NUTRITIONAL STATUS ASSESSMENT OF HIV-POSITIVE WOMEN ATTENDING CLINICS AT SENTINEL SITES IN AKWA IBOM STATE, NIGERIA

BY

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ABSTRACT

HIV-Positive Women (HPW) are nutritionally vulnerable and account for 60% of PLWHA in Nigeria. Adequate dietary intake has been found to improve the nutritional status of People Living With HIV/AIDS (PLWHA). Anti Retroviral Therapy (ART) is the mainstay in the management of PLWHA, but the influence of nutritional status of HPW has not been fully investigated in Nigeria. This study was designed to assess nutritional status and its association with ART use among HPW in HIV clinics at sentinel sites of Akwa Ibom State, Nigeria.

A descriptive cross sectional study involving 231 HPW selected from all four national HIV sentinel sites in Uyo (UY), Iquita-Oron (IO), Ikono (IK) and Urua-Akpan (UA) was carried out. Akwa Ibom State was purposively selected being the second highest in HIV surveillance in Nigeria and all HIV and treatment clinics at the sentinel sites were used. Systematic random sampling technique was used to select every third HPW that met criteria and had clinic appointment on each day of data collection. An interviewer-administered semi-structured questionnaire was used to collect information on socio-demographics, ART use, 24 hour dietary recall and anthropometric measurements. Dietary Intake was analysed using adapted Total Diet Assessment software, height and weight were measured with standard methods. Body Mass Index (BMI) was calculated and categorised using WHO standards. Dietary Diversity Score (DDS) derived from the 24 hour dietary intake was measured on a scale of 0-9 and a Women Dietary Diversity (WDD) tercile of ≤3, 4-5 and 6-9 were categorised as low, average and high respectively. Data was analysed using descriptive statistics, ANOVA, Chi-square tests and logistic regression at 5% level of significance.

Age of respondents was 29.7±6.8 years, 37.7% were single, 53.7% attained secondary education, 75.8% were employed and 84.4% of respondents were currently on ART. Of those currently on ART, 44.1% had been on ART for more than 52 weeks. Mean daily energy intake (2008.3±856.1 kcal) of respondents on ART was significantly higher than that of respondents not on ART (1686.0±736.5kcal). The proportion of respondents with inadequate, adequate and excess energy intakes were 45.0%, 35.9%, 19.0% respectively. The DDS of respondents using ART (4.3±0.8) was significantly higher (4.0±1.1) than those not using ART, about 80.0% respondents had average WDD tercile and respondents consumed mostly starchy staples. The BMI of respondents in UY, IO, IK and UA were 23.3±2.1kg/m^2, 21.7±3.5 kg/m^2, 24.4±4.4

kg/m^2 and 20.7±3.4 kg/m^2 respectively. Underweight occurrence among respondents using ART (8.2%) was significantly lower than those (25.0%) not using ART. The use of ART was significantly associated with normal BMI of respondents and respondents not on ART were less likely to have normal BMI (OR=0.3, CI=0.097-0.691).

HIV-positive women who used anti retroviral therapy had better nutritional status than those who did not. Adherence to anti retroviral therapy should be encouraged to maintain good nutritional status among HIV-positive women.

Keywords: HIV-positive women, Body Mass Index, Anti-retroviral therapy, sentinel sites

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CERTIFICATION

I certify that this research work titled **"Nutritional Status Assessment of HIV-positive women attending clinics at sentinel sites in Akwa Ibom State, Nigeria"** was carried out by Mendie, Esther Akpan under my supervision in the department of Human Nutrition, Faculty of Public Health, College of Medicine, University of Ibadan.

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LIST OF ABBREVIATIONS/ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AKS	Akwa Ibom State
ART	Anti Retroviral Therapy
BMI	Body Mass Index
DRI	Dietary Reference Intake
EAR	Estimated Average Requirement
EER	Estimated Energy Requirement
FAO	Food and Agricultural Organisation
FCT	Federal Capital Territory
FHI	Family Health International
FMOH	Federal Ministry of Health
HAART	Highly Active Anti Retroviral Therapy
HIV	Human Immunodeficiency Virus
HPW	HIV-positive women
HSS	HIV Sentinel Survey
IDD	Individual Dietary Diversity
IK	Ikot Ekpene
IQ	Iquita Oron
MDGs	Millennium Development Goals
MTCT	Mother to Child Transmission
NACA	National Agency for the Control of AIDS
NAIDS	Nutritionally Acquired Immune Deficiency Syndrome
NDHS	Nigeria Demography and Health Survey
PAL	Physical Activity Level
PEM	Protein Energy Malnutrition
PLWHA	People Living With HIV/AIDS
PRB	Population Reference Bureau
RDA	Recommended Dietary Allowance
REE	Resting Energy Expenditure
SAM	Severe Acute Malnutrition
SPSS	Statistical Package for Social Sciences
TDA	Total Diet Assessment

UA	Urua Akpan
UCH	University College Hospital
UI	University of Ibadan
UY	Uyo
UNGASS	United Nations General Assembly
UUTH	University of Uyo Teaching Hospital
WDDS	Women Dietary Diversity Score
WHO	World Health Organisation

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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Nutritional status is one of the key indicators for assessing the health of an individual, and the nutritional status of women is vital for their reproductive roles and more importantly in the face of HIV infection. The nutritional status of women is generally poor especially women of reproductive age in developing countries, worsened by infection with Human Immunodeficiency Virus (HIV).

Among the estimated 3.1 million people who were reported living with HIV/AIDS in Nigeria in 2010, HIV- positive women accounted for almost 60% of all adults living with HIV (NACA, 2011). The impact of Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) on individuals, households, the nation and the world at large is great as it affects the physical, social, psychological and economic wellbeing at these levels; women being the most affected (Opara, Umoh and John, 2007).

Both HIV/AIDS and nutrition play a critical role in the progression of HIV infection and some of the leading causes of progression in HIV have been noted to be nutrition related. Poor nutritional status leads to malnutrition which ultimately leads to mortality (Fawzi, Msamanga, Spiegelman and Hunter, 2005). Malnutrition has several causes ranging from increased utilisation and excretion of nutrients due to HIV infection to inadequate dietary intake as a result of lack of access to food and poor appetite but not limited to these factors (Obi, Ifebunandu & Onyebuchi, 2010).

Several studies have been carried out to highlight the relationship between HIV and malnutrition, which is synergistic, cyclic and closely linked (Piwoz and Preble, 2000, (Byron, Gillespie and Nangami, 2008; Colecraft, 2008; Katona and Katona-Apte, 2008; Gillespie and Kadiyala, 2005; and Anema, Vogenthaler, Frongillo, Kadiyala and Weiser, 2009). HIV affects nutrition by reducing food consumption, impairing digestion and nutrient absorption, causing changes in metabolism, the virus also directly attack and destroys the cells of the immune system (FHI, 2004). HIV/AIDS incidentally occurs in populations where malnutrition is already an epidemic.

A study conducted to describe the prevalence of malnutrition in HIV infected women from 11countries in sub-Saharan Africa reported a prevalence of 10.3% (Uthman, 2008). Data on prevalence of malnutrition among PLWHA provides a basis for identifying those with pre-existing malnutrition or those who are at risk of nutritional compromise in order to develop relevant support plans for nutritional care and support (Gibson, 2005).

Since the emergence of the first case of HIV/AIDS in Nigeria in 2006, there have been programmes initiated to prevent transmission, slow disease progression and prevent death, these include the advent of anti retroviral therapy (ART) and highly active anti retroviral therapy (HAART). With the ART treatment option, HIV/AIDS has become a chronic disease though not without its side effects which include the occurrence of metabolic disorders and long term co-morbidities in PLWHA (WHO, 2010, World Bank, 2007).

Treatment with ART is however not replacement for adequate nutrition and routine assessment of People Living With HIV/AIDS (PLWHA) in order to determine the type and level of nutrition intervention required (Crum-cianflone, Tejidor, Medina, Barahona & Ganesan 2008). Various methods have been used in assessing nutritional status, but the four common methods used in large surveys are Anthropometric, Biochemical, Clinical and Dietary assessment methods (Knox, Zafonte-Sanders, Fields-Gardner et al., 2003).

1.2 Statement of problem

Malnutrition remains undiagnosed in up to 70% of patients and about 70–80% of the malnourished patients enters and leaves the hospital without receiving any nutritional support and the diagnosis of malnutrition does not appear on their discharge sheet (Prins, 2010). A recent study describing the prevalence of malnutrition in HIV infected women from eleven (11) countries in sub-Saharan Africa did not show any National prevalence of HIV related- malnutrition for Nigeria (Uthman, 2008).

In developing countries such as Nigeria, it has been observed that populations are often affected by multiple nutrient deficiencies, frequently as a result of poverty and diets with little diversity (Gorstein, Sullivan, Parvanta and Begin, 2007). Dietary habits and the use of Anti Retroviral Therapy in recent times have a major role in the nutritional changes experienced by PLWHA (Johnson, Castrillón and Ospina, 2004).

Despite the nutritional recommendations for HIV-infected individuals by WHO that emphasises the critical role of adequate nutrition for the health and survival of all subjects

regardless of their HIV stage (WHO, 2003), many international donor agencies place more emphasis on the treatment of HIV with potent antiretroviral therapy (Obi, Ifebunandu and Onyebuchi, 2010), than on nutrition.

1.3 Justification

Nigeria had the largest number of people living with HIV/AIDS (2,980,000) in Africa in 2009 (UNGASS, 2010) with an estimate of 3.1million people according to the 2011 edition of the National Agency for the Control of AIDS (NACA, 2011) factsheet, while HIV infected women account for almost 60% of all adults living with HIV in Nigeria. Statistics from the 2010 National HIV sero-prevalence sentinel survey reported a national prevalence of 4.1% with Akwa Ibom State having the second highest prevalence of 10.9% (HSS, 2010).

Nutritional status assessment is vital for PLWHA and should be part of routine care (Crum-cianflone, Tejidor, Medina et al., 2008). To identify those with pre-existing malnutrition or those who are at risk of nutritional compromise as some may develop malnutrition upon admission or treatment with ART there is need for nutrition study to develop relevant support plans for nutritional care and support (Gibson, 2005). The focus of nutritional status assessment among PLWHA in early studies had been on HIV related underweight (involuntary weight loss greater than 10 percent; weight less than 90 percent estimated ideal weight or BMI less than 18.50 Kg/m^2) and wasting (Kotler, 2000; Hendricks et al, 2006) leaving out overnutrition (overweight/obesity – BMI $\geq$ 25 Kg/m^2) .

The advent of ART and Highly Active Anti Retroviral Therapy (HAART) has reduced the incidence of underweight (Kotler, 2000). A similarity in prevalence of overweight/obesity between HAART patients and the general population was established by Crum-cianflone et al., (2008). Similar studies in Nigeria showed an increase in BMI to levels similar to the general population upon treatment with HAART (Mustapha, Ehianeta, Kirim and Osungwu, 2011).

There is an increasing volume of data on the spread of HIV generated now in Nigeria and the prominent role of nutrition in HIV progression has been acknowledged too. Although its effect on the anthropometric status of PLWHA is widely reported in other countries, very little information is available on the situation in Nigeria and specifically the sentinel sites where data on the prevalence of the disease is being generated.

This study will therefore focus on the nutritional status assessment of HIV-positive women using both dietary intake assessment and anthropometric measures of body size.

1.4 Research questions

This study will seek to answer the following questions:

- What is the measure of nutrient intake and adequacy, dietary diversity and nutritional status of HIV-positive women at sentinel sites in Akwa Ibom State?
- Is there an association between ART use and nutritional status of the respondents?
- Is there an association between duration of ART use and nutritional status of the respondents?
- What are the factors associated with normal BMI of the respondents?

1.5 Main objective

The main objective of this study is to assess nutrient intake and nutritional status of HIV-positive women attending HIV clinics at sentinel sites in Akwa Ibom State - Nigeria.

1.6 Specific objectives

The specific objectives of this study are to:

1. assess nutrient intake and adequacy, dietary diversity and nutritional status of HIV-Positive Women attending HIV clinics at sentinel sites in Akwa Ibom State
2. determine the association between ART use and nutritional status of the respondents
3. determine the association between duration of ART use and nutritional status of the respondents
4. identify factors associated with normal BMI among the HPW

CHAPTER TWO

LITERATURE REVIEW

2.1 Epidemiology of HIV

2.1.1 Global trend of HIV epidemic

All over the world, the Human Immunodeficiency Virus (HIV) pandemic has remained a serious development and public health challenge and a threat to the achievement of the Millennium Development Goals (MDGs). The impact of Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) on individuals, households, the nation and the world at large is great as it affects the physical, social, psychological and economic wellbeing at these levels (Opara, Umoh and John, 2007).

The first confirmed case of HIV/AIDS in the 1980s has since spread to become a global health problem with Africa especially Sub-Saharan Africa undoubtedly bearing the largest burden of the disease since then. The fact that the virus HIV has different subtypes has made prevention and treatment more challenging over the years (UNAIDS 2009).

The global incidence of HIV infection has stabilised and begun to take a downward turn in many countries with generalised epidemics while women in sub-Saharan Africa continue to bear a disproportionate burden of the HIV epidemic in this region. A total of 2.7 million people acquired HIV infection in 2010, down from 3.1 million in 2001, contributing to the total number of 34 million people living with HIV in 2010. The number of people receiving antiretroviral therapy continues to increase, with 6.65 million people getting treatment at the end of 2010. Globally, more than 50% of the people eligible for treatment do not have access to antiretroviral therapy (WHO, 2010).

The annual number of people dying from AIDS-related causes worldwide is steadily decreasing from a peak of 2.2 million (2 100 000–2 500 000) in 2005 to an estimated 1.8 million (1 600 000–1 900 000) in 2010, however trends in AIDS-related deaths differ by the regions of the world. The introduction of ART has averted 2.5 million deaths in low and middle income countries globally since 1995 and Sub-Saharan Africa accounts for the majority of the averted deaths: about 1.8 million (WHO, 2010).

2.1.2 HIV trend in Nigeria

Nigeria records the highest number of adults of reproductive age living with HIV in sub-Saharan Africa and ranks among the highest in terms of the total number of people living with HIV (PRB, 2012). Many studies have shown that the best estimate of the prevalence of HIV among adults of reproductive age (15 – 49 years) is a measure of HIV prevalence among pregnant women (FMOH 2001). Women have been found to be the most infected and affected with HIV.

In 2003, women accounted for 48% of the population of people living with HIV in Nigeria UNAIDS, 2004. The World's women and Girls' data sheet in the PRB 2011 reported 4.4% of females of reproductive age living with HIV/AIDS by 2009 compared to their male counterparts who were 2.9% in the same year. By mid 2011, the figure had increased tremendously as an estimated 80.7 million females were report to be living with HIV, 48% of who were of the reproductive age group (15 – 49 years).

The HIV sero-prevalence survey conducted among pregnant women attending antenatal clinics at designated locations known as sentinel sites was introduced by the World Health Organisation (WHO) to determine the prevalence of HIV over a period of time (HSS, 2010). The 2011 report on the prevalence of HIV/AIDS showed an estimated 3.1million people living with HIV/AIDS (NACA, 2011), and HIV infected women account for almost 60% of all adults living with HIV in Nigeria.

It has been about 26 years since the first reported case of HIV in 1986 in Nigeria and the prevalence of the epidemic has continued to increase. The national HIV Sero prevalence report showed rates that increased from 1.8 percent in 1991 to 5.8 percent in 2001 and then declined to 5.0 percent in 2003 and further decreased to 4.4 percent in 2005 followed by a rise to 4.6 percent in 2008 and then a recent decline to 4.1 percent in 2010, with Akwa Ibom State ranking second highest having a prevalence of 10.9%. This ranks Nigeria third among the countries with the highest burden of HIV/AIDS in the world, next only to India and South Africa. (HSS, 2010; NACA, 2012).

The commencement of ART programme in Nigeria took place in 2002 with the number of sites substantially increasing by 13.5% between 2009 and 2010 (from 393 in 2009 to 446 in 2010) and then by another 10.1% to 491 sites in 2011. The uptake of ART increased with the scale up of ART sites with 63% of the uptake attributable to females (NACA, 2012).

2.2 HIV and the immune system

Several organs in the body are regarded as organs of the immune system because of the role they play in immune functions. These are thymus (T-cells), lymph nodes, spleen, appendix, bone marrow, lymphatic vessels, tonsils and adenoids and payer's patches. All these play a major role in the body's defense against diseases through a systematic process. During the first few months of infection with HIV, the body will produce an effective immune response which over time gradually becomes ineffective. The immune response to HIV occurs in two forms being cellular and humoral. The cellular involves the use of T-cells while humoral involves the production of specific antibodies (WHO, 2003).

In this case specific antibodies are produced by the body to fight HIV like is done for all other infections. The HIV virus disrupts this immune response process by converting the CD4+ T-cells into new generation of viruses which are slightly different. These cells are destroyed and consequently aid the HIV replication process indicated as viral load. This eventually leads to a continuous destruction of the CD4+ cells to a point when they are so depleted and HIV levels increased, giving rise to the development of opportunistic infections; an abnormality facilitated by the infection with HIV.

2.3 The link between Nutrition and HIV/AIDS

2.3.1 Vicious cycle of malnutrition and HIV

Malnutrition poses a serious danger for People Living with HIV/AIDS (PLWHA) and this leads to rapid progression from HIV to AIDS (FANTA, 2003; Duggal, Chugh & Duggal, 2012). The risk of malnutrition increases significantly with progression of the infection and both HIV and malnutrition are capable of causing significant damage to the immune system, showing that the problem of malnutrition among PLWHA is interwoven (Hailemariam, Bune & Ayele, 2013).

It has been established by Katona and Katona-Apte (2008) that malnutrition can lead to infections while infections on the other hand can lead to malnutrition by compromising nutritional status, especially in HIV infection where immune status has already been compromised (Piwoz & Salam, 2004). And according to Duggal et al., (2012), the immune compromise as a result of malnutrition is often referred to as Nutritionally Acquired Immune Deficiency Syndrome (NAIDS). This explains the vicious cycle that exists between nutrition and HIV and is supported by the existence of baseline malnutrition even before

infection with HIV in majority of PLWHA especially in developing countries (Sztam, Fawzi & Duggan, 2010) such as Nigeria.

Malnutrition in HIV/AIDS can occur at any stage during the course of the infection and has been observed to be a common complication in HIV infection and there are different factors that can be responsible for malnutrition in HIV. These may occur singly or together in complex forms (Xuereb, 2005).

In situations where good nutritional status is not maintained or nutritional status is not improved for PLWHA, a cycle of progression from bad nutrition arising from HIV infection to increased nutritional needs occurs. Nutritional deficiencies affect immune functions that may influence viral expression and replication, leading to progression of the disease while HIV affects the production of hormones which are involved in the metabolism of carbohydrates, proteins and fats (FHI, 2004).

The occurrence of malnutrition takes different forms and can be seen both in children and adults. Malnutrition can take the form of Protein Energy Malnutrition (PEM) also known as Macronutrient deficiency which occurs as stunting, underweight and wasting or Severe Acute Malnutrition (SAM) in children and low Body Mass Index (BMI) in adults, but a study was conducted to show that increased BMI was not altogether bad for PLWHA as a positive association existed between increased BMI and a lower rate of progression of HIV disease (Jones, Hogan, Synder et al., 2003). Micronutrient deficiency is another form of malnutrition which is often referred to as "hidden hunger" as it is not easily recognised except in severe cases (Piwoz, 2006; and FHI, 2004).

2.3.2 Effect of Nutrition on HIV

Adequate nutrient intake and improved nutritional status for HIV-Positive women is neither a cure for AIDS nor a means of prevention for HIV infection, but an intervention strategy for the delay of progression from HIV infection to the development of AIDS. Also, it can improve the quality of life of HIV-Positive women while prolonging their lifespan and reducing the occurrence of opportunistic infections.

This is an important component of care and support for PLWHA which often times is been undermined in many HIV/AIDS programmes in Nigeria. As a result, PLWHA are prone to malnutrition due to a number of factors including lack of access to food, poor appetite, and poor preparation of food leading to inadequate dietary intake and malabsorption, increased

utilisation and excretion of nutrients due to HIV infection (Obi et al., 2010). The goal of nutrition care and support of PLWHA has been to prevent malnutrition and wasting, achieve or maintain body weight and strength, enhance ability to fight opportunistic infections, possibly delay disease progression, promote effectiveness of ART and improve the quality of life (ECSA-HC, 2008).

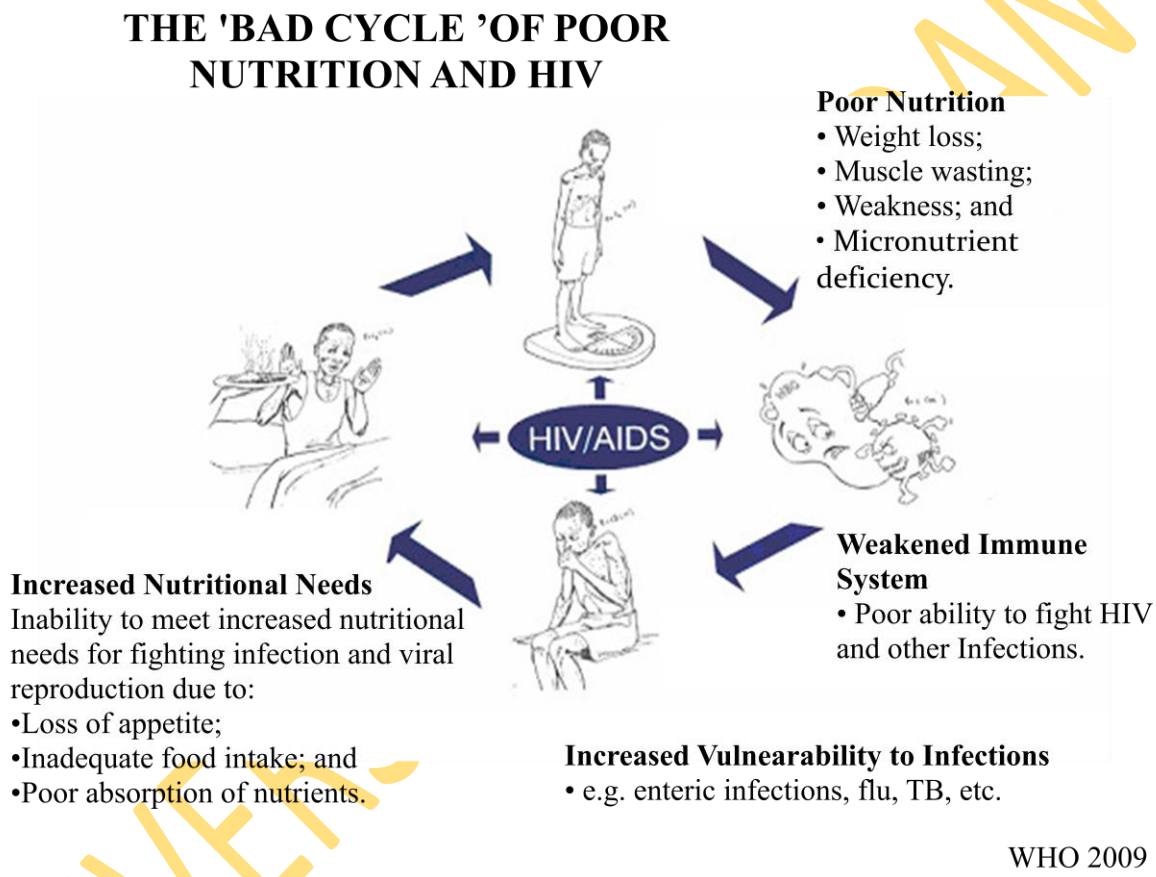

Figure 2.1 The bad cycle of malnutrition and HIV

2.3.3 Effect of HIV on Nutrition

In developing countries such as Nigeria, HIV infection has been observed to have many nutritional effects. Reports from several studies (Mpontshane, Broeck, Chhagan et al., 2008; Wanke & Kotler, 2004; Kotler, 2000), have these nutritional effects to include an increase in resting energy expenditure (REE) (especially with opportunistic infections), reduced dietary intake, neuropsychological effects such as depression, anorexia, poor absorption due to gastrointestinal tract infections, poor quality of life, low work output, and low dietary diversity.

Many of the conditions associated with HIV/AIDS affect food intake, digestion and absorption, while others influence the functions of the body. The relationship between HIV and nutrition is complicated by the fact that the virus directly attacks and destroys the cells of the immune system. The list on the effects of HIV on nutrition is elaborate but for ease and better understanding of the subject, it has been summarised into three (3) outstanding subheadings which have been described severally to be interlinked with each other; and these are the fact that:

(1) the symptoms that cause decreased food consumption are associated with HIV,
(2) HIV interrupts digestion and consequently decreased nutrient absorption,
(3) the body's metabolic process involving transportation, use, storage and excretion of nutrients is altered by HIV.

There are several symptoms and illnesses that have nutritional consequences, capable of causing malnutrition and are caused by or associated with HIV infection and commonly precipitate appetite loss, weight loss and sometimes AIDS related deaths. Some of these are anaemia, nausea and frequent vomiting, thrush, fever, anorexia and diarrhoea (WHO, 2003).

2.3.4 Nutritional implication of some symptoms caused by HIV/AIDS

Anaemia: this indicates low level haemoglobin level in the blood and results from inadequate number or quality of red blood cells that are important for carrying oxygen. Iron deficiency anaemia from poor dietary intake and/or absorption of iron account for approximately 50% of anaemia worldwide. Anaemic people are often tired, weak and lethargic and PLWHA who are anaemic will become less productive. This could lead to diminished production of food and ultimately food insecurity.

Nausea and frequent vomiting: this could occur as side effect of the drugs used to treat HIV/AIDS or the opportunistic infections which may cause reduced appetite or voluntary reduced food intake by PLWHA for fear of vomiting. Vomiting on the other hand lowers the amount of nutrient available for the body since in most cases food that is eaten is vomited.

Thrush: this is a fungal infection that is caused by *Albicans* and is common among PLWHA. It is characterised by whitish spots on the inside of the tongue, mouth, intestine, vagina and anus. Oral sores resulting from thrush can be painful when eating especially hot

or spicy food. This may lead to loss of appetite, reduced food intake, mal absorption and invariably weight loss.

Fever: this occurs when body temperature rises above 37℃; it is usually difficult to determine the cause of the fever experienced by PLWHA. Fever increases energy expenditure and if not compensated for with increased energy intake can lead to weight loss.

Anorexia: this is also referred to as loss of appetite and can occur sometimes as a result of fever or side effect of some of the drugs taken by PLWHA. In this case PLWHA are unable to eat well enough to maintain therefore leading to weight loss.

Diarrhoea: frequent stooling that lasts for more than 14 days which is often seen among PLWHA leads to loss of nutrients and water, appetite is reduced leading to poor nutrient absorption. If not properly managed can lead to malnutrition and consequently death can occur.

2.4 ART and Nutrition

The widespread availability of successful antiretroviral therapy means a reduction in both new AIDS cases and AIDS death in countries with high ART coverage (WHO, 2007). Adherence to antiretroviral treatment is critical for suppression of viral replication, reduced destruction of CD4 cells, prevention of viral resistance, promotion of immune reconstitution and slowed disease progression (Berhe, Tegabu & Alemayehu, 2013). The scale up of intervention programmes in low income countries by donor agencies and other charity organisations to combat the spread of HIV includes making ART available free for PLWHA.

This is critical to long-term survival in HIV infection, but to achieve optimal outcomes, issues such as energy expenditure and food insecurity highlight the need for comprehensive services to address all contributors to nutritional status (Obi et al, 2010 & Sztam et al, 2010). However, malnutrition has been identified to be associated with mortality even with the introduction of ART which is considered effective in improving the nutritional status of PLWHA (Jerene, Endale, Hailu & Lindtjorn, 2006).

PLWHA in resource limited settings lack access to adequate nutrition and this poses additional challenges to the success of ART, making them prone to malnutrition due to inadequate dietary intake, appetite loss, nutritional losses, metabolic changes, and increased

requirements for both macro and micro-nutrients (World Bank/UNAIDS 2009, Castleman, Seumo-Fosso & Cogill, 2004; Tiyou, Belachew, Alemseged & Biadgilign, 2012). The 2010 WHO recommendations on antiretroviral therapy however reflect evidences that early initiation of ART significantly reduces morbidity and mortality and also has important preventive benefits (WHO, 2010).

2.4.1 The ART – Nutrition interaction

ART serves as a nutritional intervention given its ability to interrupt the lifecycle of HIV, through the reduction of opportunistic infections, boosting of the immune system and consequently improving the nutritional status of PLWHA. ART improves weight, BMI and other nutritional indicators thereby reducing morbidity and mortality (Verweel, van Rossum & Hartwig et al., 2002), although the use of ART alone is not enough to benefit the nutritional status of PLWHA but a combination with adequate dietary intake/practices (Jerene et al, 2006).

Side effects of medications can affect food intake and nutrient absorption and can also reduce adherence to medications. Proper nutrition management of side effects can help minimize these effects and improve adherence to treatment. Ultimately, interactions between drugs and food and nutrients can result in poorer health and nutritional status if they are not addressed. In order to ensure successful ART treatment, food and nutrition implications of ART should be understood and appropriate responses identified and implemented.

2.4.2 Types of food-drug interaction

1. **Food can affect drug efficacy:** Some foods can affect the absorption, metabolism, distribution, or excretion of certain drugs either positively or negatively. Whether and how food will affect drug efficacy differs from one drug to another. Dietary responses to improve the efficacy of a drug may include taking the drug with food, on an empty stomach, or with or without certain types of foods.

2. **Drugs can affect nutrient utilisation:** Certain drugs affect nutrient absorption, metabolism, distribution, or excretion. Drugs that inhibit or enhance nutrient utilisation may have negative effects on nutritional status. Dietary management may require either increasing food intake, taking a nutrient supplement to compensate for the nutrient

affected, or reducing nutrient intake if the metabolite produced can affect health negatively.

3. **Drug side effects can affect food intake or nutrient absorption:** Both modern and traditional medications can cause side effects that negatively affect food intake and nutrient absorption. Side effects such as changes in taste, anorexia, nausea, bloating and heartburn, and constipation may lead to reduced food intake, while vomiting and diarrhoea can cause poor nutrient absorption. Reduced food intake and poor nutrient absorption can contribute to weight loss, malnutrition, and wasting.

4. **The combination of certain drugs and foods can create unhealthy side effects:** Combinations of specific drugs and food can cause unhealthy side effects. Such food should not be taken at the same time as these drugs. Consumption of alcohol while taking the ART can cause inflammation of the pancreas and should be avoided. Alcohol should also be avoided while taking the anti-tuberculosis medication as this combination may increase the risk of inflammation of the liver (ECSA-HC, FANTA & LINKAGES, 2008).

The main kinds of interactions between drugs and food and nutrition are:

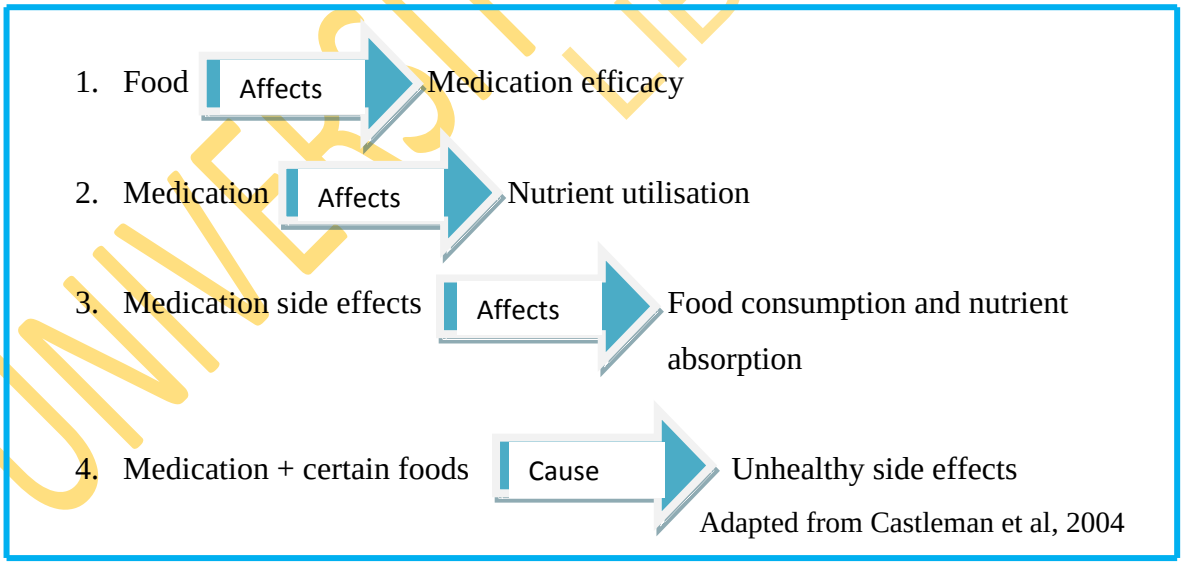

Figure 2.2 Types of food-drug interaction

2.5 Nutrient requirement for Women of reproductive health

Specific recommended intakes to meet the needs of individuals at different stages of life. Reference intakes are required to assess the diet intakes of individuals or population and to plan diets too. The reference intake can be described as recommended dietary allowance, which is the average daily nutrient intake of individuals or estimated average requirement (EAR) which is the primary reference for assessing the adequacy of estimated nutrient intakes (Otten, Hellwig & Meyers, 2006).

For healthy individuals, the reference intake depends on a number of factors that include sex, age, life stage; activity level and health status. For women, pregnancy and lactation are often considered. Dietary reference intakes of some nutrients for women of reproductive age who are neither pregnant nor lactating according to the Food and Nutrition Board, Institute of Medicine, National Academies; are as follows:

Carbohydrate	100g/d
Protein	38g/d
Vitamin A	500µg/d
Vitamin C	60mg/d
Vitamin E	12mg/d
Thiamin	0.9mg/d
Riboflavin	0.9mg/d
Niacin	11mg/d
Vitamin B_6	1.1mg/d
Folate	320µg/d
Vitamin B_{12}	2.0µg/d
Iron	8.1mg/d
Selenium	45µg/d
Zinc	6.8mg/d.

The DRIs and estimated energy requirements (EER) for men and women 30 years of age have been presented according to height, physical activity level (PAL) and BMI category. It is derived using the following regression equation:

Adult man: EER = 662 – 9.53 × age (y) + PA × (15.91 × wt (kg) + 539.6 × ht (m))

Adult woman: EER = 354 – 6.91 × age (y) + PA × (9.36 × wt (kg) + 726 × ht (m))

Table 2.1 DRIs and estimated energy requirements (EER) for men and women 30years of age

Height (m/in)	PAL	EER, Men (kcal/day) for BMI		EER, Women(kcal/day) for BMI	
		18.5 kg/m^2	24.99 kg/m^2	18.5 kg/m^2	24.99kg/m^2
1.50/59	Sedentary	1,848	2,080	1,625	1,762
	Low active	2,009	2,267	1,803	1,956
	Active	2,215	2,506	2,025	2,198
	Very active	2,554	2,898	2,291	2,489
1.65/65	Sedentary	2,068	2,349	1,816	1,982
	Low active	2,254	2,566	2,016	2,202
	Active	2,490	2,842	2,267	2,477
	Very active	2,880	3,296	2,567	2,807
1.80/71	Sedentary	2,301	2,635	2,015	2,211
	Low active	2,513	2,884	2,239	2,459
	Active	2,782	3,200	2,519	2,769
	Very active	3,225	3,720	2,855	3,141

For each year below 30, add 7kcal/day for women and 10 kcal /day for men. For each year above 30, subtract 7kcal/day for women and 10kcal/day for men (National Academy of sciences, 2004).

2.5.1 Nutrient requirement for PLWHA

The WHO has recommended the need for dietary modifications to be individualised according to need (WHO, 2003) and in the case of HIV/AIDS infection, several nutrients play important roles in the link between nutrition and HIV and these key nutrients have been identified to include Macronutrients (Carbohydrates, Protein, Fats) and Micronutrients (Vitamins and Minerals). Vitamins and Minerals have been found to be important in the fight against HIV because of the roles they play in cell differentiation, enzymatic processes, immune system reactions and other body functions.

The report of a WHO technical consultation on nutrient requirements for PLWHA showed that energy requirements be increased by 10% and 20 - 30% during asymptomatic HIV and secondary infections respectively in order to maintain body weight and physical activity.

Vitamins and minerals that have been associated with adverse outcomes include vitamins A, B_1, B_6, B_{12}, C, E, Folate, Selenium and Zinc; however the Protein and micronutrient requirements remain the same as those for non-HIV-infected individuals of the same sex, age and physical activity both during asymptomatic and symptomatic phase of the infection (WHO, 2003; Piwoz, 2010; FMOH, 2011; ECSA-HC, 2008).

Table 2.2: Roles and sources of different Vitamins and Minerals

Nutrient	Its Role	Sources
Vitamin A	Required for maintenance of epithelial cells, mucous membranes and skin. Needed for immune system function and resistance to infections. Ensures good vision and needed for bone growth.	Full-cream milk (when fortified), cheese, butter, red palm oil, fish oil, eggs, liver, carrots, mangoes, papaya, pumpkin, green leafy vegetables, yellow sweet potatoes.
Vitamin B_1 (Thiamine)	Used in energy metabolism, supports appetite, and central nervous system functions.	Whole grain cereals, meat, poultry, fish, liver, milk, eggs, oil, seeds, and legumes.
Vitamin B_2 (Riboflavin)	Used in energy metabolism, supports normal vision, health and integrity of skin.	Milk, eggs, liver, fish, yogurt, green leaves, whole-grained cereals, and legumes.
Vitamin B_3 (Niacin)	Essential for energy metabolism, supports health and integrity of skin, nervous and digestive system.	Milk, eggs, meat, poultry, fish, peanuts, whole-grained cereals, unpolished rice.
Vitamin B_6	Facilitates metabolism and absorption of fats and proteins, converts tryptophan to niacin, helps make red blood cells. Some TB drugs cause B_6 deficiency.	Legumes (white beans), potatoes, meats, fish, poultry, shellfish, watermelon, oil seeds, maize, avocado, broccoli, green leafy vegetables. Alcohol destroys vitamin B_6.

Folate (folic acid)	Required for synthesis of new cells, especially red blood cells and gastrointestinal cells.	Liver, green leafy vegetables, fish, legumes, groundnuts, oil seeds.
Vitamin B_{12}	Required for synthesis of new cells, helps to maintain nerve cells. Works together with folate.	Meat, fish, poultry, shellfish, cheese, eggs, milk.
Vitamin C	Helps the body to use calcium and other nutrients to build bones and blood vessel walls. Increases non-haeme iron absorption. Increases resistance to infection and acts as an antioxidant. Important for protein metabolism.	Citrus fruits: baobob, guava, oranges and lemons; cabbage, green leaves, yams, tomatoes, peppers, potatoes. Cooking plantains, and fresh milk. Vitamin C is lost when food is cut up, heated, or left standing after cooking.
Vitamin D	Required for mineralisation of bones and teeth.	Produced by skin on exposure to sunshine; milk, butter, cheese, fatty fish, eggs, liver.
Vitamin E	Acts as an antioxidant. Protects cell membranes and metabolism, especially red and white blood cells. Protects vitamin A and other fats from oxidation. Facilitates resistance against diseases, particularly in lungs.	Green leafy vegetables, vegetable oils, wheat germ, whole-grain products, butter, liver, egg yolk, peanuts, milk fat, nuts, seeds.
Calcium	Required for building strong bones and teeth. Important for normal heart and muscle functions, blood clotting and pressure, and immune defenses.	Milk, yogurt, cheese, green leafy vegetables, broccoli, dried fish with bones that are eaten, legumes, peas.
Zinc	Important for function of many enzymes. Acts as an anti-oxidant. Involved with making genetic material and proteins, immune reactions,	Meats, fish, poultry, shellfish, whole grain cereals, legumes, peanuts, milk, cheese, yogurt, vegetables.

	transport of vitamin A, taste perception, wound healing, and sperm production.	
Selenium	Acts as an antioxidant together with vitamin E. Prevents the impairing of heart muscles.	Meat, eggs, seafood, whole grains, plants grown in selenium rich soil.
Magnesium	Important for building strong bones and teeth, protein synthesis, muscle contraction, transmission of nerve impulses.	Nuts, legumes, whole grain cereals, dark green vegetables, seafood.
Iodine	Ensures the development and proper functioning of the brain and of the nervous system. Important for growth, development, metabolism.	Seafood, iodized salt, plants grown in iodine-rich soil.

Source: Piwoz & Prebel, 2000

2.5.2 Macronutrient and HIV infection

An increased demand for energy and resting energy expenditure accompanied by low intake have been observed as the major cause of weight loss among PLWHA. This therefore explains the need for a 10% increase in energy intake for asymptomatic adults and 20% - 30% higher than that required in non infected adult in symptomatic adults. Energy requirement increases majorly due to elevations in Resting Energy Expenditure (REE).

There is currently no sufficient data and evidences to support the need for increased protein and total fat intake to otherwise higher levels than normal requirements because of HIV infection (WHO, 2003). However, studies have reported the effect of macronutrient supplementation on ART adherence, CD4 count and weight gain among HIV infected adults as significantly positive (Tirivayi, Koethe & Groot, 2012).

2.5.3 Micronutrients and HIV infection

Studies have shown the need for micronutrient in immune response during infection, lower blood levels of micronutrient is particularly risky in HIV infection as could lead to mortality due to rapid progression. The introduction of ART notwithstanding, micronutrient

deficiency is still common among PLWHA (Faintuch, Soeters & Osmo, 2006; Burgin, Nichols & Dalrymple, 2008). HIV infected persons are encouraged to consume diverse diets, but micronutrient supplementation is required to achieve the recommended dietary allowance (RDA) in order to boost immunity. There are evidences that supplementation with some micronutrients improved immunity and pregnancy outcomes. Micronutrient supplementation also increased CD4 count among respondents in the United States. (Kaiser, Camp, Ondercin, Leoung, Pless & Baum, 2006)

Some studies conducted among HIV infected pregnant women in Tanzania and among HIV infected adults in Cape Town – South Africa, reported an association between vitamin A and CD4+ T-cell count and a deficiency of this vitamin (Mehta, Spiegelman, Aboud, Giovannucci, Msamanga, Hertzmark, Mugusi, Hunter & Fawzi, 2010; Visser, Maartens, Kossew & Hussey, 2003).

An assessment of sero-positivity in newborns of HIV infected pregnant women showed high mother to child transmission (MTCT) rates in women who had Vitamin A deficiency.
Studies have been carried extensively to show the existence of micronutrient deficiency among HIV infected persons, also emphasis on the need for micronutrient rich diets among these individuals (Nunnari, Coco, Pinzone, Pavone, Berrett, Rosa, Schnell, Calabrese, Cacopardo, 2012). On the other hand, other studies have shown an association between decreased diarrhea and micronutrient supplementation (Mda, Raaij, Villiers, MacIntyre, Kok, 2010).

2.6 Effect of HIV on Nutritional status of PLWHA

The interaction of HIV/AIDS with nutritional status has been a distinguishing characteristic of the disease course since the earliest days of the epidemic according to the report of the WHO consultation on nutrition and HIV/AIDS in Africa (WHO, 2003).

2.6.1 Nutritional status assessment

Among PLWHA, screening for nutritional risks and monitoring nutritional status should be an ideal component of management of HIV and there are four common methods that can be used in carrying out nutritional status assessment in large surveys.
Anthropometric assessment which is a noninvasive procedure for assessing body composition, body size, growth and other changes relating to nutritional status. It involves

the measurement of body weight, height, Body Mass Index (BMI), waist circumference etc. Anthropometry is a key component of nutrition status assessment in children and adults.

Anthropometric data are used to evaluate health and dietary status, disease risk, and body composition changes that occur over the adult lifespan. It is used by researchers in diverse health disciplines such as cardiovascular health, gerontology, nutrition and occupational health to examine health status. In the United States, data from anthropometric measurements have been used to track growth and weight trends in the population for more than thirty years (Hedley, Ogden, Johnson, Carroll, Curtin, Flegal 2004)

In the light of the high prevalence of malnutrition, it is important to mention that the classification of nutritional status by BMI has been suggested by the World Health Organisation as underweight (<18.50 Kg/m^2), normal weight (18.50 – 24.99kg/m^2), overweight (25.00 – 29.99kg/m^2); obesity (30.00 – 39.99kg/m^2) and morbid obesity (≥ 40.00kg/m^2), (WHO, 2004).

Although much of the attention today is on overweight and obesity, data can also be used to track trends in underweight which may occur due to a variety of factors, such as: poor nutrition and eating habits, substance abuse, chronic illness, medication therapy, surgical procedures, and other health problems including HIV (Hedley et. al., 2004).

Biochemical assessment is another method which involves laboratory analysis of some biochemical and metabolic parameters and comparing with standard values.
Clinical assessment involves the use of physical signs that are related with Vitamin and micronutrient deficiencies as well as malnutrition in general.
Dietary assessment involves the measurement of dietary intake, food consumption and frequency at individual and household levels (Knox, Zafonte-Sanders & Fields-Gardner et al., 2003).

Weight loss in people living with HIV/AIDS has been linked with decreased survival and wasting and weight loss among PLWHA had been the focus in earlier studies, but Studies have also shown an inverse relationship between Body Mass Index (BMI) and progression to death (Shor-Posner, Campa & Zhang et al., 2000; Tang, Forrester & Spiegelman et al, 2002).

Interestingly, recent studies have reported changes in the nutritional profile of PLWHA and overweight and obesity to be more prevalent than underweight especially with the initiation of ART to a level that is unseemly different from that of the general population (Amorosa, Synnestvedt & Gross et al., 2005; Jaime, Florindo, Latorre & Brasil et al., 2004; Hendricks, Mwamburi, Newby & Wanke 2008, and Leite & Sampaio, 2008). The changes experienced in the nutritional profile of PLWHA have been reportedly linked with not only their use of ART but their dietary practices also, and this further explains the need for routine nutritional assessment as part of care and management for this target group (Johnson, Castrillon & Ospina, 2004).

24hr recall

This is a detailed description of all foods and beverages and supplements consumed in the previous 24-hour period. It is one of the strongest methods for dietary assessment of nutrient adequacy among diet records and quantitative diet histories. Assessment of dietary adequacy is only one component of a nutritional status assessment and in order to provide a valid assessment of nutritional status, 24hr diet intake data are combined with clinical, biochemical, or anthropometric information (Otten, Hellwig & Meyers, 2006)

Dietary Diversity

This is the consumption of a wide variety of foods from nutritionally different food groups in a bid to meet the recommended intake for nutrients (Kennedy, Ballard & Dop, 2011). Dietary diversity is an essential element of food-based approaches to achieve nutrient requirement. The measurements of dietary diversity can be used to determine different forms of nutrition security. The measure of population level or Household dietary diversity can be used for monitoring and impact evaluation of existing intervention programmes (WHO 2008). It can also be used as an indicator of diet quality as well as provide a picture of the nutritional status of an individual, household or community (Kennedy, Ballard & Dop, 2011).

Consumption of diverse diets has been found to increase the likelihood of meeting nutrient requirement and is positively associated with nutritional status (Schaetzel, 2012). At individual level, a significant correlation between either an individual count of food items consumed over a reference period or a dietary diversity score and nutrient adequacy ratio for energy and individual micronutrients have been reported (Arimond, Wiesmann & Becquey

et al., 2010; Ahn, Engelhardt & Joung, 2006; Mirmiran, Azadbakht, Esmaillzadeh & Azizi, 2004).

Diverse diets have therefore been found to be positively associated with nutritional status at individual, household and community levels, evidenced by association between the consumption of diverse diet with a low prevalence of underweight. Also, some studies have found a high correlation between a diverse diet and nutrient adequacy among adults and adolescents (Bezerra & Sichieri, 2011; Foote, Murphy, Wilkens, Basiotis & Carlson, 2004).

Food guidelines suggest diverse diets as a better way to achieving good nutritional status and a good indicator of diet quality (FAO, 2011, Wirt & Collins, 2009). The reverse is however the case in most resource poor settings in developing countries as studies conducted in South Africa and Kenya showed that the most predominantly consumed food was from the starchy staples group consisting of roots, cereals and tubers (Steyn et al., 2006; Ndahi, 2010).

Dietary diversity is measured using dietary diversity score, which is the total number of food groups consumed over a 24 hour reference period (Schaetzel, 2012). Dietary diversity score (DDS) is reported as number of food groups consumed over a period of time, although there are no universally accepted food groups to be counted in the scores; dietary assessment still provide indirect measure of the adequacy of nutrients (both micro and macro nutrients) contained in diet.

Some food groups in the dietary diversity questionnaire are combined into a single food group to create the women dietary diversity score (WDDS). The potential score range is 0-9 for WDDS (not 0-16 which is the number of questions in the questionnaire before aggregation into groups to create each score). The food groups considered in the score for the WDDS put more emphasis on micronutrient intake (Hoddinott & yohannesy, 2002).

Dietary diversity scores are often reported as means, but in order to know which food groups are predominately consumed at different levels of the scores, the scores can be categorised as lowest, medium and high dietary diversity for ≤ 3 food groups, 4 and 5 food groups and ≥ 6 food groups (Arimond, Torheim, Wiesmann, Joseph & Carriquiry, 2009).

CHAPTER THREE

METHODOLOGY

3.1 Study design

A descriptive cross sectional design was used in this study.

3.2 Study area

The study was carried out in Akwa Ibom State, located in the South Southern part of Nigeria, created on September 23, 1987 from the old Calabar province. It is also referred to as the land of promise, having an area of 6,900sq.km and is bounded by Cross River and Imo states on the north, the Atlantic Ocean on the south and Rivers and Imo states on the south west. There are 31 local government areas with Uyo as the capital city and the main ethnic groups being Ibibio, Annang and Oron. A population of 4 million people was estimated in 2006 and the people are mainly farmers, craftsmen and merchants (www.aksgonline.com).

As part of the HIV sero-prevalence sentinel survey, four sites Uyo (St. Luke's hospital, Anua), Urua-Akpan (St. Mary's hospital), Ikono (General Hospital, Ikot Ekpene) and Iquita–Oron (General Hospital) were selected in Akwa Ibom state to participate in the survey. The 2010 national HIV sero-prevalence sentinel survey report showed Akwa Ibom to be second highest in the country with a prevalence of 10.9% (FMOH 2010). A tertiary institution in the state, University of Uyo Teaching Hospital (UUTH) had been selected by the Federal Government of Nigeria as a regional centre for distribution of subsidised Anti-Retroviral Treatment (ART) providing services to Akwa Ibom, Cross River, Rivers and Bayelsa states (Opara et al, 2007).

3.3 Study population

The respondents for this study were HIV-Positive women of reproductive age (15–49 years) attending HIV clinics at the sentinel sites in Akwa Ibom State.

3.3.1 Inclusion criteria

Non pregnant, post pubertal but pre menopausal women between age 15 and 49 years who were HIV positive both receiving ART and not receiving ART, attending HIV clinic but not diagnosed with AIDS (from medical records), self identified as not taking any contraceptive and not breastfeeding were included in the study after informed consent.

3.3.2 Exclusion criteria

Pregnant, pre pubertal and post menopausal women age 0 – 14 years and above 49 years respectively, who are HIV negative or HIV positive but diagnosed with AIDS (from medical records), self identified as taking contraceptives and breastfeeding, were not eligible to take part in the study and so were not included. Also women who met the inclusion criteria but did not consent to taking part in the study by way of oral/written informed consent were excluded from the study.

3.4.1 Sampling technique

A four-stage sampling technique was adopted in selecting participants for this study.

Stage 1: Akwa Ibom state was purposively selected as the study location being the state with the second highest prevalence of HIV (10.9%) in the country according to the 2010 National HIV sero-prevalence sentinel report (FMOH, 2010).

Stage 2: Total sampling of all four sentinel sites in the state were used as the study sites, the usual sites for National HIV sentinel survey (FMOH, 2010).

Stage 3: All HIV clinics operating in the sentinel sites or providing HIV Services to the sites were selected for the study.

Stage 4: In each HIV clinic, systematic random sampling method was used to select every third woman of reproductive age on the list of PLWHA clinic appointment for that day.

Only selected PLWHA were eligible for participation in the study but where selected PLWHA was not willing to participate, the next PLWHA on the list was selected.

3.4.2 Sample size determination

The sample size was estimated using the Kish Leslie formula for cross sectional studies:

$n = \frac{Z\alpha^2 P(1-P)}{d^2}$ (Oburu, 2009)

Where:

- n is the minimum sample size required
- Zα is the standard normal deviate corresponding to an α level of 5% (confidence level of 95% and standard value of 1.96)
- P is the pooled prevalence estimates of HIV-related malnutrition in sub-Saharan Africa - 10.3% (Uthman, 2008)
- 1 – P = (1-10.3%)
- d is level of precision (5% level of error)

Adjusting for a non response rate using the formula:

$Q = \frac{1}{1-f}$ Where f is the estimated non-response rate.

Due to the vulnerability of the study population, a non response rate of 30% was used for this study. The adjusted sample size was therefore estimated using the formula:

$$\frac{1}{1-f} X \frac{Z\alpha^2 Pq}{d^2}$$

$$= \frac{1}{1-0.3} X \frac{1.96^2 x\ 0.10\ (1-0.10)}{0.05^2} \quad = 1.43 \text{ X } 138.30$$

= 197.77 approximately 198 respondents.

This was increased to 250 to accommodate data loss due to cleaning, biases and incomplete data. After cleaning, 231 questionnaires were left complete and used for analysis.

3.5 Training of Research Assistants and pretest of survey instruments

Four female research assistants (RAs) were recruited for the study. They were recruited based on a minimum of secondary education and fluency in English, Efik languages and the local dialects. The research assistants were trained for two days. A time table was drawn for this period, with each day lasting about 4 hours (10a.m-2p.m).

The training commenced with self-introduction of the trainees and the investigator, followed by a background of the study and the objectives. Contents of the training focused on interview techniques, interpersonal and communication skills. The research instrument was introduced and demonstrations and role plays used to transfer skills. A copy of the instrument was given to each trainee to take home and read through for better understanding with the intention that issues generated be discussed the next day.

After the training, a visit was made to the General Hospital, Ikono for a pretest of the instrument. The RAs were involved in the pretest of the questionnaire in order to:

1. ascertain respondents' level of understanding of the research instrument
2. ascertain willingness of PLWHA to participate in the study
3. familiarise research assistants with the nature of research and correct possible lapses during training of research assistants
4. ascertain duration required to administer the questionnaire that will be convenient for PLWHA to participate in the study

3.6 Data collection/Research instrument

A semi-structured, interviewer-administered questionnaire was administered by trained Research Assistants to 231 respondents in Uyo (UY), Ikot Ekpene (IK), Iquita-Oron (IQ) and Urua-Akpan (UA) who were selected to take part in the study after the objectives of the study had been explained to them and voluntary informed consent obtained. The instrument was made up of six (6) sections that were administered using either English Language or Efik on request by respondents.

3.6.1 Socio demographic and economic questionnaires

This questionnaire was interviewer administered and was used to collect information about the socio demographic characteristics of respondents. This questionnaire included information such as age, highest education attained (education categories here refers to the highest level of education attained by respondent whether or not it was completed and this was categorised as no formal education, primary, secondary and tertiary), religion, ethnic group, employment status, occupation categorised according to the NPC (2008) format as professional/technical/managerial (civil servants, public servant, photography, teaching, private nursing and volunteer), sales and services (food vending and petty trading), skilled/unskilled manual labour (apprentice, hairdressing, tailoring, contractor and self employed), agriculture and other (housewife, applicant, student), marital status, average monthly income etc. this questionnaire is attached as Appendix Two.

3.6.2 Treatment status

The questionnaire section on treatment status was used to collect information about current treatment status and duration of treatment.

3.6.3 Anthropometry

Height Measurement

Respondents' heights were measured in centimeters (cm) without shoes and hair accessories using a stadiometre to the nearest 0.1cm (RGZ-160, Med-Lab Scientific Company England QTY).

Body weight

The weight of respondents was measured in kilogrammes (kg) using a calibrated analogue weighing scale which was checked at zero before and after each measurement. Participants' weight was recorded to the nearest 0.1kg (B-68, Ramson surgical co.).

Body Mass Index (BMI)

Respondents' BMI was calculated when the respondents' weight (kg) was divided by height^2 (m^2) represented by the formula:

$$\frac{\text{weight (kg)}}{\text{Height } (m^2)}$$

The WHO classification of adult underweight, overweight and obesity according to BMI was used to categorise the anthropometric outcomes of respondents (WHO, 2004).

Table 3.1: International Classification of adult underweight, overweight and obesity according to BMI

Classification	**BMI(kg/m²)**	
	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 weight	**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 2004

3.6.4 Dietary intake

24 hour dietary recall

A 24 hour dietary recall questionnaire was used to obtain dietary details of drink and food intake of respondents within the immediate past 24 hour preceding the interview. The FAO reference period of 24hour was adopted for this study to avoid recall errors and bias (Sanusi, 2010). Nutrient intake was classified as inadequate, adequate and excess when intake was <80%, 80 – 120% and >120% (respectively) of reference intake.

Dietary Diversity

Dietary diversity was evaluated using the FAO guidelines for measuring household and individual dietary diversity (Kennedy, Ballard, Dop, 2011). A 16 item Individual Dietary

Diversity (IDD) checklist that was later aggregated to a 9 point Women Dietary Diversity Score (WDDS) was used. Some food groups in the IDD questionnaire were combined into a single food group to create the WDDS. A tercile was used to categorise the level of diversity as ≤ 3, 4 - 5 and ≥ 6 for low, medium/average and high; also the FAO reference period of 24hour was adopted for this study (FAO, 2008; Kennedy, Ballard, Dop, 2011).

3.7 Data management and analyses

Data was sorted, edited and recoded using a coding guide that defined each variable in the database with its acceptable value. This was entered into the computer each day to allow for identification and correction of erroneous data. Frequencies of every variable were run to ensure that the values were within the range defined in the data coding guide. Errors found were corrected or deleted from the database where applicable.

Data entry, cleaning and analysis were performed using the Statistical Package for Social Science; data from the 24 hour dietary recall was analysed using adapted Total Diet Assessment (TDA version 3.0) software. The nutrient intake of respondents from all the foods consumed in the immediate past 24hour reference period prior to the study was calculated with the help of food consumption analyses data from some studies conducted in Nigeria (Ani, Atangwho, Ejemot-Nwadiaro, Itam and Essien (2011), Eyong, Umoh, Ogu, Edet , Eteng et al (2007), Adepoju & Nwangwu (2010), Lawal, Umoh, Akpanabiatu, Williams & Agiang (2009), Kayode, Ozumba, Ojeniyi, Adetuyi & Erukainure (2010), Okeke, Eneobong, Uzuegbunam, Ozioko, Umeh & Kuhnlein (2009); Adebayo-tayo, Onilude, Ogunjobi, & Adejoye (2006)) and West African Food Composition Table (FAO, 2012).

Quantitative data was represented as means, standard deviation and as percentages for categorical outcome variables. Bi-variate analysis was done using Chi-square test to identify factors associated with nutrient intake, BMI and WDDS. Independent sample t-test and one way ANOVA was used for comparison of means. Multivariate analysis was also carried out with a p-value of <0.05 being considered statistically significant for variables to be included in a logistic regression analysis.

Primary data storage was done on the computer and also multiple backups were done using a flash, CD and the internet.

3.8 Ethical considerations

Informed consent

Informed consent was obtained from all participants, ethical approval was obtained from the UCH/UI ethical review committee and permission sought from the Ministry of Health, Akwa Ibom State.

Confidentiality

All information given by participants and data collected were treated with utmost confidentiality as questionnaires were coded in a way that information could not be traced to owners except by the research team. Also data collected was only be used for research purpose.

Voluntariness

Adequate information about the study was made available to Participants and participation was totally voluntary with a right to withdraw from the study at any time without any reprisals.

Beneficence

The benefits of the study to participants include:

- An understanding of the link between nutrition and HIV/AIDS and the consequences of malnutrition to PLWHA
- Benefits of routine nutritional status assessment
- Adequacy of current diet and factors affecting adequate intake will be evaluated and identified
- The result of this study will form a basis for development of nutrition intervention programmes to reduce transmission and progression of HIV and also reduce malnutrition among PLWHA.

Non maleficence

The benefits of the study were explained to participants and the research was in no way harmful or injurious on participants.

CHAPTER FOUR

RESULTS

4.1 Socio demographic characteristics of respondents

Respondents' socio demographic characteristics as presented in Table 4.1 shows responses from two hundred and thirty one (231) women of reproductive age (15 – 49 years) attending HIV clinics at sentinel sites (Uyo, Ikot Ekpene, Iquita-Oron and Urua-Akpan) in Akwa Ibom State. The age of the respondents ranged between 15 and 45 years and the mean age was 29.7±6.8 years.

Of the 231 respondents that participated in this study, 53.7% had attained secondary education while 6.9% had no formal education. Respondents from Oron ethnic group were 37.2% while 3.0% belonged to other ethnic groups including Igbo, Efik, Idoma, Bakor and Obudu. Those belonging to the Annang and Ibibio ethnic groups constituted 34.2% and 25.5%, of the respondents respectively. A higher proportion of respondents (40.7%) in this study were married/ cohabiting compared to (37.7%) who were single and 6.9% who had been divorced/separated at the time of conducting this research.

Table 4.1: Socio demographic characteristics of respondents

Characteristics	Categories	UY n (%)	IK n (%)	IQ n (%)	UA n (%)	Total n (%)
Age	Mean age of respondents	29.7±6.8 years				
Highest Education attained	No formal	1(8.3)	3(2.5)	12(13.3)	0(0.0)	16(6.9)
	Primary	4(33.3)	27(22.7)	27(30.0)	5(50.0)	63(27.3)
	Secondary	7(58.3)	68(57.1)	45(50.0)	4(40.0)	124(53.7)
	Tertiary	0(0.0)	21(17.6)	6(6.7)	1(10.0)	28(12.2)
Ethnicity	Ibibio	7(58.3)	46(38.7)	5(5.6)	1(10.0)	59(25.5)
	Annang	2(16.7)	68(57.1)	1(1.1)	8(80.0)	79(34.2)
	Oron	3(25.0)	0(0.0)	83(92.2)	0(0.0)	86(37.2)
	Other*	0(0.0)	5(4.2)	1(1.1)	1(10.0)	7(3.0)
Marital status	Married/cohabiting	5(41.7)	44(37.0)	39(43.3)	6(60.0)	94(40.7)
	Single	4(33.3)	55(46.2)	25(27.8)	3(30.0)	87(37.7)
	Separated/Divorced	1(8.3)	7(5.9)	8(8.9)	0(0.0)	16(6.9)
	Widowed	2(16.7)	13(10.9)	18(20.0)	1(10.0)	34(14.7)

*other include Igbo, Efik, Idoma, Bakor and Obudu

4.2 Socio economic characteristics of respondents

Respondents who were involved in sales and services as their primary occupation were 105(45.5%) as compared to those involved in Agriculture who constituted 3.9% of the respondents. The average monthly income earned by respondents in this study, a greater proportion 60.0% earned less than ₦5, 000.00. The mean income of respondents was ₦7891.92 ± ₦11209.72 (50.83 ± 72.20 USD).

Table 4.2: Respondents' socioeconomic characteristics

Characteristics	Categories	Uyo n (%)	Ikot Ekpene n (%)	Iquita-Oron n (%)	Urua-Akpan n (%)	Total n (%)
Employment status	Unemployed	6(50.0)	19(16.0)	29(32.2)	2(20.0)	56(24.2)
	Employed	6(50.0)	100(84.0)	61(67.8)	8(80.0)	175(75.8)
Occupation	Professional	0(0.0)	14(11.8)	6(6.7)	0(0.0)	20(8.7)
	Sales/services	4(33.3)	56(47.1)	41(45.6)	4(40.0)	105(45.5)
	Skilled manual	2(16.7)	27(22.7)	12(13.3)	4(40.0)	45(19.5)
	Agriculture	0(0.0)	4(3.4)	5(5.6)	0(0.0)	9(3.9)
	Other**	6(50.0)	18(15.1)	26(28.9)	2(20.0)	52(22.5)
Average monthly income in naira	<5,000	5(41.7)	66(55.5)	62(68.9)	7(70.0)	140(60.0)
	≥5,000	7(58.3)	53(44.5)	28(31.1)	3(30.0)	91(39.4)

**others include students, dependants, housewives, applicants and unemployed

4.3: Respondents' mean daily nutrient intake by sentinel sites

Table 4.3 shows the mean daily nutrient intake of respondents across the study sites. Overall mean daily energy intake was 1958.1 ± 845.3kcal among respondents in the study. The mean energy intake was higher (2084.8 ± 835.9kcal) among respondents in Ikot Ekpene while the lowest result (1622.8 ± 572.0kcal) was obtained among respondents in Uyo.

Daily protein intake of the respondents as represented in Table 4.3.1 was 98.9 ± 52.3g with a higher mean daily intake recorded in Ikot Ekpene (105.4 ± 56.1g) compared to a lower mean daily intake (68.3 ± 38.7g) obtained in Urua-Akpan. Daily carbohydrate intake of respondents was 345.7 ± 126.6g with the highest mean (364.0 ± 126.3g) found in Ikot Ekpene and the lowest in Uyo (275.4 ± 92.2g). Daily fat intake of respondents was 50.6 ± 41.4g

Daily intake of Vitamin A among respondents in Uyo was highest (542.3 ± 1654.8mcg) compared to respondents in Iquita-Oron whose mean daily Vitamin A intake was 167.1 ± 680.9mcg. The highest mean daily intake of Vitamin C (105.5 ± 257.1mg) was obtained in Urua-Akpan and the lowest in Uyo (3.6 ± 9.6mg). Overall mean Vitamin C intake across the sites was 23.0 ± 78.8mg. The total results obtained for Folate and vitamin B_{12} were 55.8 ± 70.1mcg and 2.1 ± 5.0mcg respectively across the sites, but Vitamin B_{12} was higher (5.4 ± 8.6 mcg) in Urua-Akpan compared to Ikot Ekpene (1.2 ± 1.4mcg).

The result of the mean daily zinc intake was higher in Ikot Ekpene (10.0 ± 5.2mg) compared to other sites (Urua-Akpan = 7.3 ± 4.9mg, Uyo = 7.6 ± 2.0mg and Iquita-Oron = 8.9 ± 6.1mg), the highest mean daily Iron intake (63.2 ± 72.6mg) was obtained in Iquita-Oron and the lowest (40.6 ± 37.9mg) in Uyo.

Table 4.3: Respondents' mean daily nutrient intake by sentinel sites

Variables	Sentinel sites				Total (N = 231)
	Uyo (n=12)	Ikot Ekpene (n=119)	Iquita-Oron (n=90)	Urua-Akpan (n=10)	
Energy intake (kcal)	1622.8 ± 572.0	2084.8 ± 835.9	1868.0 ± 854.1	1662.2 ± 971.8	1958.1 ± 845.3
Protein intake (g)	86.2 ± 41.9	105.4 ± 56.1	95.3 ± 48.4	68.3 ± 38.7	98.9 ± 52.3
Carbohydrate intake (g)	275.4 ± 92.2	364.0 ± 126.3	336.9 ± 121.7	292.7 ± 169.9	345.7 ± 126.6
Fat intake (g)	41.1 ± 27.6	59.2 ± 47.0	42.2 ± 33.8	34.2 ± 25.2	50.6 ± 41.4
Vitamin A intake (mcg)	542.3 ± 1654.8	439.8 ± 1390.5	167.1 ± 680.9	214.6 ± 269.1	335.2 ± 1164.4
Vitamin C intake (mg)	3.6 ± 9.6	23.9 ± 62.7	17.0 ± 73.4	105.5 ± 257.1	23.0 ± 78.8
Folate intake (mcg)	32.0 ± 49.4	58.2 ± 79.0	53.9 ± 59.2	74.4 ± 64.7	55.8 ± 70.1
Vitamin B_{12} intake (mcg)	1.7 ± 2.0	1.2 ± 1.4	3.0 ± 7.4	5.4 ± 8.6	2.1 ± 5.0
Zinc intake (mg)	7.6 ± 2.0	10.0 ± 5.2	8.9 ± 6.1	7.3 ± 4.9	9.3 ± 5.4
Iron intake (mg)	40.6 ± 37.9	51.8 ± 62.8	63.2 ± 72.6	45.9 ± 50.3	55.4 ± 65.4

4.4: Adequacy of respondents' daily nutrient and energy intake

Table 4.4 shows the adequacy of respondents' intake of energy and some nutrients important in fighting HIV. In Table 4.4, the adequacy of respondents' daily intake of energy is reported, majority of respondents 104 (45.0%) had inadequate daily dietary intake of energy. In IK, 51(42.9%), 44(37.0%) and 24(20.2%) of respondents had inadequate, adequate and excess daily dietary intake of energy respectively compared to 39(43.3%), 35(38.9%) and 16(17.8%) of respondents in IQ who had inadequate, adequate and excess daily dietary intake of energy respectively.

A description of the adequacy of respondents' daily protein intake is shown in Table 4.4. A greater proportion (62.8%) of respondents in the entire study had excess daily dietary intake of protein distributed as 75.0%, 64.7%, 58.9% and 60.0% among respondents in Uyo, Ikot Ekpene, Iquita-Oron and Urua-Akpan respectively. The daily dietary intake of Vitamin A is reported in Table 4.4 as inadequate in almost all 216(93.5%) respondents, while only 7(3.0%) and 8(3.5%) had adequate and excess daily dietary intake of Vitamin A respectively.

The daily dietary intake of the Vitamin B_{12} and Folate was generally inadequate (220(95.2%), 214(92.6%), 208(90.0%), 208(90.0%); 186(80.5%) and 229(99.1%) respectively).Table 4.4, showed daily dietary intake of Vitamin C. Majority 215(93.1%) of respondents had inadequate daily dietary intake of Vitamin C. In UY, all 12(100.0%) respondents had inadequate daily dietary intake, similarly in UA most 7(70.0%) respondents recorded inadequate daily dietary intake of Vitamin C. The result of the adequacy of daily dietary intake of zinc of respondents is shows that a greater proportion (57.1%) of respondents in the study had inadequate intake, while 35.1% and 7.8% had adequate and excess intake respectively.

Table: 4.4 Adequacy of respondents' daily nutrient intake

NUTRIENT	ADEQUACY	UY n(%)	IK n(%)	IQ n(%)	UA n(%)	TOTAL N(%)
Energy	Inadequate	7(58.3)	51(42.9)	39(43.3)	7(70.0)	104(45.0)
	Adequate	2(16.7)	44(37.0)	35(38.9)	2(20.0)	83(35.9)
	Excess	3(25.0)	24(20.2)	16(17.8)	1(10.0)	44(19.0)
Protein	Inadequate	2(16.7)	18(15.1)	20(22.2)	1(10.0)	41(17.7)
	Adequate	1(8.3)	24(20.2)	17(18.9)	3(30.0)	45(19.5)
	Excess	9(75.0)	77(64.7)	53(58.9)	6(60.0)	145(62.8)
Vitamin A	Inadequate	11(91.7)	110(92.4)	85(94.4)	10(100.0)	216(93.5)
	Adequate	1(8.3)	4(3.4)	2(2.2)	0(0.0)	7(3.0)
	Excess	0(0.0)	5(4.2)	3(3.3)	0(0.0)	8(3.5)
Vitamin B_{12}	Inadequate	7(58.3)	94(79.0)	76(84.4)	9(90.0)	186(80.5)
	Adequate	1(8.3)	9(7.6)	6(6.7)	1(10.0)	17(7.4)
	Excess	4(33.3)	16(13.4)	8(8.9)	0(0.0)	28(12.1)
Folate	Inadequate	12(100.0)	119(100.0)	88(97.8)	10(100.0)	229(99.1)
	Adequate	0(0.0)	0(0.0)	2(2.2)	0(0.0)	2(0.9)
Vitamin C	Inadequate	12(100.0)	109(91.6)	84(93.3)	10(100.0)	215(93.1)
	Adequate	0(0.0)	3(2.5)	1(1.1)	0(0.0)	4(1.7)
	Excess	0(0.0)	7(5.9)	5(5.6)	0(0.0)	12(5.2)
Zinc	Inadequate	9(75.0)	61(51.3)	55(61.1)	7(70.0)	132(57.1)
	Adequate	2(16.7)	45(37.8)	31(34.4)	3(30.0)	81(35.1)

	Excess	1(8.3)	13(10.9)	4(4.4)	0(0.0)	18(7.8)

4.5: Respondents' consumption of food groups (dietary diversity)

Starchy staples were predominant in the diets consumed by all 231(100.0%) the respondents over the 24hr reference period. Similarly, other Vitamin A rich fruits and vegetables and tubers were mostly consumed by respondents in all the sites (Uyo - 100.0%, Ikot Ekpene - 95.8%, Iquita-Oron - 95.6% and Urua-Akpan - 90.0%).

Another food group that had a large percentage consumption rate (97.4%) across the sites was the meat and fish food group. Dark green leafy vegetables were consumed by 70.6% of the respondents while organ meat was not consumed by respondents in all the sites during the reference period of this study.

Table 4.5: Respondents' percentage consumption of food groups (dietary diversity)

Food groups	Anua (%)	Ikot Ekpene (%)	Iquita-Oron (%)	Urua-Akpan (%)	Total (%)
Starchy staples	12(100.0)	119(100.0)	90(100.0)	10(100.0)	231(100.0)
Other vitamin A rich fruits and vegetables and tubers	12(100.0)	114(95.8)	86(95.6)	9(90.0)	221(95.7)
Dark green leafy vegetables	11(91.7)	86(72.3)	58(64.4)	8(80.0)	163(70.6)
Other fruits and vegetables	0(0.0)	20(16.8)	10(11.1)	0(0.0)	30(13.0)
Organ meat	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Meat and fish	12(100.0)	116(97.5)	87(96.7)	10(100.0)	225(97.4)
Eggs	0(0.0)	7(5.9)	1(1.1)	2(20.0)	10(4.3)
Legumes, nuts and seeds	1(8.3)	26(21.8)	15(16.7)	3(30.0)	45(19.5)
Milk and milk products	5(41.7)	35(29.4)	14(15.6)	4(40.0)	58(25.1)

4.5.1 Distribution of respondents' Women Dietary Diversity tercile at sentinel sites

Table 4.5.1a shows the distribution of respondents' WDD tercile at the sentinel sites. Majority of respondents 184(79.7%) had WDD tercile within the average/medium category having consumed foods from 4 – 5 food groups during the immediate past 24 hour reference period. Low WDD tercile was 31(13.4%) while high WDD tercile was 16(6.9%) in this study. This result showed a significant difference in WDD tercile across the sites ($\chi^2 = 16.0$, $p = 0.014$).

Respondents' WDDS reported in Table 4.5.1b shows that 3.5%, 10.0%, 52.8%, 26.8%, 6.5% and 0.4% consumed foods from 2, 3, 4, 5, 6, 7 food groups respectively in all the sites within the reference period of the study.

Table 4.5.1a: Respondents' Women Dietary Diversity tercile

characteristic	categories	Uyo n (%)	Ikot Ekpene n (%)	Iquita-Oron n (%)	Urua-Akpan n (%)	Total n (%)	χ^2	p-value
WDD tercile	Low	0(0.0)	11(9.2)	19(21.1)	1(10.0)	31(13.4)	16.0	0.014*
	Average	12(100.0)	96(80.7)	69(76.7)	7(70.0)	184(79.7)		
	High	0(0.0)	12(10.1)	2(2.2)	2(20.0)	16(6.9)		

*p<0.05

Table 4.5.1b: Distribution of Women Dietary Diversity Score of respondents at the

WDDS	Uyo n(%)	Ikot Ekpene n(%)	Iquita-Oron n(%)	Urua-Akpan n(%)	Total n(%)
2	0(0.0)	4(3.4)	3(3.3)	1(10.0)	8(3.5)
3	0(0.0)	7(7.9)	16(17.8)	0(0.0)	23(10.0)
4	7(58.3)	57(47.9)	54(60.0)	4(40.0)	122(52.8)
5	5(41.7)	39(32.8)	15(16.7)	3(30.0)	62(26.8)
6	0(0.0)	11(9.2)	2(2.2)	2(20.0)	15(6.5)
7	0(0.0)	1(0.8)	0(0.0)	0(0.0)	1(0.4)

sentinel sites

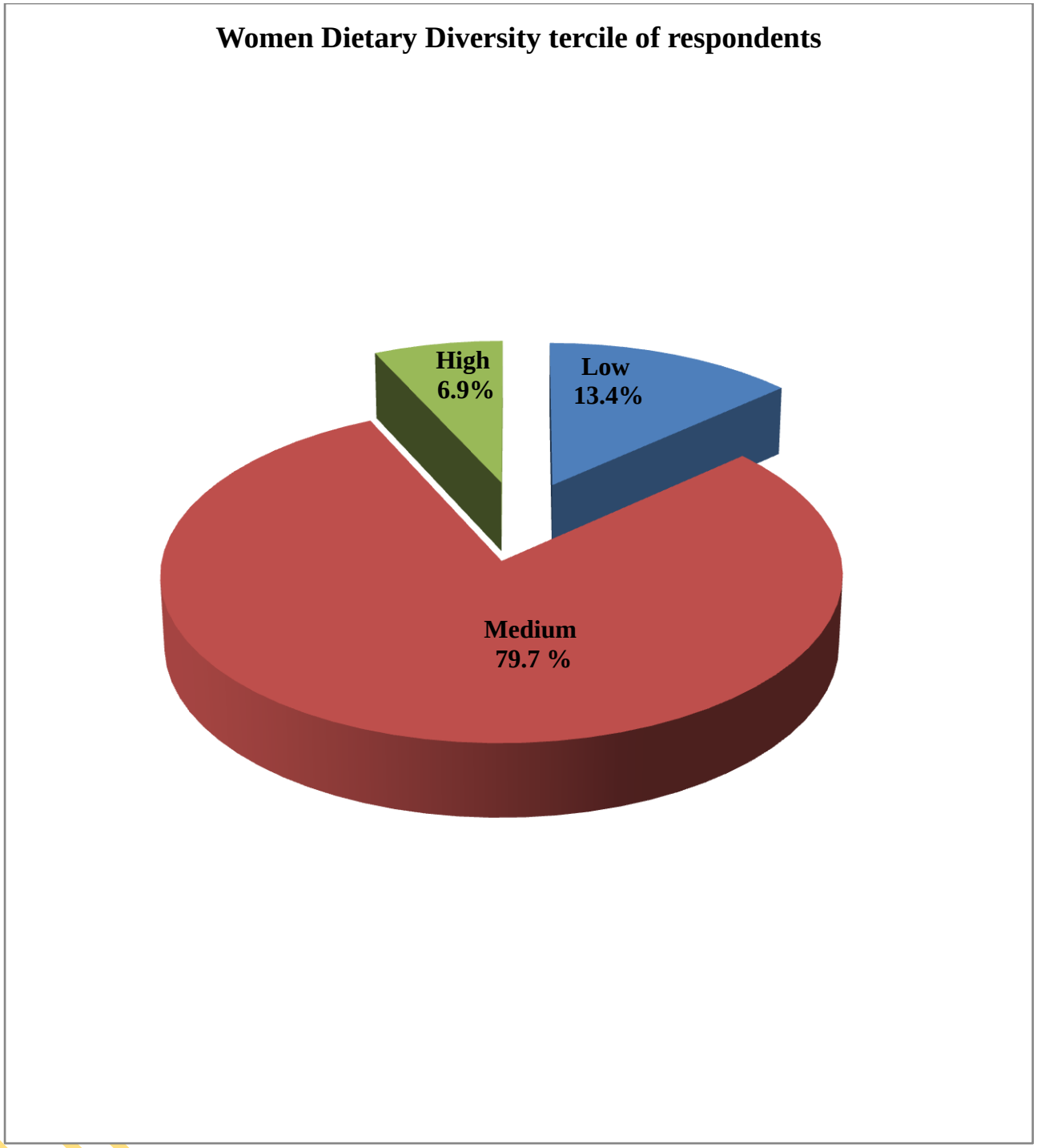

Figure 4.1 Women Dietary Diversity tercile of respondents

4.5.2: Distribution of Mean Women Dietary Diversity Score of respondents

The mean WDDS of respondents varied across all 4 sites. The highest mean WDDS (4.5±1.2) was obtained among respondents in Urua-Akpan, significantly different (f-test - 5.3, p - 0.002) from other sites (Ikot Ekpene: 4.4 ± 0.9, Uyo: 4.4 ± 0.5 and Iquita-Oron: 4.0 ± 0.8 food groups). A minimum of 2 food groups and a maximum of 7 food groups were consumed by respondents across all the sites.

Table 4.5.2: Mean Women Dietary Diversity Score of respondents

Sentinel sites	N = 231	Mean	Min	Max	f-test	p-value
Uyo	12	4.4 ± 0.5	4	5	5.3	0.002*
Ikot Ekpene	119	4.4 ± 0.9	2	7		
Iquita Oron	90	4.0 ± 0.8	2	6		
Urua Akpan	10	4.5 ± 1.2	2	6		
Total	231	4.2 ± 0.9	2	7		

*p<0.05

4.6: Mean and standard deviation of respondents' weight (kg)

Respondents in Ikot Ekpene had a higher mean weight (61.8±13.3kg) compared to other sites in the study and the mean weight of all the respondents that took part in the study was 58.2±12.2kg, this difference was statistically significant (f-test = 8.9, p-value = 0.000).

Table 4.6: Mean and standard deviation of respondents' weight (kg)

Sentinel sites	N = 231	Mean	Min	Max	f-test	p-value
Uyo	12	59.3 ± 7.0	50	70		
Ikot Ekpene	119	61.8 ± 13.3	40	113		
Iquita Oron	90	54.2 ± 9.4	40	97	8.9	0.000*
Urua Akpan	10	50.6 ± 11.0	40	70		
Total	231	58.2 ± 12.2	40	113		

*p<0.05

4.6.1: Mean and standard deviation of respondents' height (m)

The highest mean height of respondents in the study was obtained in Uyo (1.60 ± 0.040m), however, the difference across all four sites was not statistically significant (f-test = 1.4, p = 0.251).

Table 4.6.1: Mean and standard deviation of respondents' height (m)

Sentinel sites	N = 231	Mean	Min	Max	f-test	p-value
Uyo	12	1.60 ± 0.040	2	2		
Ikot Ekpene	119	1.59 ± 0.063	1	2		
Iquita Oron	90	1.58 ± 0.048	1	2	1.4	0.251
Urua Akpan	10	1.56 ± 0.049	2	2		
Total	231	1.59 ± 0.056	1	2		

4.7: Respondents' Body Mass Index outcome

Respondents' BMI outcome as represented in Table 4.7 showed that 0(0.0%), 9(75.0%), 3(25.0%) were underweight, normal and overweight respectively in Uyo. Respondents who were underweight, normal, overweight and obese were 6(5.0%), 65(58.0%), 29(24.4%) and 15(12.6%) respectively in Ikot Ekpene. Respondents in Iquita-Oron had a BMI result of 15(16.7%) as underweight, 66(73.3%) as normal, 5(5.6%) as overweight and 5(4.4%) as obese. While 4(40.0%), 5(50.0%) and 1(10.0%) of respondents in Urua-Akpan were underweight, normal and overweight respectively.

The difference between the different locations was statistically significant ($\chi^2 = 36.0$, $p = 0.000$). Overall, underweight was 10.8%, normal BMI was 64.5%, overweight was 16.5% and obesity was 8.2% among respondents in the study.

Table 4.7: Respondents' Body mass index

Characteristic	Categories	Uyo n(%)	Ikot Ekpene n(%)	Iquita-Oron n(%)	Urua-Akpan n(%)	Total n(%)	χ^2	p-value
BMI	Underweight	0(0.0)	6(5.0)	15(16.7)	4(40.0)	25(10.8)	36.0	0.000*
	Normal	9(75.0)	69(58.0)	66(73.3)	5(50.0)	149(64.5)		
	Overweight	3(25.0)	29(24.4)	5(5.6)	1(10.0)	38(16.5)		
	Obese	0(0.0)	15(12.6)	4(4.4)	0(0.0)	19(8.2)		
	Total	12(100.0)	119(100.0)	90(100.0)	10(100.0)	231(100.0)		

*p<0.05

4.7.1: Respondents' Body Mass Index (Kg/m^2)

The BMI of respondents was higher (24.4 ± 4.4kg/m^2 in Ikot Ekpene with a statistically significant difference (f-test = 9.8, p = 0.000) than other study sites (23.3±2.1kg/m^2, 21.7±3.5kg/m^2 and 20.7±3.4kg/m^2 in Uyo, Iquita Oron and Urua Akpan respectively). A minimum BMI of 16.0kg/m^2 and maximum BMI of 39.0kg/m^2 were recorded among respondents in this study.

Table 4.7.1: Respondents' Body Mass Index (Kg/m^2)

Sentinel sites	N = 231	Mean	Min	Max	F-test	p-value
Uyo	12	23.3 ± 2.1	19	27		
Ikot Ekpene	119	24.4 ± 4.4	16	39		
Iquita Oron	90	21.7 ± 3.5	16	37	9.2	0.000*
Urua Akpan	10	20.7 ± 3.4	17	28		
Total	231	23.1 ± 4.2	16	39		

*p<0.05

4.8: Respondents' current use of Anti Retroviral Therapy

A greater proportion 84.4% of respondents across all the sites had initiated the use of anti retroviral therapy (ART) compared to 15.6% of respondents who were not taking any ART as at the period of collecting data for this study, and the difference was statistically significant (χ^2 = 17.3, p = 0.001). The proportion of respondents in Ikot Ekpene, Iquita-Oron, Uyo and Urua-Akpan who were using ART as at the period of conducting this study was 89.1%, 85.6%, 58.3% and 50.0% respectively. Half (50.0%) of the respondents in Urua-Akpan had not commenced the use of ART, compared to 10.9% of respondents in Ikot Ekpene.

Table 4.8: Respondents' current use of Anti Retroviral Therapy

Variable	Categories	Uyo n(%)	Ikot Ekpene n(%)	Iquita-Oron n(%)	Urua-Akpan n(%)	Total n(%)	χ^2	p-value
Current use of ART	Yes	7(58.3)	106(89.1)	77(85.6)	5(50.0)	195(84.4)	17.3	0.001*
	No	5(41.7)	13(10.9)	13(14.4)	5(50.0)	36(15.6)		
	Total	12(100.0)	119(100.0)	90(100.0)	10(100.0)	231(100.0)		

*p<0.05

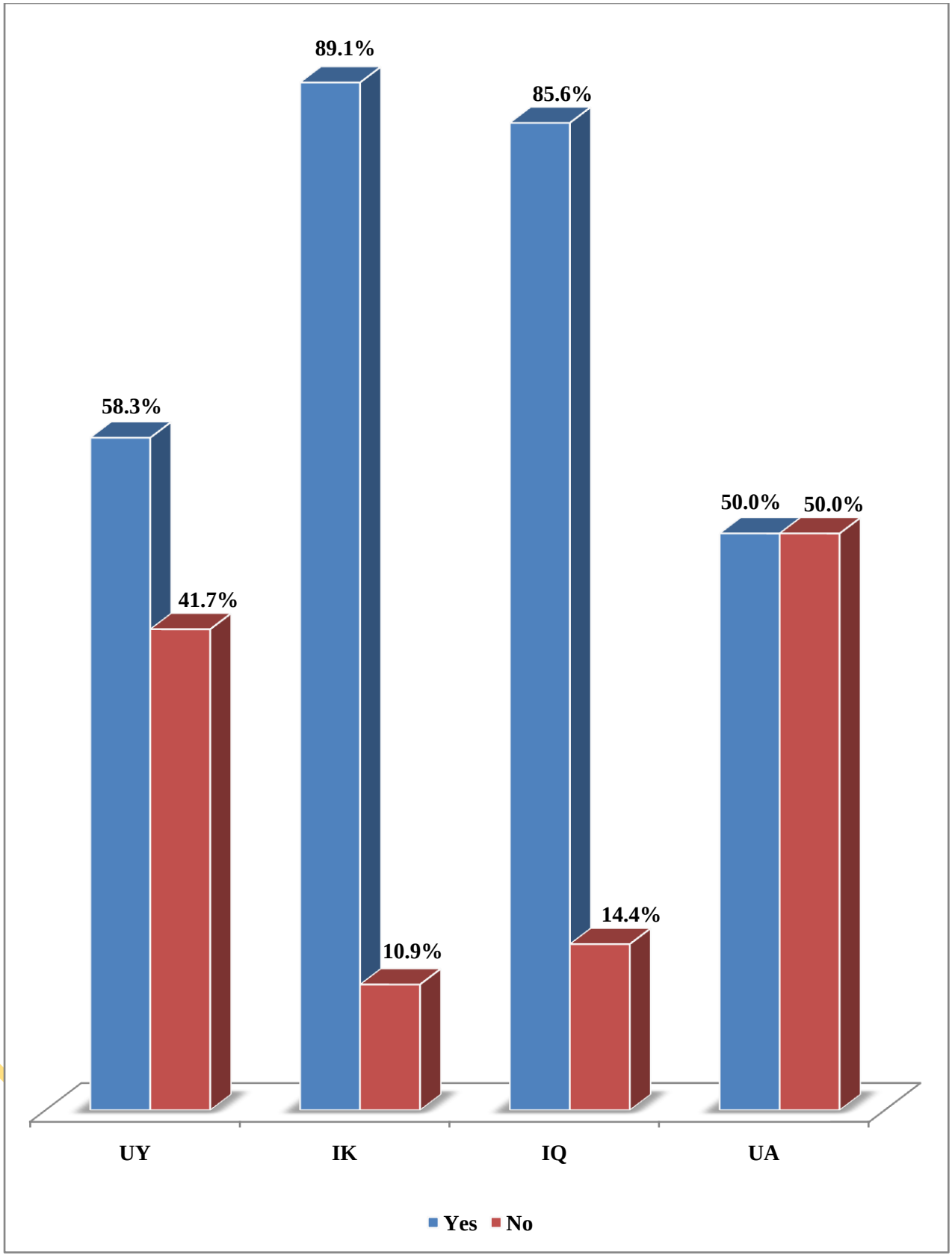

Figure 4.2 Respondents' current use of Anti Retroviral Therapy

4.8.1: Nutrient intake, Body Mass Index and Dietary Diversity Score according to their Anti Retroviral Therapy use

The mean energy intake (2008.3±856.1kcal), of respondents who were using ART was higher compared to respondents who were not using ART (1686.0±736.5kcal). The mean carbohydrate intake of respondents taking ART (352.8±123.0g) was higher compared to mean carbohydrate intake among respondents who were not using ART (307.3±140.3g). Mean fat intake was also higher (53.1±43.0g) among ART users compared to a lower mean intake (36.9±28.9g) among non ART users. These differences were however statistically significant ($p<0.05$).

There was a difference in mean WDDS of ART users in all the sites and this difference was significant.

Table 4.8.1: Respondents' mean nutrient intake, Body Mass Index and WDDS according to their use of Anti Retroviral Therapy

Variables	ART USE			f-test	P value
	Yes (n=95)	No (n=36)	Total N=(231)		
Energy intake (kcal)	2008.3±856.1	1686.0±736.5	1958.1±845.3	4.4	0.035*
Protein intake (g)	101.6±52.4	84.2±50.4	98.9±52.3	3.4	0.066
Carbohydrate intake (g)	352.8±123.0	307.3±140.3	345.7±126.6	4.0	0.048*
Fat intake (g)	53.1±43.0	36.9±28.9	50.6±41.4	4.7	0.031*
Vitamin A intake (mcg)	382.6±1260.9	80.3±160.7	335.2±1164.4	1.8	0.185
Vitamin C intake (mg)	25.7±84.4	7.5±18.9	23.0±78.8	1.2	0.278
Folate intake (mcg)	54.8±71.2	60.9±65.2	55.8±70.1	0.2	0.659
Vitamin B_{12} intake (mcg)	2.1±5.0	2.2±5.1	2.1±5.0	0.0	0.884
Zinc intake (mg)	9.6±5.7	8.0±4.1	9.4±5.5	2.6	0.110
Iron intake (mg)	58.6±66.9	38.4±54.0	55.4±65.4	2.9	0.089
BMI (Kg/m^2)	23.2±4.0	22.7±5.3	23.1±4.2	0.5	0.499
WDDS	4.3±0.8	4.0±1.1	4.2±0.9	4.2	0.041*

*$p<0.05$

4.8.2: Relationship between respondents' Body Mass Index categories and Anti Retroviral Therapy use

A significant positive relationship was observed between BMI category and ART use among the respondents ($\chi^2 = 13.2$, $p = 0.004$) as respondents (66.2%) who had normal BMI were reported to be using ART when compared to respondents (55.6%) who had normal BMI but were not using ART. Also, only 8.2% respondents using ART were underweight while 25.0% of respondents who were not currently using ART were underweight.

Respondents who were on ART had significantly better BMI than their counterparts who were not ($P<0.05$).

Table 4.8.2: Relationship between respondents' Body Mass Index categories and Anti Retroviral Therapy use

ART use	BMI						
	Underweight n(%)	Normal n(%)	Overweight n(%)	Obesity n(%)	Total n(%)	χ^2	p-value
Yes	16(8.2)	129(66.2)	36(18.5)	14(7.2)	195(100.0)		
No	9(25.0)	20(55.6)	2(5.6)	5(13.9)	36(100.0)	13.2	0.004*
Total	25(10.8)	149(64.5)	38(16.5)	19(8.2)	231(100.0)		

*p<0.05

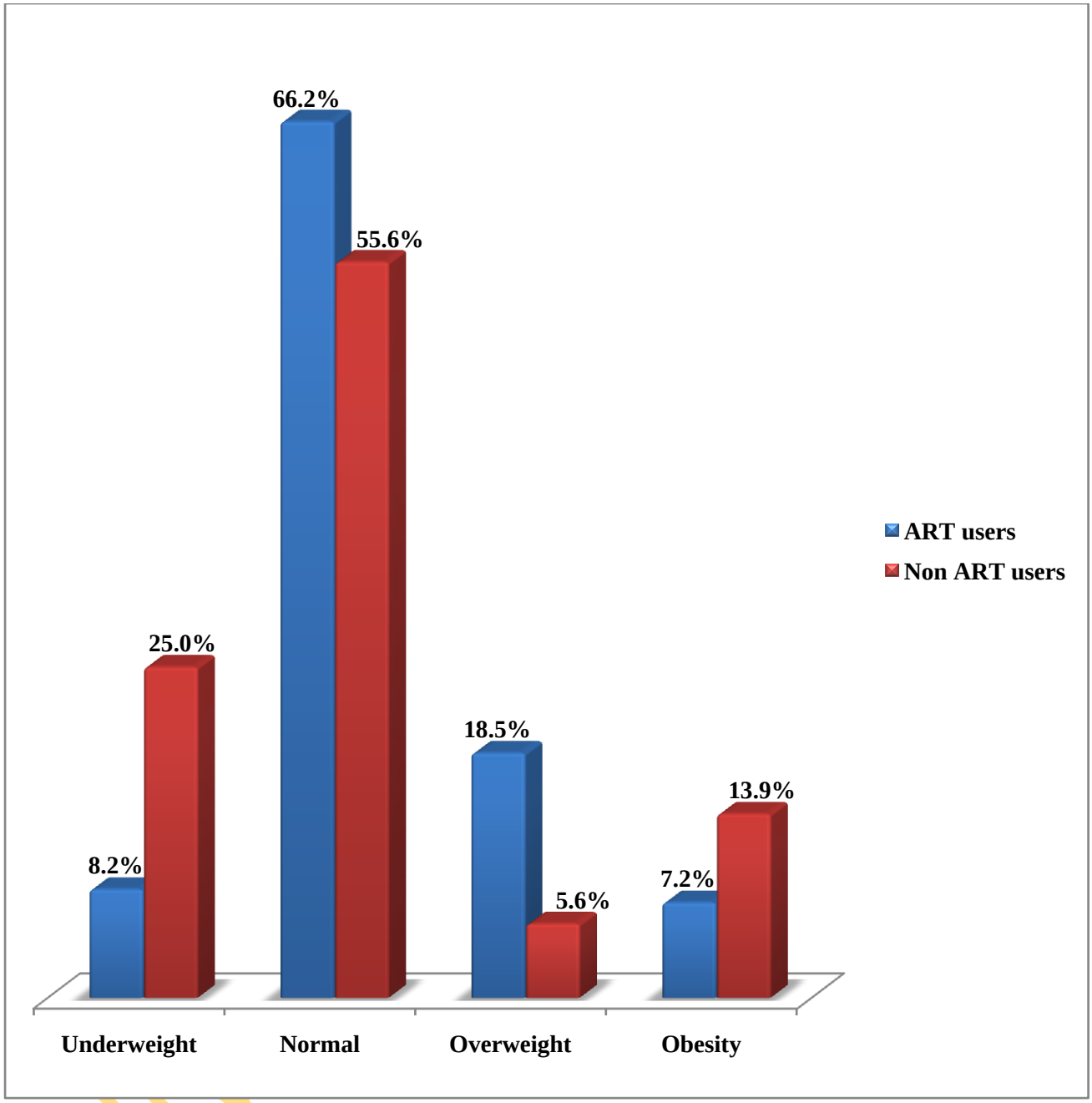

Figure 4.3 Respondents' Body Mass Index categories by current Anti Retroviral Therapy use

4.9 Respondents' duration of Anti Retroviral Therapy use

The difference in duration of ART use among respondents was not significant (χ^2 = 9.0, p = 0.175), 40(20.5%) of respondents had been using ART for less than 24weeks, while 69(35.4%) and 86(44.1%) had been on ART between 24 – 52 weeks and >52 weeks respectively.

Table 4.9: Respondents' duration of Anti Retroviral Therapy use

Variable	Categories (weeks)	Uyo n(%)	Ikot Ekpene n(%)	Iquita-Oron n(%)	Urua-Akpan n(%)	Total n(%)	χ^2	p-value
Duration of ART use	<24	1(14.3)	19(17.9)	17(22.1)	3(60.0)	40(20.5)	9.0	0.175
	24-52	4(57.1)	35(33.0)	30(39.0)	0(0.0)	69(35.4)		
	>52	2(28.6)	52(49.1)	30(39.0)	2(40.0)	86(44.1)		

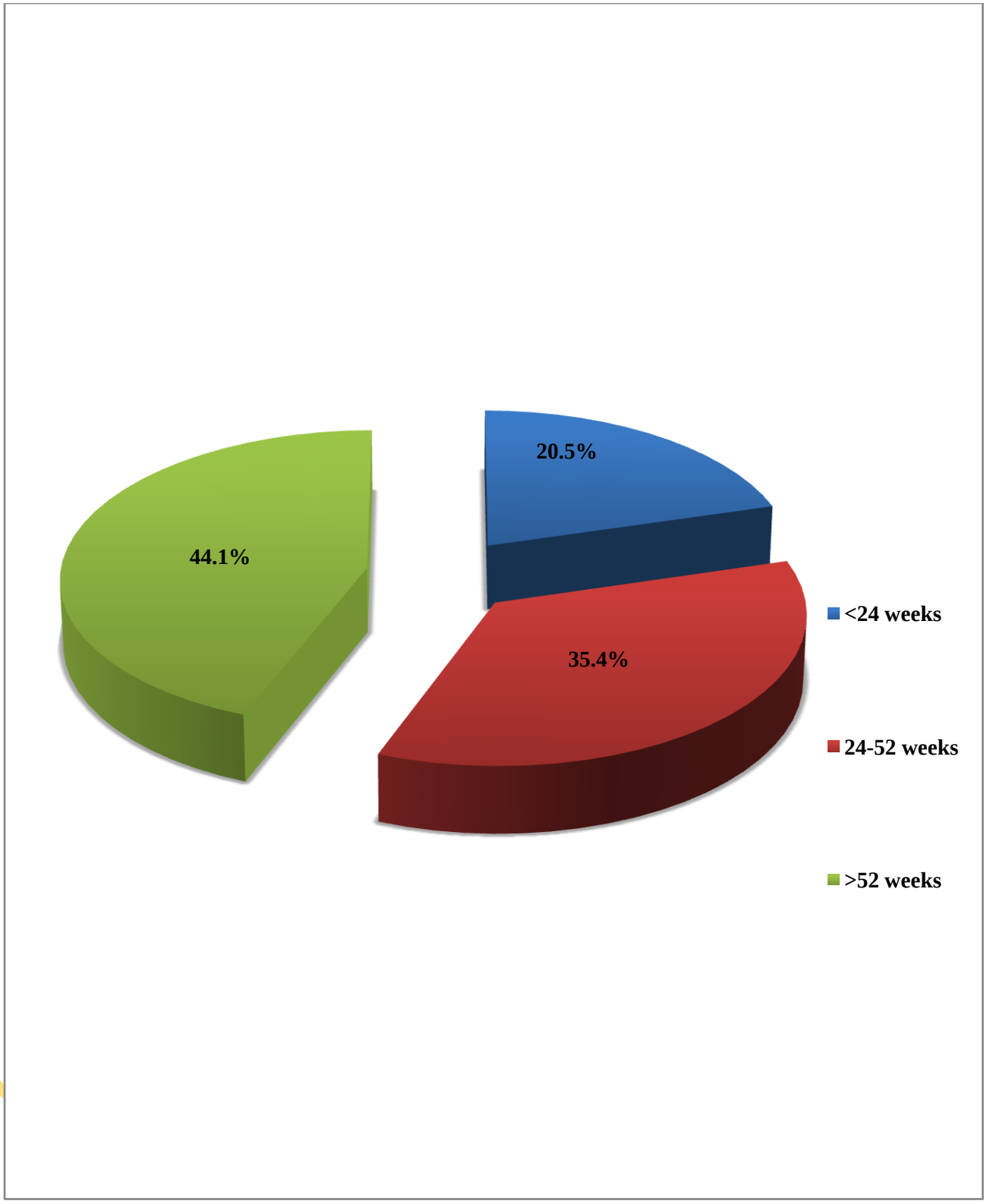

Figure 4.4 Respondents' duration on Anti Retroviral Therapy use

4.9.1: Respondents' nutrient intake, Body Mass Index and WDDS by duration of Anti Retroviral Therapy use

Table 4.9.1 is a report of the mean of respondents' nutrient intake, BMI and WDDS by the duration of ART use. A significant difference (f-test=7.7, p-value=0.001) was observed between BMI of respondents and the duration of ART use. Respondents who had been using ART for more than 52weeks had the highest BMI 24.4±4.5kg/m^2 towards overweight compared to the mean BMI of respondents who had been using ART in less than 24weeks (21.8±3.1kg/m^2) and between 24-52weeks (22.5±3.3kg/m^2) who were within normal BMI category. Longer duration of anti retroviral therapy significantly influenced higher BMI of the respondents.

The mean intake of all the nutrients assessed (Energy, Protein, Carbohydrate, Fat, Vitamins A, C, Folate, B_{12}, Zinc and Iron) was not significantly influenced by duration of ART use ($p>0.05$) among respondents.

Table 4.9.1: Relationship between nutrient intake, Body Mass Index and Women Dietary Diversity Score by duration of Anti Retroviral Therapy use

Variables	Duration of ART use				f-test	p-value
	<24 weeks	24-52 weeks	>52 weeks	Total		
Energy intake (kcal)	1954.4±913.7	2064.3±987.7	1981.7±711.7	2005.3±856.6	0.3	0.768
Protein intake (g)	99.8±54.2	100.6±55.9	103.4±48.9	101.7±52.3	0.1	0.916
Carbohydrate intake (g)	352.0±151.6	352.1±133.8	354.2±98.1	353.0±122.9	0.0	0.993
Fat intake (g)	47.0±29.1	57.3±50.0	51.6±41.8	52.7±42.8	0.8	0.467
Vitamin A intake (mcg)	147.2±232.6	443.3±1494.5	359.9±1157.4	348.0±1188.9	0.7	0.504
Vitamin C intake (mg)	32.6±94.8	11.8±35.0	34.4±106.7	25.9±85.0	1.2	0.316
Folate intake (mcg)	72.9±86.0	39.8±52.4	58.7±76.1	54.6±71.3	2.6	0.075
Vitamin B_{12} intake (mcg)	2.0±2.9	2.0±3.6	2.2±6.7	2.1±5.0	0.1	0.950
Zinc intake (mg)	10.0±7.4	9.3±4.1	9.7±5.9	9.6±5.7	0.2	0.809
Iron intake (mg)	63.1±78.8	51.7±61.4	61.9±65.6	58.5±66.9	0.6	0.572
BMI (Kg/m^2)	21.8±3.1	22.5±3.3	24.4±4.5	23.2±4.0	7.7	0.001*
WDDS	4.1±1.0	4.3±0.7	4.4±0.8	4.3±0.8	1.7	0.188

*$p<0.05$

4.9.2: Respondents' Body Mass Index categories by duration of Anti Retroviral Therapy use

Table 4.9.2 shows a description of BMI categories of respondents by the duration of ART use. This report shows that a greater proportion 60.5% of respondents who had been using ART for more than 52weeks had a BMI within the normal range (18.50 – 24.99kg/m^2) compared to 4.7% of respondents using ART for more than 52weeks and having BMI within the underweight range (< 18.50kg/m^2). Of the 195 respondents using ART during the period of conducting the study, 40 had been using ART for <24weeks, 69 between 24 – 52weeks and 86 within a period greater than 52weeks. However, the difference in the duration of ART among respondents had a relationship with the BMI of respondents to a level that was statistically significant ($\chi^2 = 15.3$, $p = 0.018$).

Table 4.9.2: Respondents' Body Mass Index categories by duration of Anti Retroviral Therapy use

Duration of ART use	BMI categories				Total	χ^2	p-value
	Underweight n(%)	Normal n(%)	Overweight n(%)	Obesity n(%)			
<24 weeks	7(17.5)	28(70.0)	4(10.0)	1(2.5)	40(100.0)		
24-52weeks	5(7.2)	49(71.0)	13(18.8)	2(2.9)	69(100.0)	15.3	0.018*
>52weeks	4(4.7)	52(60.5)	19(22.1)	11(12.8)	86(100.0)		
Total	16(8.2)	129(66.2)	36(18.5)	14(7.2)	195(100.0)		

*p<0.05

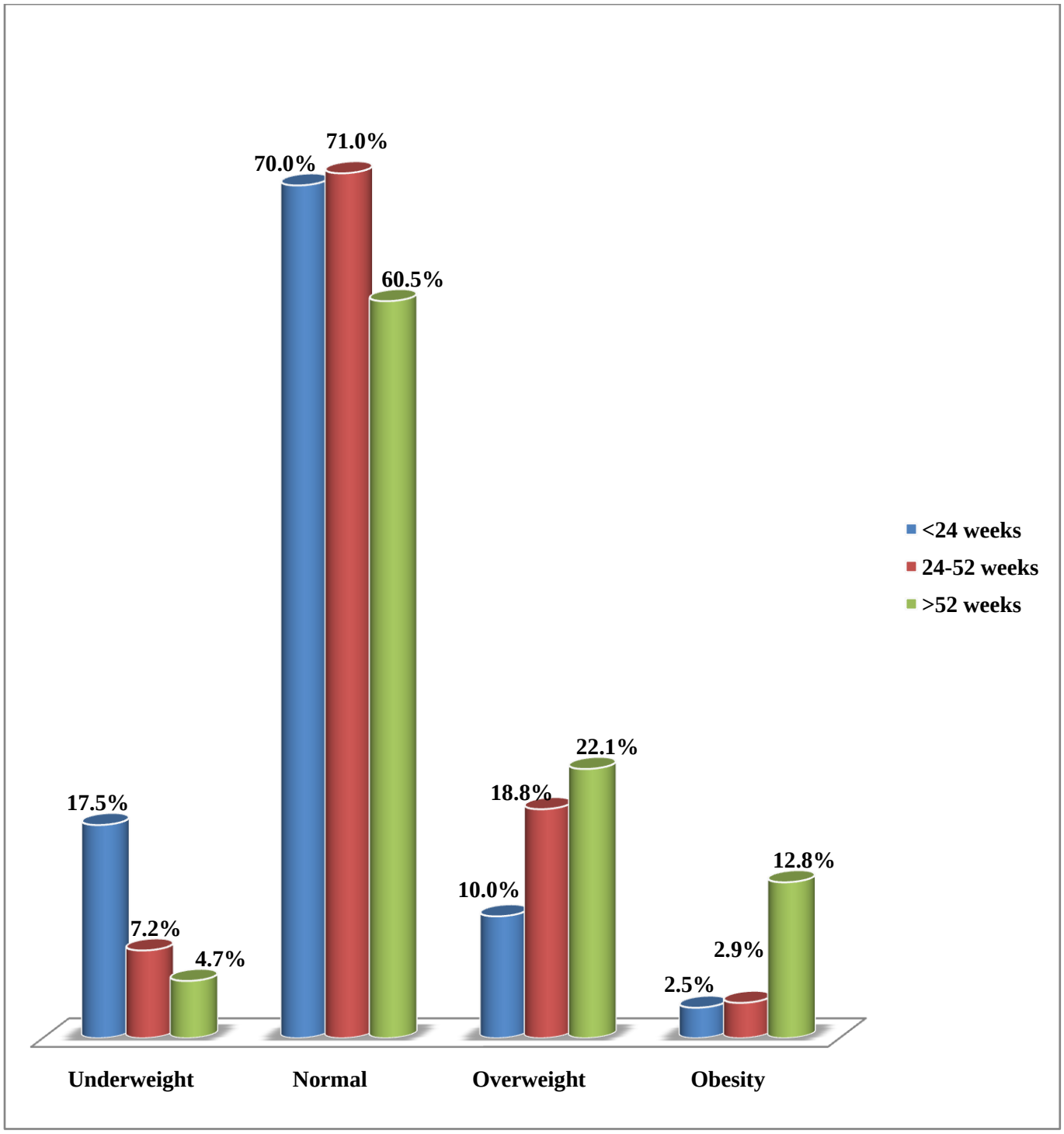

Figure 4.5 Respondents' Body Mass Index categories by duration of Anti Retroviral Therapy use

4.10: Respondents' mean nutrient intake, Body Mass Index and Women Dietary Diversity Score by level of Education

The mean nutrient intake, BMI and WDDS of respondents by level of their education attained is represented in Table 4.10. Respondents who had attained tertiary education had a higher mean intake (91.4 ± 86.8mcg) of Folate compared to other respondents who secondary education or had a primary or no formal education at (56.3 ± 71.3mcg, 41.8 ± 55.4mcg and 28.3 ± 41.1mcg) respectively. This difference was statistically significant (f-test = 3.8, p = 0.012).

Similarly, respondents who had attained a tertiary education had significantly higher BMI (24.6 ± 5.1kg/m^2, p = 0.000) when compared to respondents who had no formal education and those that attained either a primary or secondary education. There was a significantly higher mean difference in WDDS (4.6 ± 0.9) among respondents who had attained a tertiary education in comparison with respondents who had attained other levels of education (f-test = 3.0, p = 0.032).

Table 4.10: **Respondents' mean nutrient intake, Body Mass Index and Women Dietary Diversity Score according to their level of Education**

Variables	Level of Education				Total	f-test	p-value
	No formal	Primary	Secondary	Tertiary			
Energy intake (kcal)	1856.7 ± 617.1	1921.6 ± 910.5	1940.8 ± 853.6	2174.3 ± 770.0	1958.1 ± 845.3	0.7	0.528
Protein intake (g)	120.0 ± 49.1	93.0 ± 53.4	96.6 ± 50.8	110.3 ± 56.2	98.9 ± 52.3	1.7	0.175
Carbohydrate intake (g)	331.6 ± 93.3	337.4 ± 139.8	346.0 ± 125.4	371.6 ± 119.8	345.7 ± 126.6	0.5	0.653
Fat intake (g)	53.0 ± 32.1	48.3 ± 40.4	48.9 ± 43.2	61.6 ± 40.5	50.6 ± 41.4	0.8	0.495
Vitamin A intake (mcg)	458.4 ± 1589.4	418.7 ± 1393.1	329.0 ± 1143	152.8 ± 239.4	152.8 ± 239.4	0.3	0.790
Vitamin C intake (mg)	13.7 ± 45.5	15.2 ± 53.6	27.7 ± 95.3	22.9 ± 56.4	27.7 ± 95.4	0.3	0.827
Folate intake (mcg)	28.3 ± 41.1	41.8 ± 55.4	56.3 ± 71.3	91.4 ± 86.8	55.8 ± 70.1	3.8	0.012*
Vitamin B_{12} intake (mcg)	4.1 ± 10.5	3.3 ± 7.4	1.6 ± 2.8	1.3 ± 1.4	2.1 ± 5.0	2.2	0.086
Zinc intake (mg)	8.9 ± 3.6	9.3 ± 7.3	9.4 ± 4.9	9.3 ± 4.1	9.3 ± 5.5	0.6	0.982
Iron intake (mg)	59.9 ± 63.4	56.6 ± 68.9	52.8 ± 61.3	61.8 ± 78.0	55.4 ± 65.4	0.2	0.908
BMI	21.5 ± 3.5	21.5 ± 2.9	23.8 ± 4.4	24.6 ± 5.1	23.1 ± 4.2	6.4	0.000*
WDDS (Kg/m^2)	3.9 ± 0.8	4.1 ± 0.9	4.3 ± 0.9	4.6 ± 0.9	4.2 ± 0.9	3.0	0.032*

*$p<0.05$

4.10.1: Respondents' Body Mass Index categories by Educational level

Significant association was observed between the educational status of respondents and their BMI categories (χ^2 = 29.7, p-value = 0.01). Majority of the respondents (25.0%) who were underweight were among respondents who had no formal education. The prevalence of overweight was higher among respondents who attained secondary education while obesity was higher among those who attained tertiary education.

In the overall study, although majority of respondents across all levels of education had normal BMI, the prevalence of underweight, overweight and obesity increased with increase level of education attained by respondents.

Table 4.10.1: Respondents' Body Mass Index categories by Educational level

Level of Education	BMI				Total n(%)	χ^2	p-value
	Underweight n(%)	Normal n(%)	Overweight n(%)	Obesity n(%)			
No formal education	4(25.0)	9(56.2)	3(18.8)	0(0.0)	16(100.0)		
Primary	8(12.7)	51(81.0)	2(3.2)	2(3.2)	63(100.0)		
Secondary	12(9.7)	71(57.3)	30(24.2)	11(8.9)	124(100.0)	29.7	0.001*
Tertiary	1(3.6)	18(64.3)	3(10.7)	6(21.4)	28(100.0)		
Total	25(10.8)	149(64.5)	38(16.5)	19(8.3)	231(100.0)		

*p<0.05

4.10.2: Mean nutrient intake, Body Mass Index and Women Dietary Diversity Score according to respondents' occupation

Table 4.10.2 shows the nutrient intake, BMI and WDDS by respondents' occupation. Respondents who were involved in Agriculture had the highest mean intake of Energy (2762.4 ± 813.0kcal) compared to respondents who were involved in skilled manual labour and had the lowest mean Energy intake (1791.1 ± 807.2kcal) among respondents in the study. The difference was statistically significant (f-test = 2.6; p = 0.039). The daily intake of fat among respondents was highest among respondents in Agriculture (101.7 ± 78.4g) and lowest (40.4 ± 28.8g) among respondents in skilled manual labour with a significant difference (f-test = 5.0; p = 0.001).

The highest intake of Vitamin A (2177.0 ± 2942.4mcg) was obtained among respondents involved in Agriculture and the lowest intake (54.8 ± 77.0mcg) among respondents involved in skilled manual labour with a statistically significant difference (f-test = 7.2; p = 0.000).

For the mean BMI, respondents who were professionals had the highest (25.2 ± 5.0kg/m^2) compared to respondents involved in skilled manual labour, Agriculture and those unemployed who had mean BMI within normal range (22.8 ± 3.9kg/m^2 , 22.0 ± 3.9kg/m^2 and 21.8 ± 3.9kg/m^2 respectively), a difference that was statistically significant (f-test = 3.2; p = 0.014).

Table 4.10.2: Mean nutrient intake, Body Mass Index and Women Dietary Diversity Score by occupation of respondents

Variables	Occupation				Total	f-test	p-value
	Professional	Sales/services	Skilled manual	Agriculture			
Energy intake (kcal)	1912.6 ± 755.2	1966.5 ± 807.7	1791.1 ± 807.2	2762.1 ± 813.0	1958.1 ± 845.3	2.6	0.039*
Protein intake (g)	119.3 ± 76.1	101.9 ± 48.2	87.4 ± 49.2	121.0 ± 50.3	98.9 ± 52.3	2.1	0.079
Carbohydrate intake (g)	371.2 ± 149.4	343.0 ± 110.7	345.3 ± 140.7	426.1 ± 149.0	345.7 ± 126.6	1.4	0.239
Fat intake (g)	63.1 ± 44.1	50.2 ± 39.9	40.4 ± 28.8	101.7 ± 78.4	50.6 ± 41.4	5.0	0.001*
Vitamin A intake (mcg)	446.9 ± 1673.9	177.0 ± 627.7	54.8 ± 77.0	2177.0 ± 2942.4	335.2 ± 1164.4	7.2	0.000*
Vitamin C intake (mg)	26.6 ± 69.2	30.8 ± 98.4	12.1 ± 48.4	1.9 ± 4.0	23.0 ± 78.8	0.5	0.724
Folate intake (mcg)	37.8 ± 60.2	64.8 ± 75.3	34.7 ± 44.0	44.9 ± 61.9	55.8 ± 70.1	2.0	0.096
Vitamin B_{12} intake (mcg)	1.2 ± 1.6	1.9 ± 4.7	2.1 ± 4.4	2.0 ± 3.6	2.1 ± 5.0	0.5	0.732
Zinc intake (mg)	2.1 ± 5.0	10.0 ± 4.9	9.4 ± 5.5	9.9 ± 4.8	8.7 ± 6.3	0.5	0.750
Iron intake (mg)	86.3 ± 104.1	56.8 ± 63.7	50.2 ± 56.2	70.9 ± 66.4	55.4 ± 65.4	1.9	0.120
BMI (Kg/m^2)	25.2 ± 5.0	23.6 ± 4.3	22.8 ± 3.9	22.0 ± 3.9	23.1 ± 4.2	3.2	0.014*
WDDS	4.3 ± 0.9	4.2 ± 0.9	4.4 ± 0.9	4.3 ± 0.5	4.2 ± 0.9	0.7	0.582

*$p<0.05$

4.10.3: Respondents' Body Mass Index categories by Employment status

Underweight was higher (19.6%) among respondents who were unemployed while overweight (18.9%) and obesity (9.1%) was higher among employed respondents. The association between employment status and BMI categories of respondents was significant ($\chi^2 = 8.6$; p-value = 0.035).

Table 4.10.3: Respondents' Body Mass Index categories by Employment status

Employment status	BMI						
	Underweight n(%)	Normal n(%)	Overweight n(%)	Obesity n(%)	Total n(%)	χ^2	p-value
Unemployed	11(19.6)	37(66.1)	5(8.9)	3(5.4)	56(100.0)		
Employed	14(8.0)	112(64.0)	33(18.9)	16(9.1)	175(100.0)	8.6	0.035*
Total	25(10.8)	149(64.5)	38(16.5)	19(8.3)	231(100.0)		

*p<0.05

4.11: Logistic regression of variable(s)/factor(s) in significant association with normal Body Mass Index

The odds of having a normal BMI was 3.86 times higher among respondents who were using ART than among respondents who had not initiated the use of ART. This test is statistically significant at a p-value of 0.007 with 95% confidence interval of 0.097-0.691.

Table 4.11: Logistic regression of variables/factors in significant association with normal Body Mass Index

Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
ART use(1)	-1.352	0.501	7.273	1	0.007*	0.259	0.097	0.691
Employment(1)	-0.646	0.467	1.909	1	0.167	0.524	0.210	1.310
Educational level in 2 categories(1)	-1.310	0.704	3.466	1	0.063	0.270	0.068	1.072
Age in 2 groups (1)	-0.906	0.511	3.138	1	0.076	0.404	0.148	1.101
Constant	2.986	0.497	36.063	1	0.000	19.810		

*p value < 0.05

CHAPTER FIVE

DISCUSSION

5.1 Discussion

5.1.1 Socio demographic characteristics of respondents

This study has assessed the nutritional status of HIV-positive women attending clinics at sentinel sites in Akwa Ibom state, Nigeria. The report of the HIV sentinel survey in 2010 showed that the greater burden of HIV prevalence is among the age group less than 25 years (HSS 2010). In this study which involved mostly women from the three major ethnic groups in the state (Annang, Ibibio and Oron), a greater proportion of respondents that participated were aged less than 30 years and the mean age of all the respondents was 29.7 ± 6.8 years.

An earlier study which was conducted in Enugu, reported a similar mean age (29.4 ± 7.5 years) among respondents (Obi et al., 2010). The report however indicates that increase in age (>30 years) is associated with increased BMI. Respondents' BMI also increased with increased age and age was also observed to be significantly associated with BMI in this study ($p<0.05$).

The NPC (2008) report shows that only 6.1% of women of reproductive age in Akwa Ibom State had no formal education and in this study, majority of respondents were single and more than half had attained secondary level of education while only few respondents had no formal education. This observation however contradicted a study conducted in Jos, North Central Nigeria by Banwat, Yakubu, Olalude, Ogunsakin (2013) where more than half of the respondents had attained a tertiary education. Educational status in this study was observed to be associated with increase in BMI and WDDS at a level that was statistically significant. The number of food groups consumed by respondents increased with increase in level of education attained, and BMI.

HIV/AIDS has a poor impact on the economic conditions of individuals and populations, causing a downward spiral on the economic status of individuals that are either infected or affected by the disease (Piwoz and Preble, (2000); NIMR-FMOH, (2003) and NPC, (2004)). Considering the socio economic characteristics of the HIV-positive women in this study, majority of the women were employed, and were involved in different jobs. A higher proportion of HIV-positive women in this study were involved in sales and services (food

vending and trading). This observation indicates a low socioeconomic status of the HIV-positive women in this study.

This however supports the NPC (2008) report of the employment status and occupation of women in Akwa Ibom State, showing that 9.1% women were professionals and 65.4% were in sales and services. Employment status as well as occupation of the women in this study was significantly associated with BMI ($p<0.05$). Underweight was higher among the women who were unemployed. The women who had professional jobs or were in sales/services as their major occupation were mostly overweight. The sedentary nature of their job could have contributed to their high BMI.

The mean income of respondents that participated in this study is ₦7891.92 ± ₦11209.72 (50.83 ± 72.20 USD) and a greater proportion of respondents earned less than ₦5,000 for monthly income irrespective of their employment status. This implies that majority of the respondents lived on extreme poverty, being less than US$1 a day according to the World Bank classification of poverty. Also according to the World Bank income group classification, Nigeria has been categorised under the lower middle income group and by 2009/2011, 84% of Nigerians were observed to be experiencing moderate poverty that is living on less than US$2 a day (PRB, 2012). This poverty level will not allow the HIV-positive women to meet up with the financial demands of the illness, most especially ability to purchase and consume good quality food which enhances the immune system, thus poor nutritional status.

5.1.2 Nutrient intake and nutritional status assessment

In developing countries such as Nigeria, it has been observed that populations are often affected by multiple nutrient deficiencies, frequently as a result of poverty and diets with little diversity (Gorstein et al., 2007). Dietary habits and the use of Anti Retroviral Therapy in recent times have a major role in the nutritional changes experienced by PLWHA (Johnson, Castrillón and Ospina, 2004). In this study, the daily intake of energy was adequate among about a third, but inadequate in about half of all the respondents. Inadequate nutrient intake has been reported to be one of the causes of maternal malnutrition among African women therefore the need to improve energy intake to attain adequacy (Lartey, 2008).

Most of the respondents in this study had a medium/average tercile dietary diversity, meaning that they consumed foods from between 4 to 5 food groups within the reference period. Studies conducted in South Africa (Steyn et al., 2006) and Kenya (Ndahi, 2010) showed that the most predominantly consumed food was from the starchy staples group consisting of cereals, roots and tubers, which is similar to the observations made in all the sites in this study. All respondents consumed starchy staples mainly from roots and tubers within the reference period. This could probably serve as an explanation for the high daily energy intake level of the respondents in this study.

Protein and non-protein energy (from carbohydrates and fats) must be available to prevent protein-energy malnutrition (PEM). Similarly, if amino acids are not present in the right balance, the body's ability to use protein will be affected. Protein deficiency has been shown to affect all of the body's organs and many of its systems. The physical signs of protein deficiency include edema, failure to thrive in infants and children, poor musculature, dull skin, and thin and fragile hair. Biochemical changes reflecting protein deficiency include low serum albumin and low serum transferrin. In this study however, excess protein was reported and the risk of adverse effects from excess protein intake from foods appears to be low. Data are conflicting on the potential for high-protein diets to produce gastrointestinal effects, changes in nitrogen balance, or chronic disease, such as osteoporosis or renal stones (Otten et. al., 2006).

The reason for inadequate consumption of micronutrients among the respondents can be supported with the report of the proceedings of the International Symposium on Food and Nutrition Security which indicates that starchy staples are poor in micronutrient content and could lead to malnutrition especially inadequate micronutrient intake (Kennedy, Razes, Ballard & Dop, 2010).

The study of Jones et al., (2003) showed that increased BMI was not altogether bad for PLWHA as a positive association was reported between increased BMI and a lower rate of progression of HIV disease. A similarity in prevalence of overweight/obesity between Highly Active Anti Retroviral Therapy patients and the general population was established by Crum-cianflone et al., (2008). The NPC (2008) reported the mean BMI of women of reproductive age in Akwa Ibom State and Nigeria to be similar to that observed in this study.

5.1.3 ART use and duration of use

The introduction of Anti Retroviral Therapy (ART) and Highly Active Anti Retroviral Therapy (HAART) for the management of HIV has decreased the incidence of underweight (Kotler, 2000), which was reported in this study to be low. Another study conducted in the FCT in Nigeria showed an increase in BMI to levels similar to the general population upon treatment with HAART (Mustapha, Ehianeta, Kirim and Osungwu, 2011). The BMI of majority of women of reproductive age sampled in Akwa Ibom State was within the normal range. Similarly, it was observed in this study that the BMI of majority of the respondents was within normal range, higher than respondents who were overweight or obese.

These findings indicate that underweight, overweight and obesity co-exist among HPW on anti retroviral therapy in a pattern similar with that of HIV negative women of reproductive age in Nigeria. This calls for intervention as it has been established that maternal malnutrition is the leading risk factor for preventable deaths and diseases in developing countries including Nigeria.

According to the new WHO recommendation for the initiation of ART among all adults living with HIV when their CD4 cell count falls to 500cell/mm^3 or less and when their immune systems are still strong, a large proportion of the HIV-positive women in this study had already initiated the use of ART as at the period of conducting this study. The WHO report notes that this can keep them healthy, lower the amount of virus in the blood and reduce the risk of passing it on to someone else (WHO, 2013).

5.1.4 Nutrition and ART use

ART is critical to long-term survival in HIV infection, but to achieve optimal outcomes, issues such as energy expenditure and food insecurity highlight the need for comprehensive services to address all contributors to nutritional status (Sztam et al, 2010). Findings from this study show a significant association between the use of ART and energy intake and dietary diversity of the respondents ($p<0.05$). Respondents who used ART consumed more energy and foods from more food groups during the reference period of this study.

Studies have shown that increased BMI is not altogether bad for PLWHA as a positive association existed between increased BMI and a lower rate of progression of HIV disease (Jones et al., 2003). Similarly, there was a significant association between the use of ART and BMI among respondents in this study. Most of the respondents who were on ART had

normal BMI compared to those who were not using ART and were underweight. The aim of treatment of PLWHA with ART which is to keep them healthy while reducing mortality, it is therefore necessary to ensure BMI normal weight status among PLWHA.

A study conducted among HIV-infected children reported that they experienced a continued increase in weight and height having been placed on ART for about 5 years (Guillen et al., 2007). Most respondents in this study had been using ART for more than 52 weeks, the longer the duration of use of ART, the higher the BMI. Majority of the respondents who had been using ART for more than 52 weeks, were either overweight or obese. A greater proportion of respondents who were underweight were among those who only initiated ART use for less than 24 weeks prior to this study while those who used ART for about 24-52 weeks were mostly overweight.

Duration of use of ART was found to be significantly associated with BMI in this study. This therefore implies that respondents who had commenced use of ART will most likely have better nutritional status and also experience reduced morbidity compared to ART naive respondents. These findings support the report by some authors (Kotler, 2000, Katona and Katona-Apte, 2008; Mustapha et al, 2011) that with the introduction of HAART, malnutrition and its prevalence had reduced, with increased prevalence of obesity to a level similar to that of the general population (Hendricks, Mwamburi, Newby and Wanke 2008, Jaime, Florindo, Latorre, Brasil, Santos and Segurado 2004, Leite & Sampaio 2008; Ford and Mokdad 2008 and Crum-Cianflone et al., 2008).

These findings were however not consistent with the outcome of a study conducted in Philadelphia where neither the duration of ART nor the type of regimen influenced BMI values (Amorosa, Synnestvedt, Gross, Friedman, MacGregor et al., 2005). ART had been identified as a nutrition intervention that is able to improve nutritional status (Sztam et al., 2010) though malnutrition is still an established possibility even with ART use (Jerene, Endale, Hailu & Lindtjorn, 2006). The Federal Governments free ART policy has led to an increased uptake of ART by PLWHA and consequently an improved nutritional status and quality of life too.

5.1.5 Factors associated with normal BMI of HPW

All the variables/factors (ART use, duration of ART use, employment status, income, age and level of Education) that were associated with the BMI of respondents in this study were not significantly associated with normal BMI except ART use. Respondents' ART use in this study was significantly associated with normal BMI status in the final multivariate analysis model. This corroborates other reports that short duration studies recorded a significant association with ART use while studies with longer follow-up times recorded a peak followed by a decline in weight (Gallant, Staszewski, Pozniak, DeJesus, Suleiman et al., 2004; Lichtenstein, Ward, Moorman, Delaney, Young et al., 2001).

5.2 Conclusion

It is clear in this study that underweight, overweight and obesity co-exist among HPW at sentinel sites in Akwa Ibom State irrespective of their ART treatment status and duration. Underweight was more prevalent among respondents who had not initiated the use of ART while overweight and obesity were more prevalent among respondents who were using ART. Though underweight is still a problem among HPW, majority of the respondents had their BMI within the normal range. Inadequate micronutrient intake and consumption of medium to low diversity diet were common among the women.

Overall, mean BMI among respondents in this study increased with increase duration of ART use, increase age and increase in educational level (women who had attained tertiary education). HPW who were already using ART as at the period of conducting this study were more likely to have a normal BMI outcome. Conversely, among the socio demographic factors considered in this study neither marital status nor religion was significantly associated with BMI.

5.3 Recommendation

Based on the findings from this study the following are recommended:

1. High diversity diet is highly recommended for HIV-positive women as it contributes to good nutritional status such as adequacy of nutrients and improved anthropometric outcomes.
2. Similarly, monitoring BMI as part of nutritional status assessment is recommended for effective patient management.

3. A more comprehensive study should be conducted to assess the nutrient composition of all the food varieties across the different regions of Nigeria.
4. Only increasing access to ART cannot improve nutritional status, therefore nutrition care and support should be integrated into the initiation of ART; while adequate monitoring of ART use is recommended for proper adherence.
5. As a way of providing comprehensive care for PLWHA, the need to incorporate human nutritionists for adequate monitoring of patients' nutritional status not only through weight monitoring but BMI and dietary factors is recommended.
6. Particular attention to addressing poverty among this target population is recommended in order to improve their nutritional status and address the first Millennium Development Goal (MDG 1) which is to eradicate extreme poverty and hunger.

5.4 Contribution to knowledge

This study has contributed the following to knowledge:

1. The nutritional status, BMI categories of underweight, normal BMI, overweight and obese; and anthropometric outcome of HPW at the sentinel sites in Akwa Ibom state was provided in this study.
2. Underweight is still prevalent among this target group and overweight and obese was more prevalent among HIV-positive women in Ikot Ekpene.
3. This study has provided the Women Dietary Diversity Score (WDDS) of HPW at the study sites.
4. Furthermore, the findings observed in this study showed the need for proper integration of nutrition care and support into the management and care of people living with HIV/AIDS.

5.5 Limitations to the study

1. This study is limited in the choice of study design being cross sectional, a result of which only the BMI and dietary intake of respondents was used to assess nutritional status.
2. Nutrient composition of foods consumed by respondents in this study could not be sufficiently assessed as a comprehensive Food Composition Table for Nigerian foods is not yet available.

3. There is no universally acceptable cut-off point above or below which dietary diversity can be considered adequate or inadequate.
4. Due to the purposive sampling of the study sites, HIV-positive women at other treatment centres in the state were not included in the study. This makes the study results less generalisable to all HIV-positive women in the state but does not invalidate the findings in this study.

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APPENDIX 0NE

INFORMED CONSENT FORM

IRB Research Approval Number: UI/EC/12/0301

This Approval will elapse on: 09/01/2014

Title of the research: Dietary intake and nutritional status assessment of people living with HIV/AIDS (PLWHA) in sentinel sites in Akwa Ibom state

Name of principal investigator: This study is being conducted by **MENDIE**, Esther Akpan of the Department of Human Nutrition, University of Ibadan – Nigeria.

Purpose of research: To assess dietary intake and nutritional status of PLWHA in sentinel sites in Akwa Ibom State.

Procedure of the Research: A multistage sampling technique involving four (4) stages will be used including the use of total sampling for the use all the (4) sentinel sites in the state for the study and a systematic random sampling to select every third (3rd) woman of reproductive age from the list of PLWHA in the clinic. Certain inclusion and exclusion criteria will be used as basis for selecting participants and approximately 231 participants will be expected to take part in this study. Semi structured questionnaire and food frequency questionnaire will be administered, also anthropometric measures (height, weight, waist/hip ratio) and body mass index (BMI) will be assessed to determine nutritional status and prevalence of malnutrition among participants.

Expected duration of research and of participants' involvement: You are expected to be involved in this study for 2months with only 1month active participation.

Risk(s): It is expected that this research will pose no physical, biological or social harm to all the research participants as all the procedures involved are non invasive and no samples (blood, urine, saliva are collected). It is understood that in the process of recall in the administration of questionnaire certain emotional harm might be experienced. This type of harm is not anticipated in this study.

Costs to the participants' if any, of joining the research: Your participation in this research will not cost you anything.

Benefit(s): This research will help in determining the following:

a) nutritional status of PLWHA in sentinel sites in Akwa Ibom state
b) prevalence of malnutrition among PLWHA in sentinel sites in Akwa Ibom state
c) relationship between treatment and malnutrition among PLWHA in sentinel sites in Akwa Ibom state
d) effect of behavioural characteristics on nutritional status of PLWHA in sentinel sites in Akwa Ibom state

Confidentiality: Data collected will be treated with utmost confidentiality as questionnaires will be coded in a way that information cannot be traced to owners except by the research team and data collected will only be used for research purpose.

Voluntariness: Your participation in this study is voluntary and you are at liberty to withdraw at any time without any reprisals.

Alternatives to participation: If you choose not to participate, this will not affect your treatment and other services in this clinic.

Due inducement(s): You will not be paid for participating in this research.

Consequences of participants' decision to withdraw from research and procedure for orderly termination of participation: You are at liberty to withdraw from the study at any time, but some of the information you provided before you chose to withdraw may have been modified or used in reports and these cannot be removed anymore. However the researchers wish to comply with your wishes as much as is practicable.

Modality of providing treatments and action(s) to be taken in case of injury or adverse event(s): In the event that you suffer any harm as a result of your participating in this study, the research will bear the cost of the treatment.

What happens to research participants and communities when the research is over: Research findings and outcome will be made available to research participants through the health facilities used in this research.

Any apparent or potential conflict of interest: This research is self sponsored and solely for academic purpose.

Statement of person obtaining informed consent:

I have fully explained this research to _____ and have given sufficient

(*questionnaire code*)

information, including about risks and benefits, to make an informed decision.

DATE: _____SIGNATURE: _____

NAME: _____

Statement of person giving consent: I have read the description of the research or have had it translated into language I understand. I have also talked it over with the doctor to my satisfaction. I understand that my participation is voluntary. I know enough about the purpose, methods, risks and benefits of the research study to judge that I want to take part in it. I understand that I may freely stop being part of this study at any time. I have received a copy of this consent form and additional information sheet to keep for myself.

DATE: _____SIGNATURE: _____

NAME: _____

This research has been approved by the Ethics Committee of the University of Ibadan and the Chairman of this committee can be contacted at Bode Building, Room T10, 2nd Floor, Institute for Advanced Medical Research and Training , College of Medicine, University of Ibadan, Telephone: **08032397993,** E-mail: **uiuchirc@yahoo.com.** If you have any question about your participation in this research, you can contact the principal investigator, Mendie, Esther at the Department of Human Nutrition, Faculty of Public Health – University of Ibadan or on her mobile phone **08030978690 and e-mail: esthermendie@yahoo.com.** You can also contact the Head of Department of Human Nutrition, University of Ibadan.

APPENDIX TWO

QUESTIONNAIRE

Dear respondent,

My name is Mendie Esther Akpan and I am a postgraduate student of the Department of Human Nutrition, Faculty of Public Health at the University of Ibadan; Ibadan – Oyo State. I am conducting a study the goal of which is to assess dietary intake and nutritional status of people living with HIV/AIDS (PLWHA) at sentinel sites in Akwa Ibom state. Results from this study will form a basis for the development of nutrition intervention programmes to reduce malnutrition and progression of HIV among PLWHA. Please be assured that all the information provided in this questionnaire will be treated with confidentiality and please note that your names are not required. Thank you for your sincerity and cooperation.

(For official use only)

Code: **……/…….**

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

(Please tick (√) the options that correspond to your answer or fill in the spaces provided)

1. **How old are you as at last birthday (in years)? …….**
2. **Highest level of Education:**
   1. No formal Education ( )
   2. Primary ( )
   3. Secondary ( )
   4. Tertiary ( )
3. **Religion:**
   1. Christianity ( )
   2. Islam ( )
   3. Traditional ( )
   4. Others (please specify)……
4. **Nationality:** ……..
5. **Ethnicity (for Nigerians only)**
   1. Ibibio ( )
   2. Annang ( )
   3. Oron ( )
   4. Igbo ( )
   5. Hausa ( )
   6. Yoruba ( )
   7. Others (please specify)……..
6. **Are you employed or have a paid job?**
   1. Yes ( )
   2. No ( )

7. Occupation

1. Civil servant ( ) 2. Trading ( )
3. Farming ( ) 4. Apprentice ( )
5. Public servant ( ) 6. Others (specify)

8. Average income per month …….. (In naira ₦)

9. Any alternative source of income?

1. Yes ( ) 2. No ( )

10. Marital status

1. Currently Married ( ) 2. Single ( )
3. Cohabiting ( ) 4. Separated ( )
5. Divorced ( ) 6. Widowed ( )

11. Family type

1. Monogamous ( ) 2. Polygamous ( )

12. Who is the bread winner (*for married only*)?

1. Husband ( ) 2. Wife ( )
3. Others (specify) ……..

13. Type of housing

1. Cement/blocks ( ) 2. Mud ( )
3. Wood ( ) 4. Zinc ( )

14. Cooking fuel

1. Gas ( ) 2. Firewood ( )
3. Kerosene ( ) 4. Sawdust ( )

SECTION B: TREATMENT

(The following section contains questions about the type of treatment you take whether hospital or self prescribed. Please tick (√) the option that corresponds to your answer)

15. Presence of opportunistic infections (e.g. tuberculosis)

1. Yes ( ) 2. No ( )

16. Are you currently using any supplements (e.g. vitamin B complex, multivitamin or iron tablets)?

1. Yes ( ) 2. No ( )

17. Are you currently using any herbal supplement, concoction or treatment?

1. Yes ( ) 2. No ( )

18. Are you taking any anti retroviral therapy (ART) currently?

1. Yes ( ) 2. No ( )

19. How long have you been taking anti retroviral therapy (ART)? ----------

20. When did you first know of your HIV status? …….

21. Do you belong to any support group?

1. Yes ( ) 2. No ( )

22. Have you ever received nutrition counseling?

1. Yes ( ) 2. No ( )

23. If yes to Q22, what was the source? (*If no to Q22 please go over to Section C)*

	Sources	Yes	No
1.	**Hospital/health facility**		
2.	**Support group**		
3.	**Telephone (HIV/AIDS hotline or National call center on HIV/AIDS and related diseases)**		
4.	**Media (TV, radio, internet)**		
5.	**Church, mosque or any other religious organization**		
6.	**Others (specify)** ----------		

24. If yes to Q22, how often?

1. Once a week ( ) 2. Once a month ( )
3. During every clinic/meeting day ( ) 4. Once in two months ( )
5. Others (specify) ……

SECTION C: BEHAVIOURAL CHARACTERISTICS

25. Do you smoke cigarette?

1. Yes ( ) 2. No ( )

26. Do you use tobacco (snuff)?

1. Yes ( ) 2. No ( )

27. Do you drink alcohol?

1. Yes ( ) 2. No ( )

28. Do you use hard drugs?

1. Yes ( ) 2. No ( )

29. If yes to Q28 which of the following? (*if no please go over to Section D*)

S/N	Hard drugs	Yes	No
1	**Marijuana**		
2	**Cocaine**		
3	**Heroine**		
4	**Petrol**		
5	**Others (specify)**		

SECTION D: DIETARY INTAKE/ANTHROPOMETRIC MEASUREMENTS

30. Are there foods in your community that are forbidden to be eaten (food taboos)?

1. Yes ( ) 2. No ( )

31. If yes to Q30, please specify the type of foods …….
……

32. Do you experience problems eating food?

1. Yes ( ) 2. No ( )

33. If yes to Q32 Please select any of the options that represent the problems you experience with food intake (*if no please go over to Q34*)

S/N	PROBLEMS WITH FOOD INTAKE	YES	NO
1	Loss of appetite		
2	Swallowing problem		
3	Nausea		
4	Vomiting		
5	Others (specify)		

34. Are you restricted from eating any type of food?

1. Yes ( ) 2. No ( )

35. If yes to Q34 state what food(s) ----------

---

36. What reasons may you give for these restrictions in Q34?

1. food-drug interference ( ) 2. Other reasons ----------

(*This table is to be completed by the interviewer*)

S/N	Anthropometrics	Measurements	Remarks
1.	Weight in kilograms (kg)		
2.	Height in centimetres (cm)		
3.	BMI (kg/m^2)		
4.	Waist circumference in centimetres (cm)		
5	Hip circumference in centimetres (cm)		
6.	Waist/Hip ratio (WHR)		

SECTION E: 24-HOUR DIETARY RECALL

Please kindly tell me everything you ate or drank after you woke up yesterday morning until you went to bed. Include all you had at home, outside the home, even snacks, tea, coffee, soft drinks, juices of all kinds etc and others. Please be specific and as honest as possible.

S/N	Food/Drink	Description (Qty, size/price)	Place Taken	Time	Amount	Weight equiv. (g)

1. Was food taken usual? (Yes/No)
   If No, How was it unusual?
2. Was it a Feast day? (Yes/No)
3. Probe for Sickness (Yes/No)
   If yes did the sickness affect your appetite (Yes/No)
   If yes how? Increase OR Decrease
4. Probe for Supplement (Iron, Vitamins, antimalaria and other supplements) (Yes/No)

SECTION F: INDIVIDUAL DIETARY DIVERSITY QUESTIONNAIRE*

Please describe the foods (meals and snacks) that you ate yesterday during the day and night, whether at home or outside the home. Start with the first food eaten in the morning.

QN	Food group	Examples	YES=1 NO=0
1	CEREALS	bread, noodles, biscuits, cookies or any other foods made from millet, sorghum, maize, rice, wheat, buns, puffpuff, doughnut, spaghetti,	
2	VITAMIN A RICH VEGETABLES AND TUBERS	pumpkin, carrots, squash, or sweet potatoes that are orange inside + *other locally available vitamin-A rich vegetables(eg. sweet pepper)*	
3	WHITE TUBERS AND ROOTS	White potatoes, white yams, cassava, or foods made from roots (*eg. Garri, tapioca, ekpang*)	
4	DARK GREEN LEAFY VEGETABLES	dark green/leafy vegetables, including wild ones + *locally available vitamin-A rich leaves such as cassava leaves, fluted pumpkin leaves, afang, aditan, atama etc.*	
5	OTHER VEGETABLES	other vegetables, including wild vegetables	
6	VITAMIN A RICH FRUITS	ripe mangoes, papayas + *other locally available vitamin A- rich fruits*	
7	OTHER FRUITS	other fruits, including wild fruits *eg. Uyo*	
8	ORGAN MEAT (IRON- RICH)	liver, kidney, heart or other organ meats or blood-based foods	
9	FLESH MEATS	beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds	
10	EGGS		
	FISH AND SEA FOODS	fresh or dried fish or shellfish, periwinkle, oyster, crab, prawn, crayfish	
12	LEGUMES, NUTS AND SEEDS	beans, peas, lentils, nuts, seeds or foods made from these *eg. Moimoi*	
13	MILK AND MILK PRODUCTS	milk, cheese, yogurt or other milk products	
14	RED PALM PRODUCTS	Red palm oil, palm nut or palm nut pulp Sauce	

15	OILS AND FATS	oil, fats or butter added to food or used for cooking	
16	SWEETS	sugar, honey, sweetened soda or sugary foods such as chocolates, sweets or candies	
17	SPICES, CONDIMENTS, BEVERAGES	spices(black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages OR *local examples*	

*Adapted from FAO/Nutrition and Consumer Protection Division, version 4 December, 2008

APPENDIX THREE

NWED MBUME

Edima mbon iboro,

Ami nkere Mendie Esther Akpan, ami ndi akwa eyen ufok nwed ke epri usiak ifia emi ekotde ndido udia emi okotukde owo, ke akwa ikpehe usiak ifia emi ekotde anwaanwa nsongidem okotukde owo, ke akwa ufok nwed nta ifiok emi odude ke Ibadan, obio Oyo. Ami nkama ukpep mkpo mbana ndise mme usung ye afang emi mme owo adade edia mme nsio nsio udia, ye edu udia emi oyun okotukde mme owo emi enyenede udongho itia ita ke itie emi ekode sentinel ke obio Akwa Ibom. Mme iboro emi ediworode ke idaha ukpep emi eyetie nte usung uboho ke okotukde mme nsio nsio ufang udia, ndiyung nsuhode unana ntido eti udiankpo emi odude ke HIV ke ufot mmo emi edunde ye udongho itia ita. Mbok nyom edi songho nte ke kpukpuru iboro eke ndinyenede nto mbufo idibehe ikesim mbon efen, ndien ndidian do, ufon eyin mbufo ididuhe. Esosono ke edu akpaniko mbufo ye uwam ami esinde enomi.

AKPA IKPEHE : ANWAANWA NDIDO EMI ONODE IFIOK ABANA NKPO

(Mbok sio tiet (√) ke otuemi asanade okotuk ye iboro fo, oyun oyoho mme ufan emi ye iboro fo)

1. Ekedi isua ifan ke akpatre usoro emana fo (ke mme isua)? .....

2. Akwa idaha emi esimde ke ufok nwed:

1. nyeneke eti idaha ukpep ke otukde ufok nwed ( ) 2. Akpa ikpehe ufok nwed ( )
3. udiana akpa ikpehe ke ufok nwed (secondary) ( ) 4. Ufok nwed nta ifiok ( )

3. Itie ukpono fo:

1. Mme nsna Abasi ( ) 2. Mme atuak ibuot isong (Isam) ( )
3. Idaha mkpo obio ( ) 4. Mbon efen (mbok siak) ( )

4. Obio emana fo:.....

5. Ison obio idung fo (adi ke otode Nigeria ikpong)

1. Ibibio ( ) 2. Annang ( )
3. Oron ( ) 4. Igbo ( )
5. Hausa ( ) 6. Yoruba ( )
7. Mbon efen (mbok siak) .....

6. Ndi emenyene utom emi ekpede fi okuk?

1. mmenyene ( ) 2. Nyeneke ( )

7. Se anamde

1. Utom mbakara ( ) 2. Nyam udua ( )
3. Nto inwang ( ) 4. Nkpep nkpo ( )
5. Anwaanwa eyen ufok utom ( ) 6. Mbon efen (mbok siak) ( )

8. Idaha okuk emi adiade ke ofiong.....(ke naira ₦)

9. Mme usung efen mmodo emi adade enyene okuk?

1. Mmodo/mmenyene ( ) 2. Iduhe/nyeneke ( )

10. Idaha fo ke abana ndo

1. mmenam ndo ( ) 2. Nnamke ndok kana ( )
3. ndung ye owo emi mme ndoho kana ( ) 4. Mmenam ndo edi imidianade ( )
5. mmenam ndo ke oyoho idaha edi mebo nwed edidianade ke ufok mbed ke edi woro ken do ( ) 6. Ndi ebe akpa ( )

11. Uto ufok oworode

1. Ebe tiet ye eka tiet ( ) 2. Ette tiet ye uwak iban ( )

12. Anie owo edi ono ufok udia (Mbume adi ono mmo emi edode ndo ikpong)?

1. Ebe ( ) 2. Nwan ( ) 3. Mbon efen (mbok siak) .....

13. Uto ufok idung

1. Ntong ubop ufok/itiat ( ) 2. Mbat ( )
3. Eto ( ) 4. Tian ( )

14. Ikang utem nkpo

1. Gas ( ) 2. Ifia ( ) 3. Aran ikang otode isong ( ) 4. Ndita eto ( )

UDIANA IKPEHE (B): NKPO EDIKOK YE USOBO

(Mbume ke ikpehe enyemi abana mme uto usobo emi afo adade, mme uto ufok ibok, usobo emi afo onode idem fo. Mbok sio tiet ke otu emi asanade okotuk ye iboro fo)

15. Emenyene ndido udongo esitidem (uto nte akpaikpai ikong)

1. mmenyene ( ) 2. Nyeneke ( )

16. Ndi afo e ada mme ibok nsono idem idaha emi (mme ibok iyip)?

1. Ke nda ( ) 2. Ndaha ( )

17. Ndi afo ke ada mme odung mme ibok mbubut owonte usobo?

1. ke nda ( ) 2. Ndaha ( )

18. Ndi afo ke ada usobo udongo itia ita emi ekotde ART?

1. Ke nda ( ) 2. Ndaha ( )

19. Abihi didie afo aketono ada usobo udongo itia ita emi ekotde ART? .....

20. Ini efe ke afo okotono odiongo ke emenyene udongo itiaita?.....

21. Ndi afo emesine ke nka uwam mbon enyenede udongo itiaita (support group)?

1. Mmesine ( ) 2. Nsineke ( )

22. Ndi akananam afo omobo ukpep abana eti usung udia nkpo?

1. Mmebo ( ) 2. Mbogho

23. Edieke edide amaobo nte ebipde ke mbume edip ye iba, akedi ke uto usung afe? (edieke iboro fo edide ete ke ukuboho ukpeb emi yak ika anam ikpehe ita)

	Mme usung ukpeb	Ntre	Idghe ntre
1	Ufok ibok		
2	Ebiet unwam		
3	Nkpo uting iko(usop usop usung uting iko ke abanga udongo itia ita mme akwa itie ikot emi esede nkpo abanga itia ita ye mme udongo efen)		
4	Usung ubo etop (ekebe ndise, ekebe uting iko, internet)		
5	Ufok Abasi, itie ukpono mme atuak ibuot isong, mme itie ukpono efen		
6	Mbon efen (Mbok siak)		

24. Edieke afo enyimede kpa nte ebipde ke mbume edip ye iba, asi sop didie?

1. Ini tiet ke urua ( ) 2. Ini tiet ke ofiong ( )
3. Kpukpuru usen inyenede ndi bo usobo ke ufok ibok ( )
4. Ini tiet ke ofiong iba ( ) 5. Edieke efen odude (mbok siak).....

IKPEHE ITA: MME NDUNAM EMI ASANGADE OKOTUK YE IDO

25. Ndi afo emesi furi cigar?

1. Mmesi furi ( ) 2. Nsifurike ( )

26. Ndi afo emesi sin uwong?

1. Mmesi sin ( ) 2. Nsisinke ( )

27. Ndi afo emesi wong okposong mmin?

1. Mmesi wong ( ) 2. Nsiwongke ( )

28. Ndi emesi da mme okposong ibok?

1. Mmesi da ( ) 2. Nsidaha ( )

29. Edieke edide ama da ndomotiet kpa nte ebup de ke mbume edip ye itia ita, efe ke otu emi? (edieke mmudaha, ndien be ka ke ikpehe inang)

S/N	Mme mkposong ibok	Mmeda	Ndaha
1	Marijuana		
2	Cocaine		
3	Heroine		
4	Adan isong		
5	Edieke efen odude (mbok siak).....		

IKPEHE INANG: MME NSIONSIO USUNG UDIA/UDOMO IDEM

30. Ndi mme udia mmodo ke obio foe ma eke no ikpan edidia (mme udia mbet)?

1. Mmodo ( ) 2. Iduhe ( )

31. Edieke edidentre nte ebupde ke mbume edip ye duop, mbok siak mme uto udia odo

.....

32. Ndi emesi nyene mfana ke ama adia udia?

1. Mmmesinyene ( ) 2. Nsinyeneke ( )

33. Edieke eyimede kpa nte ebupde ke mbume edip ye duop iba, mbok sio ke otu emi owutde mme mfana odo esinyenede kea ma adia udia (edieke mmunyeneke mfana, ka mbume edip ye duop inang)

S/N	MME MFANA EMI ENYENEDE KE UDIA UDIA	MMENYENE	NYENEKE
1	Unyeneke udong uno udia		
2	Ukemeke ndi men nkpo		
3	Isiong		
4	Ikpohi		
5	Edieke efen odude (emekeme ndi siak).....		

34. Ndi enyene udia emi enode fi ikpan ndidia?

1. Odu ( ) 2. Iduhe ( )

35. Edieke enyimede kpa nte ebupde ke mbume edip ye duop inang, ndien siak mme udia odo .....

36. Nso idi mme ntak emi enode ikpan odo kpa nte ebupde ke mbume edip ye duop inang

1. ubiongo emi abangade udia ye ibok ( ) 2. Mme ntak efen .....

(okpokoro emi odongode nsio nsio nkpo ye udomo mmo enyene ndino iboro nto anibup mbume ikpong)

S/N	Anthropometrics	Measurements	Remarks
1.	**Weight in kilograms (kg)**		
2.	**Height in centimetres (cm)**		
3.	**BMI (kg/m^2)**		
4.	**Waist circumference in centimetres (cm)**		
5	**Hip circumference in centimetres (cm)**		
6.	**Waist/Hip ratio (WHR)**		

IKPEHE ITION: EDITI MME UDIA AKE DIADE TONGO USEN UBOK MKPONG TUTU OKON EYO

Mbok nwana doho mi kpukpuru se ake diaide nkpong usen ubok tutu afo oduk idap. Dian kpukpuru se ake diade ke ufok, ke anwa, mme utata nkpo nte uyo, tea, mmemmem mmin, ininge mmin otode mfri ke uto ke uto. Mbok nwana siak nte edide nyung nam ke ido akpaniko.

S/N	Udia/mmin	Awak didie, okpon didie, udua esie	Oto se ake diaide	Ini	Awak didie	udobi (g)

1. Ndi ama adia udia nte esi diade? (mmandia/Nkidiaha)
   Edieke edide ukudiaha nte esi diaide, ake diangade didie?
2. Ndi eke di usen usoro? (ntre/idihentre)
3. Ama nyene udongo? (mmenyene/nyeneke)
   Edieke edide amanyene, ndi udongo odo ama anam fi etre ndinyene udong nno udia (ama anam/ikinam ke)
   Edieke edide ntre ndi okododok mme okososuhode?
4. Ndi ama ada mme ibok nsong idem (nte mme ibok iyip) (mmanda/Nkidaha)

IKPEHE ITIOTIET: MME MBUME ABANGADE NSIO NSIO UDIA

Mbok siak mme udia (utetem ye mme utata nkpo) emi afo akediade nkpong tongo ke usenubok tutu okoneyo nkpong, mm eke ufok, mm eke anwa. Tongo ye akpa udia ake diade ke usenubok.

QN	Nsio nsio mme nkok udia	Mme nsio nsio nkpo udia ke mme nkok udia emi	Mmenyime =1 Nnyimeke =0
1	Cereals	Uyo, ebipot, edesi,	
2	Mme ikong ye me odung udia emi enyenede ediwak vitamin A	Ikong ubong, mme udia ye ikong emi esit edide awawa me ndad ndad.	
3	Mme afaia odung udia	Iwa, afia bia, afia potatoes, garri usung bia, edita iwa, ekpang	
4	Mme awawa ikong efere	Ikong ubong, afang ikong iwa, editan, atama ye mme nsio nsio efen	
5	Mme uto ikong udia efen	Mme uto ikong efen nte mme afai ikong udia	
6	Mme mfuri enyenede uwak vitamin A	Ndad ndad mango, pawpaw ye mme mfuri mbon efen emi enyenede ediwak vitamin A	
7	Mme mfuri efen	Mme mfuri efen ye mme mfuri ikot nte uyo	
8	Unam otode mme esit unam enyenede uwak iron	Esit unam ye mme itie unam efen emi enyenede ediwak iyip	
9	Obuk unam	Unam enang, edi, ebot, unen, unen mbakara ye mme inuen efen	
10	Nsen unen		
11	Iyak ye mme udia mmong	Ndek ye unwanwan iyak mme iyak ikpok, mfi, nkop, isobo, ndek ye unwanwan obu	
12	Mme mkpasip	Okoti, mkpasip, mme udia enamde eto usung udia emi nte maimai	
13	Mmong eba ye mme udia efen otode mmong eba	Mmong eba, yoghurt, mme unwonwong nkpo efen otode mmong eba	
14	Mme nkpo emi otode ndadndad eto eyop	Ata aran, isip eyop, aran isip, abak	

15	Aran	Aran, butter	
16	Mme ininge nkpo	Sugar, aran okwok, ininge mmin, sweet	
17	Mme inem nkpo udia ye mme nkpo tea	Ntokon, inung, magi, okposong mmin, tea, coffee	

*Adapted from FAO/Nutrition and Consumer Protection Division, version 4 December, 2008.

APPENDIX FOUR

TRAINING PROGRAMME OF RESEARCH ASSISTANTS ON NUTRITIONAL STATUS ASSESSMENT OF HIV-POSITIVE WOMEN AT SENTINEL SITES IN AKWA IBOM STATE

Date: 1st and 2nd October, 2012

Venue: Methodist primary school, Ikot Obong Edong, Ikot Ekpene – Akwa Ibom state

1. Open prayer
2. Introduction of RAs and investigator
3. Objectives of the training programme

a. Overview of the training programme to the Research Assistants (RAs)

b. Basic skills required in an interview process

c. Conduct the training using the evaluation tools

d. Information on logistics and working modalities on the field

e. Pretesting procedures

4. General briefings a expectations from the research assistants:
    i. The investigator will make preliminary visits to the selected hospitals before commencement of data collection by RAs.
    ii. Respondents to be interviewed are HIV-positive women
    iii. Respondents will be selected systematically (Every 3rd woman on clinic appointment)
    iv. A small incentive will be given to each respondent at the end of the interview
    v. Two research assistants will be posted to a hospital determined by balloting
    vi. Maximum of two weeks have been earmarked for this data collection exercise
5. Questions and Answers
6. Distribution of Pretesting materials
7. Closing of the Training Programme

A TRAINING GUIDE ON HEIGHT AND WEIGHT MEASUREMENT PROCEDURES

OBJECTIVES

The goal of this training session is to impact research assistants (RAs) with relevant knowledge on the measurement techniques described in this manual.

At the completion of this training the RAs will be able to:

1. Set up measurement stations with all of the appropriate equipment
2. Check accuracy of the scales
3. Prepare respondents for measurement
4. Measure height and weight following proper procedure
5. Perform the steps of the weight measurement correctly
6. Perform the steps of the height measurement correctly
7. Apply the one-inch rule for height
8. Record/enter data
9. Maintain respondents' privacy and confidentiality
10. Provide respondents with results of the measurement where necessary in a confidential manner

DEFINITIONS

BMI or Body Mass Index: a measure of body fat that is the ratio of the weight of the body
in kilograms (Kg) to the square of its height in metres (m)

Calibration: the use of standard test weights and measuring rods to check the accuracy of equipment

Height: a standing measurement in inches or meters (m)

Frankfort Horizontal Plane: imaginary line passing through the external ear canal and across the top of the lower bone of the eye socket, immediately under the eye

Mid-Axillary Line: an imaginary line through the axilla (armpit) parallel to the long axis of the body and midway between its ventral (front or anterior) and dorsal (back or posterior) surfaces

Private: not openly or in public

Confidential: Information marked or intended for a specific person or persons

Scale: instrument for measuring weight

Stadiometre: instrument for measuring height

Weight: a measurement in pounds or kilograms

Zeroed: assuring the scale balances at 'zero or 00' before the respondent steps on the platform

Scapulae: Two large, flat, triangular bones forming the back part of the shoulder; also called shoulder blade.

GENERAL GUIDELINES FOR MEASURING AND RECORDING RESULTS

Follow the guidelines below when taking anthropometric measurements and subsequently recording the data:

1. Always tell the respondent what you are going to do before you do it. Explain what you are doing and why, such as when locating the leg tendon in the groin area to measure the upper leg length; or before adjusting the pants down to measure the waist circumference. Remain unaffected by tattoos, piercings, etc. and do not comment about the respondents' body. Maintain professionalism at all times.

2. Measure the right side of the body. If the respondent has a physical disability or abnormality on the right side, the examiner should still attempt to measure the right side. Only take measurements on the left side when the respondent has a cast, prosthesis, or amputation on the appropriate right limb; or for some other reason the measurement cannot be taken on the right side.

3. Turn the respondents in the direction needed for a given measure. Do not move yourself around the respondents instead. This promotes efficiency during the examination by saving time and avoiding unnecessary movement on the part of the RA.

4. Position the zero end of the measuring tape below the measurement value. With respect to circumference measures, do not take any measurement readings with the zero end of the tape placed above the section of the tape with the result.

5. Avoid parallax when taking measurement readings. Parallax describes the Phenomenon where an observer reads a different value on a measuring device depending on the angle from which it is viewed. Parallax is a common cause of data error especially for

measurements obtained using the skinfold callipers and measurement tape. The RA should read the measurement with his or her line of sight directly in front of the value rather than at an angle or from even slightly off to the side.

6. Record all measurements (except skinfolds) to the nearest tenth of a centimetre (0.1cm). Record skinfold measurements to the nearest tenth of a millimetre (0.1 mm). Always verify the result before advancing to the next measure.

PROCEDURES FOR WEIGHT MEASUREMENT

Respondents will be weighed in kilograms (Kg) using a digital weight scale. At the end of the measurement, RAs may share with the respondent if he or she wants to know the result.

1. Set the scale at zero reading
2. Place standard weight on the scale to ensure accuracy of the scale
3. If scale is accurate, begin assessments
4. Have the respondent remove shoes, heavy outer clothing (jacket, vest, sweater, hat), and empty pockets (cell phones, iPods) to extent possible
5. Have the respondent step on the scale platform, facing away from the scale read out, with both feet on the platform, and remain still with arms hanging naturally at side and looking forward
6. Read the weight value to the nearest 0.1 (1/10) kilogram
7. Have the respondent step off the scale and take a second measurement, repeating the steps above (measurements should agree within 0.1 kilogram; if not, re-measure until this standard is met)
8. For confidentiality and to avoid stigma or harassment, do not call out weight value
9. Record the weight value immediately in the relevant section on the respondents' questionnaire

PROCEDURES FOR HEIGHT MEASUREMENT

1. Have the student remove shoes, hat, and hair ornaments /buns,/braids to extent possible
2. Have the respondent stand on the footplate or uncarpeted floor with back against the stadiometre rule
3. Ensure legs are placed together, bringing knees or ankles together

4. Assure respondent's legs are straight, arms are at sides, and shoulders are relaxed
5. Assure the back of the respondent's body touches/has contact with the stadiometre at some point, preferably with heels, buttocks, upper back and head touching the measuring surface
6. Assure that the respondent's body is in a straight line (mid-axillary line parallel to the stadiometre),
7. Assure the head is in the appropriate position (Frankfort horizontal plane)
8. Ask the respondent to breath in and hold his/her breathe WITHOUT moving head or body while being measured
9. Bring headpiece down onto the upper most point on the head; compress the hair
10. Position yourself so that your eyes are parallel with the head piece and read the measurement to the nearest 0.1cm
11. Ask respondent to let breath out immediately record the results in the appropriate section of respondents' questionnaire.

Source: Hedley, Ogden, Johnson, Carroll, Curtin& Flegal (2004); Rockenbach, Smith, Green, Wells, Lindly, Glasscock, Lyons, Justus (2010).

APPENDIX FIVE

Aggregation of food groups from the Individual Dietary Diversity (IDD) questionnaire to create Women Dietary Diversity Score (WDDS)

Question number(s)	Food groups
1,2	Starchy staples[1]
4	Dark green leafy vegetables
3,6 and red palm oil if applicable	Other vitamin A rich fruits and vegetables[2]
5,7	Other fruits and vegetables[3]
8	Organ meat
9,11	Meat and fish[4]
10	Eggs
12	Legumes, nuts and seeds
13	Milk and milk products

[1] The starchy staples food group is a combination of Cereals and White roots and tubers.
[2] The other vitamin A rich fruit and vegetable group is a combination of vitamin A rich vegetables and tubers and vitamin A rich fruit.
[3] The other fruit and vegetable group is a combination of other fruit and other vegetables.
[4] The meat group is a combination of meat and fish.

APPENDIX SIX

CBN Exchange rates

Rate Date	Currency	Rate Year	Rate Month	Buying Rate	Central Rate	Selling Rate
10/02/2012	US DOLLAR	2012	October	154.78	155.28	155.78
10/03/2012	US DOLLAR	2012	October	154.77	155.27	155.77
10/04/2012	US DOLLAR	2012	October	154.77	155.27	155.77
10/05/2012	US DOLLAR	2012	October	154.77	155.27	155.77
10/08/2012	US DOLLAR	2012	October	154.75	155.25	155.75
10/09/2012	US DOLLAR	2012	October	154.75	155.25	155.75
10/10/2012	US DOLLAR	2012	October	154.75	155.25	155.75
10/11/2012	US DOLLAR	2012	October	154.75	155.25	155.75
10/12/2012	US DOLLAR	2012	October	154.75	155.25	155.75
10/15/2012	US DOLLAR	2012	October	154.75	155.25	155.75
10/16/2012	US DOLLAR	2012	October	154.75	155.25	155.75
10/17/2012	US DOLLAR	2012	October	154.76	155.26	155.76
10/18/2012	US DOLLAR	2012	October	154.76	155.26	155.76
10/19/2012	US DOLLAR	2012	October	154.76	155.26	155.76
10/22/2012	US DOLLAR	2012	October	154.76	155.26	155.76
10/23/2012	US DOLLAR	2012	October	154.76	155.26	155.76
10/24/2012	US DOLLAR	2012	October	154.76	155.26	155.76
10/29/2012	US DOLLAR	2012	October	154.76	155.26	155.76
10/30/2012	US DOLLAR	2012	October	154.76	155.26	155.76
10/31/2012	US DOLLAR	2012	October	154.74	155.24	155.74

Source: Central Bank of Nigeria, 2012

APPENDIX SEVEN

ETHICAL APPROVAL

INSTITUTE FOR ADVANCED MEDICAL RESEARCH AND TRAINING (IAMRAT)
COLLEGE OF MEDICINE, UNIVERSITY OF IBADAN. IBADAN, NIGERIA.
Director: **Prof. A. Ogunniyi,** B.Sc(Hons), MBChB, FMCP, FWACP, FRCP (Edin), FRCP (Lond)
Tel: **08023038583, 08038094173**
E-mail: **aogunniyi@comui.edu.ng**

UI/UCH EC Registration Number: **NHREC/05/01/2008a**

NOTICE OF EXPEDITED REVIEW AND APPROVAL

Re: Dietary Intake and Nutritional Status Assessment of People living with HIV/AIDS (PLWHA) at Sentinel Sites in Akwa Ibom State

UI/UCH Ethics Committee assigned number: UI/EC/12/0301

Name of Principal Investigator: **Esther A. Mendie**

Address of Principal Investigator: Department of Human Nutrition,
College of Medicine,
University of Ibadan, Ibadan

Date of receipt of valid application: 22/03/2012

Date of meeting when final determination on ethical approval was made: **10/01/2013**

This is to inform you that the research described in the submitted protocol and other participant information materials have been reviewed and *given expedited approval by the UI/UCH Ethics Committee.*

This approval dates from 10/01/2013 to 09/01/2014. If there is delay in starting the research, please inform the UI/UCH Ethics Committee so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the* UI/UCH EC *assigned number and duration of* UI/UCH EC *approval of the study.* It is expected that you submit your annual report as well as an annual request for the project renewal to the UI/UCH EC early in order to obtain renewal of your approval to avoid disruption of your research.

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the UI/UCH EC. *No changes are permitted in the research without prior approval by the* UI/UCH EC *except in circumstances outlined in the Code. The* UI/UCH EC *reserves the right to conduct compliance visit to your research site without previous notification.*

UI/UCH EC
10 JAN 2013
APPROVED

Professor A. Ogunniyi
Director, IAMRAT
Chairman, UI/UCH Ethics Committee
E-mail: uiuchirc@yahoo.com