioral characteristics of the study subjects by Khalili et al (2008) who were males only and mainly Injection Drug Users (IDU) or drug addicts.

In this study, the mean BMI for both males and females was 22.4 kg/m². This is only slightly lower than the mean BMI at the national level which is 23 kg/m² according to the Kenya Demographic Health Survey (CBS, 2003). This means that malnutrition prevalence in this population is comparable to the general Kenyan population. However, there were differences across gender; the mean BMI for females was 23.1 kg/m², while that of males was slightly lower (21 kg/m²) than the National level. The median BMI of the men (20.3 kg/m²) was lower than that of the women (22.9

kg/m²), indicating that the male PLWHA tended to be leaner than the women. These results are compatible with findings of Dannhauser et al (1999).

Analysis of under-nutrition, by gender, showed that the proportion of males who were underweight was higher (22.9%) compared to that of females (12.9%). However, there were differences in the severity across gender with more males being severely underweight and more females being moderately underweight.

MUAC provides an index of muscle wastage in under nutrition that is characteristic in HIV/AIDS while BMI detects acute malnutrition, hence the difference in the nutritional status by the two measurements.

An additional finding of this study was that, although the rate of malnutrition by MUAC was generally higher than malnutrition by BMI, the differences across gender were consistent; with the proportion of males with malnutrition about twice that of the females using both parameters. Further investigation on this gender difference needs to be carried out.

Bivariate analysis of socio-demographic factors showed no association with underweight. However, the PLWHA who were unemployed were slightly more likely to be underweight than those who were employed (COR = 1.23). Those employed are likely to obtain food resulting in better nutritional status.

5.4 Dietary practices

To maintain good nutrition, an adequate intake of energy giving foods, proteins, vitamins and minerals, fibre and water are vital. It is recommended that PLWHA should maintain a balance of foods from each food group and consume a variety within each food group daily (MOH GOK, 2007).

Irrespective of the HIV status, adequate energy intake is a critical step to prevent weight loss and wasting. Majority of PLWHA mainly consumed staple foods that were predominantly carbohydrate rich foods for lunch and the pattern was repeated for supper. Consumption of protein-rich foods was not on a daily basis. Protein-rich foods are also generally more expensive than staple foods.

A good balance of essential amino acids is found mostly in animal food sources and to a lesser extent in plant sources. Plant proteins tend to be of poorer quality as they may be deficient in some essential amino acids. Specifically legume grains are usually deficient in sulfur amino acids including methionine. On the other hand, cereal proteins are usually deficient in lysine. More PLWHA (55.6%) consumed legumes compared to meat (25.1%). This diet may not provide all the essential nutrients the body needs to build up the immune system and help maintain adequate weight.

Further, there was less dietary diversity in the foods consumed. A good dietary diversity should contain different foods and food groups. It includes consumption of at least four food groups from among: cereals, roots and tubers, legume grains, animal source foods, fruits, vegetables and oil daily (Ruel, 2003).

Carbohydrate rich foods are a major part of the diet in Kenya and they include maize, rice, peas, potatoes, sorghum, cassava, wheat, sweet potatoes, millet, and bananas. Yet the study participants' carbohydrate rich food sources were limited to only maize, rice, wheat and potatoes (Table 4.2). These results confirm the findings of Kuria (2009).

The findings showed that a large proportion of PLWHA consumed green vegetables but some of the vitamins such as vitamin C, folate and vitamin B6 may be lost during

preparation and cooking. Again thiamin, folate and vitamin B6 are lost when maize is sifted. In addition, fruits which are rich in micronutrients were much less consumed by the study participants.

This may not only be due to limited financial resources evidenced by high unemployment rate, but also as a result of knowledge deficiency on ensuring a balanced and varied diet using locally available nutrient dense foods in the market.

5.5 Clinical factors

5.5.1 Duration of HIV status, hospitalization and ART use

The mean duration of HIV status indicates that most of the PLWHA had been diagnosed recently. This suggests an increase in HIV diagnostic services and/or awareness. Given that most were recently diagnosed, few had been hospitalized since knowledge of HIV status.

Nutritional status has been shown to deteriorate during stay in hospital or in a nursing home (Meier and Stratton, 2008). The findings of this study showed that although PLWHA who had been hospitalized since knowledge of HIV status were more likely to be underweight (COR=2.64), the association was not significant ($p=0.06$). The lack of association may have been due to the fact that the study participants were only stable outpatients.

Despite the availability of ART at the clinic, only half were on ART. The mean duration of ART use was similar to the mean duration of HIV status meaning that they started on ART almost immediately after diagnosis with HIV.

5.5.2 Opportunistic infections

Effects of opportunistic infections are known to cause HIV-related malnutrition (Macallan, 1995b). This was confirmed by the results of this study which showed a significant association between occurrence of opportunistic infections and being underweight ($p=0.0027$, Crude Odds Ratio=2.9308). This means PLWHA who had experienced an opportunistic infection were about three times more likely to be underweight than those who had not.

About one-third of all reported HIV cases in developing countries are co-infected with tuberculosis (Dye and Williams, 2003). In this study, 26% of the PLWHA reported co-infection with tuberculosis since knowledge of their HIV status. HIV infection appears to be a key component in the development of active TB by rapidly increasing its progression. The immune response in patients with TB might enhance HIV viral replication and accelerate the natural progression of HIV infection (Ferrari, 2004).

The proportion of underweight PLWHA co-infected with tuberculosis was high (36.2%). Wasting is a cardinal feature of tuberculosis that is likely caused by a combination of reduction in appetite, leading to a decrease in energy intake, interacting with increased losses and altered metabolism associated with inflammatory and immune responses (Paton et al, 2003). PLWHA who had a history of co-infection with tuberculosis were two times more likely to be underweight than those without tuberculosis (Crude Odds Ratio=1.9), though the difference was not statistically significant ($p=0.1000$). The lack of a significant association between underweight and co-infection with tuberculosis may have been due to the fact that

this was based on recalled information. The influence of HIV/tuberculosis co-infection on nutritional status should be investigated further.

5.5.3 Food intake, absorption and GIT problems

Poor appetite, nausea and vomiting are factors that may decrease dietary intake. Diarrhea impairs nutrient absorption and is also among the known causes of HIV-related malnutrition (MOH GOK, 2007). This study confirmed the link between malnutrition in PLWHA and poor appetite; $p=0.0002$, Crude Odds Ratio=4.0885 and C.I=1.9352-8.6380 (Macallan et al, 1995b; Sharkey et al, 1992; Kotler et al, 1991).

5.6 Strengths and limitations

The strength of this study is that the data came from a clinic that takes care of the HIV/AIDS patients on a daily basis; therefore our results reflect the real situation in an urban HIV clinic. However, there were some limitations:

Food consumption and dietary practices assessment was dependent on respondents' memory ability which may have introduced recall bias. To minimize this bias the diet recall was limited to the previous 24 hours only.

Twenty four hours may not be representative of usual diet therefore a weekly food frequency was recorded to complement the findings.

The nutrient contents of the foods consumed were not analyzed to give the exact energy and nutrient content and intake.

The study was carried out in one site only which is supported by LVCT and this may not be representative of other sites.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

- Majority of PLWHA attending Riruta Health Center had low level of education with high level of unemployment. This may have had an implication on the effectiveness of nutrition and health education programs and may also have affected their ability to purchase food and in turn their nutritional status.
- About a quarter of the PLWHA attending Riruta H/C were undernourished with the proportion of males who were undernourished being twice that of the females.
- PLWHA attending Riruta H/C had poor dietary practices: they consumed tea as a main item for breakfast which was likely to result in low energy intake, they most frequently consumed staple foods that were predominantly carbohydrate rich foods for lunch and the pattern was repeated for supper. Furthermore, they consumed very little animal protein source foods and fruits. This diet as well as the lack of variety in it was likely to predispose them to PEM and some micronutrient deficiencies.
- The clinical factors that were independently associated with being underweight among PLWHA attending Riruta H/C were poor appetite ($p=0.0009$) and occurrence of opportunistic infections ($p=0.0119$).

6.2 Recommendations

- Introduction of income generating activities designed for PLWHA such as food for work programs to improve their ability to obtain food by the government. They should also be encouraged to utilize the government programs such as the women and youth funds to undertake entrepreneurship in groups.
- The comprehensive care program should ensure regular nutrition and health education on how to increase nutrient intake for PLWHA through: ensuring a balanced and varied diet; improving the nutrient value of local staples by pre-cooking, soaking and sprouting of cereals and legumes, and fermentation to enhance digestibility and increase bio-availability of nutrients and consumption of fortified foods such as fortified maize flours where available.
- Health care providers should ensure prompt treatment and/or management of clinical factors such as poor appetite and opportunistic infections in the care and treatment of PLWHA.
- Given the findings of this study, there is need for further study on selected key biomarkers of nutritional status such as vitamin A and Zinc among PLWHA.

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Appendix II : Questionnaire

**NUTRITIONAL STATUS OF PERSONS LIVING WITH HIV/AIDS
ATTENDING RIRUTA HEALTH CENTRE, KENYA**

Questionnaire number..... Date of interview.....

Patient study number..... Name of interviewer.....

A. Demographic factors (Tick appropriately)

1. Gender: Male Female

2. Date of Birth Age (in complete years)

3. Usual Residence: District Division

4. Marital status: Single Married

Cohabiting

Divorced Separated Widowed

B. Socioeconomic factors

5. Highest level of education completed:

None Primary Secondary

Tertiary

6. Employment status:

Employed Unemployed

7. Type of employment:

Permanent Contract

Casual Self employed

Other (specify)

8. Monthly income level (in kshs):

<5, 000 5, 001- 10, 000 10, 001- 40, 000 > 40, 000

9. Religion: Christian Islam Hindu Atheist

Other (specify)

10. Number of people in the household/family setting.....

C. HIV/AIDS Related Clinical factors

11. For how long have you been living with HIV (since diagnosis)?

12 (a) Have you been diagnosed with any opportunistic infection(s)?

Yes No
I don't know

12(b) If Yes, which one(s)

Tuberculosis Candidiasis (oral thrush)
 Meningitis Human Papiloma Virus (HPV)
 Vaginal Candidiasis Pneumonia

13. (a) Are you on ART treatment? Yes No

13. (b) If yes in Q13.(a) above, state ARV combination.....

13. (c) State the duration of ARV use (in complete years)

14. Are you on any other medication? Yes No

If yes above, specify.....

15. Have you been hospitalized since diagnosis with HIV/AIDS?

Yes No

If Yes above, state the number of times

16. What nutritional problems are you experiencing currently? (*Tick all that apply*)

Poor appetite Nausea Vomiting
 Diarrhea Oral thrush None

Other (specify)

D. Food Intake Assessment

17. 24 hour dietary recall schedule: What did you take yesterday?

- Breakfast: Black Tea/coffee Tea/coffee with Milk
 Porridge (Uji) Mandazi milk
 Bread Eggs Juice
 Pumpkins Chapati
 Sweet Potatoes None

Other (Specify)

- Lunch: Ugali Fish chicken
 Matoke Beef Rice
 Githeri mukimo Beans
 Chapati milk Potatoes
 Green vegetables chicken None

Other (specify)

- Supper: Ugali Fish Matoke
 Rice Beef Fruits
 Githeri Beans mukimo
 Chapati Milk Potatoes
 Green vegetables chicken None

Other (specify)

- Snacks: Soda Porridge Milk
 Yoghut Fruits None

Others (specify)

18. How many glasses of water did you drink in the last 24 hours?

19. Food frequency: How often do you consume the following foods?

Type of food	Daily	Thrice a week	Twice a week	Once a week	Once a month	Rarely
Milk & dairy products						
Fruits						
Green Vegetables						
Meat						
Chicken						
Fish						
Eggs						
Plant proteins						
Carbohydrates						

20. How many meals do you usually have in a day (24 hours)?

One Two Three >Three None

21. Where do you get your food? Buy from the market

Garden

Donations

Other sources (specify)

22 (a) Have you received any dietary interventions at this clinic?

Yes No

22 (b) If Yes above, which one?

Nutrition counseling

Food supplements

Other (specify)

22 (c) If you received nutritional counseling, were you capable of getting the foods you were counseled on? Yes No

22 (d) Why were you not able to get these foods?

- I could not afford
- I could not use them for religious/ cultural reasons
- They are unavailable in the market

Others (specify)

22 (e) If you received food supplements, what supplements did you receive?

If yes in no. 22(a) above, did you find the dietary intervention useful?

- No Yes

23. What would you recommend concerning the nutritional care/interventions available at this clinic?.....

24. Dietary habits:

(a) List any food(s) that you don't take

(b) How do you feel about weight gain?

25. Other lifestyle factors

(a) Do you smoke cigarettes? Yes No

(b) Do you drink alcoholic beverages? Yes No

(c) Do you take illegal drugs? Yes No

If yes, please specify

E. Anthropometric parameters

26. (a) Body weight (kgs)27. (b) Height (m)

28. Body Mass Index (Kgs/m²):

29. Mid Upper Arm Circumference (cm)

Physiological status

30. For females ONLY (*Please tick appropriately*)

Pregnant Non-pregnant Lactating

Thank you for your time and participation in this exercise.

Appendix III: Informed consent / Idhini ya kushiriki katika utafiti

STUDY TITLE

Nutritional Status of Persons Living with HIV/AIDS attending Riruta Health Centre, Kenya.

Masuala ya lishe ya watu wanaoishi na virusi vya/ na ugonjwa wa ukimwi wanaopata huduma kutoka zahanati ya Riruta- nchini Kenya.

PART A

Introduction

You are asked to participate in the study because the nutritional status of an individual is affected by several factors, one of them being the immune (or disease) status such as in HIV/AIDS. Also the period of time it takes for HIV infection to become full-blown AIDS depends on the general health and nutritional status of a person before and during the infection period. There is need for current information on the nutritional status of PLWHA attending Riruta Health Centre.

SEHEMU YA KWANZA

Utangulizi

Unaombwa kushiriki katika utafiti huu kwa sababu kuna uhusiano kati ya lishe ya mtu na masuala mengi ikiwemo uwezo wa mwili kupigana na magonjwa(kinga) na magonjwa kama ukimwi. Pia muda anaochukua aliyeambukizwa virusi vya ukimwi kuanza kuugua hutegemea hali yake ya afya na lishe yake kabla na baada ya kuambukizwa. Kwa hivyo kuna umuhimu mkubwa kujua lishe ya wagonjwa wanoishi na virusi vya ukimwi au ugonjwa wenyewe walio chini ya huduma za zahanati ya Riruta.

Freedom of choice

This consent form gives you information about the study, the risks and benefits and the process that will be explained to you. Once you understand the study and agree to take part, you will be asked to sign or make your mark on this form. Before you learn about the study, it's important to note that; your participation in the study is totally voluntary, you are free to make enquiries to fully understand the study before you agree to participate and you may decide to terminate the study at any time without facing any consequences.

Uhuru wa kushiriki

Fomu hii inakupa habari juu ya utafiti, umuhimu wake na hatua zinazofuata. Unapoelewa na kukubali kushiriki, utatia sahihi katika sehemu iliyotengwa kwa minajili hiyo. Ni vyema pia kukumbuka kuwa kushiriki kwako ni kwa hiari na ikiwa kuna masuala ambayo hujaelewa vyema ni bora kuuliza kabla ya kukubali ombi hili la kushiriki. Una uhuru wa kusitisha kushiriki kwako wakati wowote utakaoamua kufanya hivyo na hutachukuliwa hatua yoyote

Purpose of the study

The purpose of this study is to determine the nutritional status of adult People Living with HIV/AIDS in an urban setting in Kenya. This will help inform policy on how best to incorporate nutrition and food based interventions into HIV prevention, care and treatment programs in this area. It will involve use of questionnaires

Madhumuni ya utafiti

Madhumuni ya utafiti huu ni kujua hali na masuala ya lishe ya wagonjwa hao wanaoishi sehemu za miji nchini Kenya. Matokeo ya utafiti huu yatasaidia katika kuunda sara ya kuhusisha lishe katika mipango ya kuzuia maambukizi ya ukimwi, kutunza wanaougua na kutibu wagonjwa katika sehemu hizi. Utafiti utafanywa kwa njia ya kujibu maswali na majadiliano.

In case of any questions, please contact/ *kwa maswali yoyote uliza:*

Ruth Nyaboke Nyansikera. Cell phone number/ nambari ya simu rununu: 0734 926273

Email: myansikera@yahoo.com

If you have any questions about this research study and would like to talk to someone other than the researcher, you are encouraged to contact the following:

Ukiwa na suala lolote kuhusu utafiti huu na ungependa kumuuliza mtu mwingine kando na anayefanya utafiti, unahimizwa kupata ushauri kutoka kwa:

The Director, Institute of Tropical Medicine and Infectious Diseases (ITROMID)

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OR/AU

The Chairperson, Kenyatta National Hospital/University of Nairobi- Ethical Review Committee

P.O Box 20723 00202 Nairobi, Kenya

[Tel: +254 20 726300-9](tel:+254207263009)

Email: KNHplan@Ken.Healthnet.org

Expectations during participation

I will ask you simple questions about nutritional status and also check your weight and height if you wish to participate in this study.

Matarajio

Nitakuuliza maswali rahisi kuhusu hali ya lishe na pia utapimwa kilo na urefu wako iwapo utashiriki katika utafiti huu.

Choice to withdraw or leave the study

You have the choice to or not to participate in this research study. If you choose not to participate or leave the study during the interview process, you may do so freely without any consequences against you.

Uamuzi wa kuendelea au kutoendelea na mahojiano

Una uhuru wa kushiriki au kutoshiriki utafiti huu. Iwapo utaamua kutoendelea na mahojiano, una uhuru wa kufanya hivyo bila kuchukuliwa hatua zozote.

Harm and/or risks and/or discomforts

We do not anticipate any risks or discomforts to you during this study. You will be requested to avail yourself for an interview. We will protect your privacy and confidentiality during your participation in the study. The interview will take place in private. It is unlikely that any harm could happen to you as a result of being in this study.

Madhara/ hatari ya kushiriki

Hatutarajii madhara au hatari yoyote kwako kwa kushiriki utafiti huu. Unaombwa kujitokeza na kushiriki mahojiano bila wasi wasi kwani yatafanyika faraghani na abari utakayoitoa itawekwa pasipo ufahamu wa mtu mwingine yeyote.

Benefits

There is no cost for participating in the study. Your participation is voluntary and you have the right to withdraw at any time. You are free to ask for further clarifications as need be.

By participating in this study and answering our questions, you will help increase our understanding of the nutritional status of PLWHA. The results will be used to assist the MOPHS to formulate policy on how best to incorporate nutrition and food based interventions into HIV prevention, care and treatment programs in this area. Also you will benefit from free nutritional counseling depending on your need.

Manufaa

Hakuna gharama yoyote ya kushiriki na kushiriki kwako ni kwa hiari. Ikiwa kuna jambo ambalo utahitaji lifafanuliwe kwako, una haki ya kuuliza. Unaposhiriki utafiti huu, utasaidia kuwepo na ufahamu juu ya hali ya lishe ya wanaoishi na virusi vya na ugonjwa wa ukimwi. Matokeo ya utafiti huu yatasaidia Wizara ya Afya ya Umma kuunda sera itakayohusisha lishe katika mipango ya kuzuia maambukizi, kutunza wanaougua na kutibu ugonjwa wa ukimwi. Pia utanufaika kwa kupata maelezo kuhusu lishe kulingana na mahitaji yako.

Privacy of records

All information provided will be kept confidential by all means. You will only be identified by a code and personal information from the interview will not be released without your written permission. You will not be personally identified in any publication of this study. However absolute confidentiality cannot be guaranteed because your records may be reviewed by the Ethics Committee at Kenyatta National Hospital.

Kubaniwa kwa utafiti

Habari itakayopatikana itawekwa kwa umakini na siri. Wewe utapewa nambari ya kutumika kwenye utafiti na habari yako ya kibinafsi haitatolewa kwa mtu yeyote bila idhini iliyoandikwa toka kwako. Hutatajwa katika ripoti ya utafiti huu lakini huenda rekodi yako ikathathminiwa na kamati ya kushughulikia maadili ya taaluma ya hospitali ya kitaifa ya Kenyatta.

PART B

Please read the information in PART A or have it read to you carefully before completing this consent form. If you have any questions, please ask the investigator prior to signing the consent form.

SEHEMU YA PILI

Tafadhali soma habari iliyo katika sehemu hii au hakikisha umesomewa na kuelewa kabla ya kutoa idhini ya kushiriki katika utafiti. Kama uko na maswali yoyote, uliza kwa mtafiti kabla ya kutia sahihi.

Declaration of volunteer

I Mr/Miss/Mrs..... do hereby give consent to Ms Ruth Nyaboke Nyansikera to include me in the proposed study entitled Nutritional Status of Persons Living with HIV/AIDS attending Riruta Health Centre, Kenya. I have read the information sheet and understand the aim of the study and what will be required of me if I take part in the study. The risks and benefits if any have been explained to me. Any questions I have concerning the study have been adequately answered. I understand that I can withdraw from the study at any time if I so wish without any consequences. I realize I'll be interviewed once. I Consent voluntarily to participate in this study.

Arifa ya mhojiwa wa hiari

Mimi Bwana/Bi natao ruhusa kwa Bi Ruth Nyaboke Nyansikera kunihusisha kwa utafiti : "Hali ya lishe ya watu wanaoishi na virusi vya na/au ugonjwa wa ukimwi wanaohudumiwa na Zahanati ya Riruta, nchini Kenya." Nimesoma nakala ya habari kuhusu utafiti huu na nimeelewa madhumuni ya utafiti huu na yanayotarajiwa kwangu ikiwa nitashiriki. Nimeelezwa madhara na manufaa na maswali yote niliyonayo yamejibiwa. Nimeelewa kwamba naweza kuacha kushiriki wakati wowote bila kuchukuliwa hatua yoyote. Najua nitahojiwa mara moja tu na nakubali kwa hiari kushirikishwa kwenye utafiti huu.

Respondent's Name / Jina la Mhojiwa
.....

Signature or left thumb print / Sahihi au alama ya kidole gumba (Kushoto)
.....

Date/Tarehe.....

Name of person taking consent / Jina la anayepewa ruhusa.....

Signature / Sahihi Date / Tarehe
.....

Name of Investigator /Jina la mtafiti.....

Signature / Sahihi Date / Tarehe
.....

Appendix IV: Energy and protein values of commonly consumed foods in

Kenya

	Common foods	Energy, Kcal per 100g	Protein g per 100g	Possible consumption amount per meal (g)	Nutrient output per meal	
					Energy, Kcal	Protein, g
Cereals	Whole maize meal	370	9	50	185	5
	Maize grain	370	9	50	185	5
	Rice	359	8	75	270	6
	Wheat flour (Home baking)	340	11	50	170	6
Roots and tubers	Sweet potatoes	131	6	75	98	6
	Irish/English potatoes	81	2	60	49	1
	Banana raw (matoke)	109	1	60	65	1
Animal source foods	Fish fillet	244	72	50	122	36
	Meat (beef)	180	20	75	135	15
	Chicken	163	25	75	122	19
	Egg	154	12	100	154	12
	Cow whole	73	3	200ml	150	6

	milk					
Plant source foods	Green grams	352	24	100	352	24
	Beans	347	18	100	347	18
Fruits	Avocado	128	1	100	128	1
	Banana ripe	94	1	50	47	1
	Oranges	89	1	40	36	-
	Passion	87	1	40	35	-
	Mangoes	60	1	60	36	-
	Pawpaw	32	0.4	40	12	0.2
Vegetables	Spinach	32	3	200	64	6
	Cabbage	24	2	150	36	3
	Kales (Sukumawiki)	52	4	150	73	6

Adapted from: Sehmi J. K., 1993

Appendix V: Ethical approval



Ref: KNH-ERC/ A/360

Ruth Nyaboke Nyansikera
TM 312-0002/2008
JKUAT

Dear Ruth

**RESEARCH PROPOSAL: "NUTRITIONAL STATUS OF PERSONS LIVING WITH HIV/AIDS
ATTENDING RIRUTA HEALTH CENTRE CARE CLINIC, KENYA"
(P255/08/2009)**


This is to inform you that the Kenyatta National Hospital/UON Ethics and Research Committee has reviewed and **approved** your above revised research proposal for the period 25th November, 2009 - 24th November 2010.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given. Clearance for export of biological specimen must also be obtained from KNH-ERC for each batch.

On behalf of the Committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of database that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely


DR. L. W. MUCHIRI
AG SECRETARY, KNH/UON-ERC

c.c. Prof. K.M. Bhatt, Chairperson, KNH/UON-ERC
The Deputy Director CS, KNH
The HOD, Medical Records, KNH
Supervisors: Mr. Makokha Anselimo, JKUAT
Dr. Jared Omolo, FELTP
Mr. Charles Mbakaya, KEMRI

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Email: KNHplan@Ken.Healthnet.org
November 25, 2009

Appendix VI: Research authorization

REPUBLIC OF KENYA



NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telegrams: "SCIENCETECH", Nairobi
Telephone: 254-020-241349, 2213102
254-020-310571, 2213123
Fax: 254-020-2213215, 318245, 318249
When replying please quote

Our Ref: **NCST/5/002/R/840/5**

P. O. Box 30623-00100
NAIROBI-KENYA

Website: www.ncst.go.ke

11th September, 2009

Date:

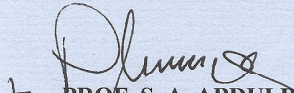
**Ruth Nyaboke,
Jomo Kenyatta University of Agriculture and Technology,
P.O.Box 62000 – 00200
NAIROBI**

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*Nutritional status of persons living with HIV attending Riruta Health Centre HIV clinic, Kenya* " I am pleased to inform you that you have been authorized to undertake your research *in Nairobi West District* for a period ending *30th June 2010*.

You are advised to report to *the District Commissioner and District Education Officer, Nairobi West District* before embarking on your research project.

Upon completion of your research project, you are expected to submit two copies of your research report/thesis to our office.


- **PROF. S. A. ABDULRAZAK Ph.D, MBS
SECRETARY**

Copy to:
The District Commissioner
Nairobi West District

The District Education Officer

Appendix VII: International classification of adult weight according to BMI

Classification	BMI(kg/m ²)	
	Principal cut-off points	Additional cut-off points
Underweight	<18.50	<18.50
Severe thinness	<16.00	<16.00
Moderate thinness	16.00 - 16.99	16.00 - 16.99
Mild thinness	17.00 - 18.49	17.00 - 18.49
Normal range	18.50 - 24.99	18.50 - 22.99
		23.00 - 24.99
Overweight	≥25.00	≥25.00
Pre-obese	25.00 - 29.99	25.00 - 27.49
		27.50 - 29.99
Obese	≥30.00	≥30.00
Obese class I	30.00 - 34.99	30.00 - 32.49
		32.50 - 34.99
Obese class II	35.00 - 39.99	35.00 - 37.49
		37.50 - 39.99
Obese class III	≥40.00	≥40.00

Source: Adapted from WHO, 1995, WHO, 2000 and WHO 2004.

Appendix VIII: Multivariate analysis for factors associated with underweight.

LOGISTIC Underweight_BMI = Diarrhea Nausea Poor appetite Q12Opportunisticinfections
Q15Historyofhospitalizationsincediagnosis Tuberculosis PVALUE=95%

First Model

Variable	Odds Ratio	95% C.I.	Coefficient	S. E.	Z-Statistic	P-Value
Diarrhea (Yes/No)	1.5498	0.2208 10.8754	0.4381	0.9941	0.4407	0.6594
Nausea (Yes/No)	2.6329	0.5414 12.8049	0.9681	0.8070	1.1996	0.2303
Poor appetite (Yes/No)	<u>3.5553</u>	<u>1.6277</u> <u>7.7656</u>	1.2684	0.3986	3.1821	<u>0.0015</u>
Q12Opportunisticinfections (Yes/No)	<u>3.2215</u>	<u>1.0572</u> <u>9.8164</u>	1.1698	0.5685	2.0578	<u>0.0396</u>
Q15Historyofhospitalizationsincediagnosis (Yes/No)	2.1382	0.7776 5.8792	0.7600	0.5161	1.4726	0.1409
Tuberculosis (Yes/No)	0.7306	0.2202 2.4244	-0.3138	0.6120	-0.5128	0.6081
CONSTANT	*	*	*	-2.1814	0.2930	-7.4456 <u>0.0000</u>

LOGISTIC Underweight_BMI = Nausea Poor appetite Q12Opportunisticinfections
Q15Historyofhospitalizationsincediagnosis Tuberculosis

Second Model

Variable	Odds Ratio	95% C.I.	Coefficient	S. E.	Z-Statistic	P-Value
Nausea (Yes/No)	3.0482	0.7398 12.5594	1.1146	0.7224	1.5428	0.1229
Poor appetite (Yes/No)	<u>3.6710</u>	<u>1.7037</u> <u>7.9097</u>	1.3005	0.3917	3.3204	<u>0.0009</u>
Q12Opportunisticinfections (Yes/No)	<u>3.2587</u>	<u>1.0731</u> <u>9.8960</u>	1.1813	0.5667	2.0844	<u>0.0371</u>
Q15Historyofhospitalizationsincediagnosis (Yes/No)	2.1217	0.7732 5.8223	0.7522	0.5150	1.4605	0.1441
Tuberculosis (Yes/No)	0.7385	0.2236 2.4393	-0.3032	0.6096	-0.4973	0.6190
CONSTANT	*	*	*	-2.1904	0.2930	-7.4744 <u>0.0000</u>

**LOGISTIC Underweight_BMI = Nausea Poor appetite Q12Opportunisticinfections
Q15Historyofhospitalizationsincediagnosis**

Third Model

Variable	Odds Ratio	95% C.I.	Coefficient	S. E.	Z-Statistic	P-Value
Nausea (Yes/No)	3.0122	0.7353 12.3396	1.1027	0.7195	1.5326	0.1254
Poor appetite (Yes/No)	<u>3.7352</u>	<u>1.7408</u> <u>8.0143</u>	1.3178	0.3895	3.3832	<u>0.0007</u>
Q12Opportunisticinfections (Yes/No)	<u>2.6259</u>	<u>1.2723</u> <u>5.4194</u>	0.9654	0.3697	2.6114	<u>0.0090</u>
Q15Historyofhospitalizationsincediagnosis (Yes/No)	2.0192	0.7518 5.4233	0.7027	0.5041	1.3940	0.1633
CONSTANT	*	*	*	-2.1924	0.2931	-7.4802 <u>0.0000</u>

LOGISTIC Underweight_BMI = Nausea Poor appetite Q12Opportunistic infections

Fourth Model

Variable	Odds Ratio	95% C.I.	Coefficient	S. E.	Z-Statistic	P-Value
Nausea (Yes/No)	2.8687	0.7116 11.5648	1.0539	0.7113	1.4816	0.1384
Poor appetite (Yes/No)	<u>3.7936</u>	<u>1.7754</u> <u>8.1061</u>	1.3333	0.3874	3.4417	<u>0.0006</u>
Q12Opportunisticinfections (Yes/No)	<u>2.9033</u>	<u>1.4326</u> <u>5.8836</u>	1.0658	0.3604	2.9576	<u>0.0031</u>
CONSTANT	*	*	*	-2.1434	0.2880	-7.4419 <u>0.0000</u>

**Underweight_BMI = Poor appetite Q12Opportunistic infections
Final Model**

Variable	Odds Ratio	95% C.I.	Coefficient	S. E.	Z-Statistic	P-Value
Poor appetite (Yes/No)	<u>4.0885</u>	<u>1.9352</u> <u>8.6380</u>	1.4082	0.3816	3.6899	<u>0.0002</u>
Q12Opportunisticinfections (Yes/No)	<u>2.9308</u>	<u>1.4529</u> <u>5.9122</u>	1.0753	0.3580	3.0032	<u>0.0027</u>
CONSTANT	*	*	*	-2.1070	0.2850	-7.3927 <u>0.0000</u>