UNIVERSITI PUTRA MALAYSIA

NUTRITIONAL STATUS AMONG PEOPLE LIVING WITH HIV IN KLANG VALLEY

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BY

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Abstract

NUTRITIONAL STATUS AMONG PEOPLE LIVING WITH HIV IN KLANG VALLEY

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Human immunodeficiency virus (HIV) is a virus that infects cells of the immune system and weakens or destroys their function. The synergistic interaction between infection, nutritional status and immune function is particularly evident in patients with AIDS, who exhibit impaired immune function and altered nutritional status. Standard antiretroviral therapy (ARV) or highly active antiretroviral therapy (HAART) is the combination of at least three ARV to prevent the transmission and slow down the progression of the infection in people living with HIV (PLWH). Thus the objectives for the study are to assess the nutritional status among PLWH and to determine the relationship between socioeconomic factors, use of HAART, and CD4 count with nutritional status. Due to the issue of confidentiality only 37 respondents were recruited through the snowball method. Through face-to-face interview, nutritional status of respondents was assess using their anthropometric measurements and also dietary intake. Almost two thirds (23 or 62.2%) of the respondents were male while 14 (37.8%) were female with a mean age of 42.3±8.8 years. Respondents in this study have mean CD4 count of 330.76±182.1 and 73.0% of them were taking HAART. Results showed that a majority (59.5%) of the respondents had normal body weight status, 24.3% were overweight, and 16.2% were underweight. As for dietary intake, male respondents had better RNI achievements compared to female respondents except for protein, vitamins A and C. This study also found that there is no significant relationship between socioeconomic status, use of HAART, and CD4 count with nutritional status among PLWH. This study also showed that majority have a normal body weight status however, their dietary intake was still poor. Effective intervention programs should be conducted in order to improve nutritional status among PLWH through education and counseling session by health care professionals.

Abstrak

TARAF PEMAKANAN DALAM KALANGAN PENGHIDAP HIV DI LEMBAH KLANG

Nur Adilah Bt Muhammadun Basar

'Human immunodeficiency virus (HIV)' merupakan virus yang menjangkiti sel sistem pertahanan badan dan melemahkan atau memusnahkan fungsi sel tersebut. Perkaitan di antara jangkitan kuman, taraf pemakanan, dan sistem pertahanan badan dapat dibuktikan oleh penghidap AIDS yang mempunyai gangguan dalam fungsi pertahanan badan dan juga taraf pemakanan. Terapi *antiretroviral* (ARV) atau 'highly active antiretroviral therapy' (HAART) merupakan gabungan sekurang-kurangnya tiga ARV untuk mengelakkan penyebaran dan memperlahankan pertumbuhan jangkitan tersebut dalam kalangan penghidapnya. Oleh itu, kajian ini dijalankan bertujuan bagi mengetahui taraf pemakanan penghidap HIV dan bagi menentukan hubungkait antara faktor sosioekonomi, penggunaan HAART, dan jumlah CD4 dengan taraf pemakanan golongan tersebut. Dipengaruhi oleh isu sulit, hanya 37 orang responden berjaya diperolehi melalui kaedah bola salji (snowball). Melalui kaedah temubual secara bersemuka, taraf pemakanan responden ditetukan melalui ukuran antropometri dan juga pengambilan makanan. 23 (62.2%) daripada responden merupakan lelaki manakala 14 (37.8%) merupakan wanita dengan purata umur adalah 42.3±8.8. Responden dalam kajian ini mempunyai purata jumlah CD4 iaitu 330.76±182.1 dan 73.0% daripada responden adalah dibawah penggunaan HAART. Keputusan kajian menunjukkan hampir keseluruhan (59.5%) responden mempunyai status berat badan yang normal, 24.3% merupakan lebih berat badan, dan 16.2% merupakan kurang berat badan. Bagi pengambilan makanan pula, responden lelaki lebih bagus dalam mencapai paras nutrisi yang disarankan berbanding responden wanita kecuali bagi protein, vitamin A dan C. Kajian ini mendapati tiada hubungkait yang ketara di antara faktor sosioekonomi, penggunaan HAART, dan jumlah CD4 dengan taraf pemakanan penghidap HIV. Kajian ini turut menunjukkan bahawa hampir majoriti responden mempunyai status berat badan yang normal tetapi pengambilan makann mereka adalah rendah. Program intervasi yang efektif harus dijalankan bagi memperbaiki taraf pemakanan dalam kalangan

penghidap HIV melalui pendidikan dan kauseling oleh pegawai kesihatan professional.

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Human immunodeficiency virus (HIV) is a virus that infects cells of the immune system and weakens or destroys their function. Infection with this virus results in the progressive deterioration of the immune system, leading to 'immune deficiency'. Immune systems are crucial to protect the human body from developing infections and cancer. HIV invades the genetic core of the CD4+, T-helper lymphocyte cells, which are the principle agents involved in the protection against infection. HIV infection has four clinical stages including acute HIV infection, clinical latency, symptomatic HIV infection, and progression of HIV to

AIDS. Each stage comes with different severity. Primary infection with HIV is the underlying cause of acquired immune deficiency syndrome (AIDS).

HIV is transmitted via direct contact with infected body fluids such as blood, semen, pre-seminal fluid, vagina fluid, and breast milk. Amniotic fluid surrounding a fetus, synovial fluids surrounding joints, and cerebrospinal fluids surrounding the brain and spinal cord are other fluids that can transmit HIV. By not having enough HIV, saliva, tears, and urine do not transmit the infection. Sexual transmission is the most common way the HIV is transmitted and injecting drug use is the second most prevalent method of transmission (Mahan et al., 2012).

According to Hughes, Darlington, and Bendich (2004), infections, no matter how mild have deleterious effects on nutritional status and in turn, nutrient deficiency especially when sufficiently severe to impair resistance to infection. Nutrition deficiency further burdens the already weakened immune system in the patient with HIV known as people living with HIV (PLWH). The synergistic interaction between infection, nutritional status and immune function is particularly evident in patients with AIDS, who exhibit impaired immune function and altered nutritional status. Micronutrient deficiencies, which influence immune function, are prevalent even before the development of HIV symptoms.

Today antiretroviral drugs (ARV) are used to control the multiplication of the virus in the body. Standard antiretroviral therapy (ARV) or highly active antiretroviral therapy (HAART) is the combination of at least three ARV to prevent the transmission and slow down the progression of the infection in

PLWH. According to the World Health Organization (WHO), the use of ART has reduced the prevalence of wasting as well as mortality rates among PLWH worldwide. Nonetheless, the limitations of ART, such as the nutrient-drug interaction, and the inaccessibility of the treatment (WHO, 2005) have meant that not all PLWH can be on this life saving drug.

Achieving basic nutritional recommendation is important when treating people living with HIV at all stages of the disease (WHO, 2003). Although undernutrition or malnutrition is still found among infected individuals, the use of highly active antiretroviral therapy (HAART) had not only prolonged their survival, but also increased the prevalence of obesity (Amorosa et al., 2005; Hendricks et al., 2006). Therefore, long-term complications, such as cardiovascular disease (CVD) relating to diet and obesity have become more important (Hendricks et al., 2006).

1.2 Problem statement

According to the UNAIDS report in 2012, globally, 34.0 million (31.4 million – 35.9 million) people were living with HIV at the end of 2011. An estimated 0.8% of adults aged 15-49 years worldwide were living with HIV. Sub-Saharan Africa remained most severely affected, although the burden of the epidemic continues to vary significantly between countries and regions. In Africa nearly 1 in every 20 adults (4.9%) wereliving with HIV accounting for 69% of the people living with HIV worldwide in 2012. Although the regional prevalence of HIV infection was nearly 25 times higher in Sub-Saharan Africa than in Asia, almost 5 million people are living with HIV in South, South-East and East Asia

together. The most severely affected regions after sub-Saharan Africa, were the Caribbean and Eastern Europe and Central Asia.

Men, women, and children with HIV/AIDS are at risk of compromised nutritional status, although the type and severity of malnutrition may vary from macronutrient and micronutrient deficits to altered nutrient metabolism (Bogden et al., 2000). According to Tang et al. (2002) nutritional status, especially the maintenance of weight and important body-protein stores (body cell mass), affects a person's ability to survive HIV disease. With a loss of body cell mass to a level of 54% of the expected value based on height, death is likely to occur in HIV-infected patients regardless of the presence or absence of infectious complications. Because metabolism of nutrients and medication occur primarily in the body cell mass compartment, knowledge and preservation of these body tissues can support the efficacy of the medication (John et al., 2003).

Infections with the HIV and AIDS have had a significant impact on domestic and global health, social, political, and economic outcomes. Prevention and treatment efforts to control HIV infection are more demanding than in previous decades. The challenges for patients and for those involved with HIV/AIDS prevention, care, and treatment efforts are achieving food and nutrition security, managing nutrition-related complications of HIV infection and the multiple aspects of disease initiated by or surrounding HIV infection which is referred to as HIV disease (American Dietetic Association, 2004).

There were many other issues related to the HIV disease and side effects of medication therapy that may require nutrition intervention. With the development of HAART, life spans are increasing but, this benefit of medication is tempered by a broad spectrum of side effects, including a wide range of laboratory and clinical outcomes. According to the American Dietetic Association (2004), fat redistribution syndrome or lipodystrophy, hyperlipidemia, insulin resistance and hyperglycemia have been extensively reported in subjects treated with protease inhibitor (PIs) and nucleoside-reverse transcriptase inhibitors (NRTIs) which are two examples of ARV. However, it remains uncertain whether these complications were related to each other or not since all the side effects were also related to dietary patterns of individual.

Therefore, the present study aims to determine the nutritional status among PLWH based on their anthropometric data and also dietary intake. Besides that, this study and the research methodology served as a purpose to improve the understanding of the following questions:-

1) What is the nutritional status of PLWH?
2) Is there any association between socio-economic factors and nutritional status among PLWH?
3) Is there any association between usage of HAART with nutritional status among PLWH?

1.3 Importance of the study

It has been 32 years since HIV was first recognized as a public health menace. It remains till today a lethal disease that brings misery and suffering both to the infected person as well as to the community and country. However, the emergence of HAART in the mid 90's has meant a profound improvement in the prognosis of HIV sufferers worldwide, changing HIV from a lethal infection to a chronic, controllable condition. Since 2006, Malaysians have been able to access HAART for free. Mortality and morbidity are reduced since then and quality of life of this population taking HAART has also improved. The present study provides information on current nutritional status of PLWH. It is important to monitor their nutritional status because if they have a good nutrition and are able to maintain it for a long time, they can also be employed and be of service to the country. Since the government has spent a lot of money in providing free treatments usingHAART, it is important the PLWH are able to benefit fully so that the money they spent is to good use.

1.4 Conceptual framework

Figure 1 shows the conceptual framework of this study. Based on the figure, socio-economic status, usage of antiretroviral therapy, and CD4 count are considered as independent variables while nutritional status as the dependent variable. All the variables were measured by different type of parameters and are further explained in the methodology part. Nutritional status is measured by using body mass index (BMI) and achievement of RNI from dietary intake as the parameter.

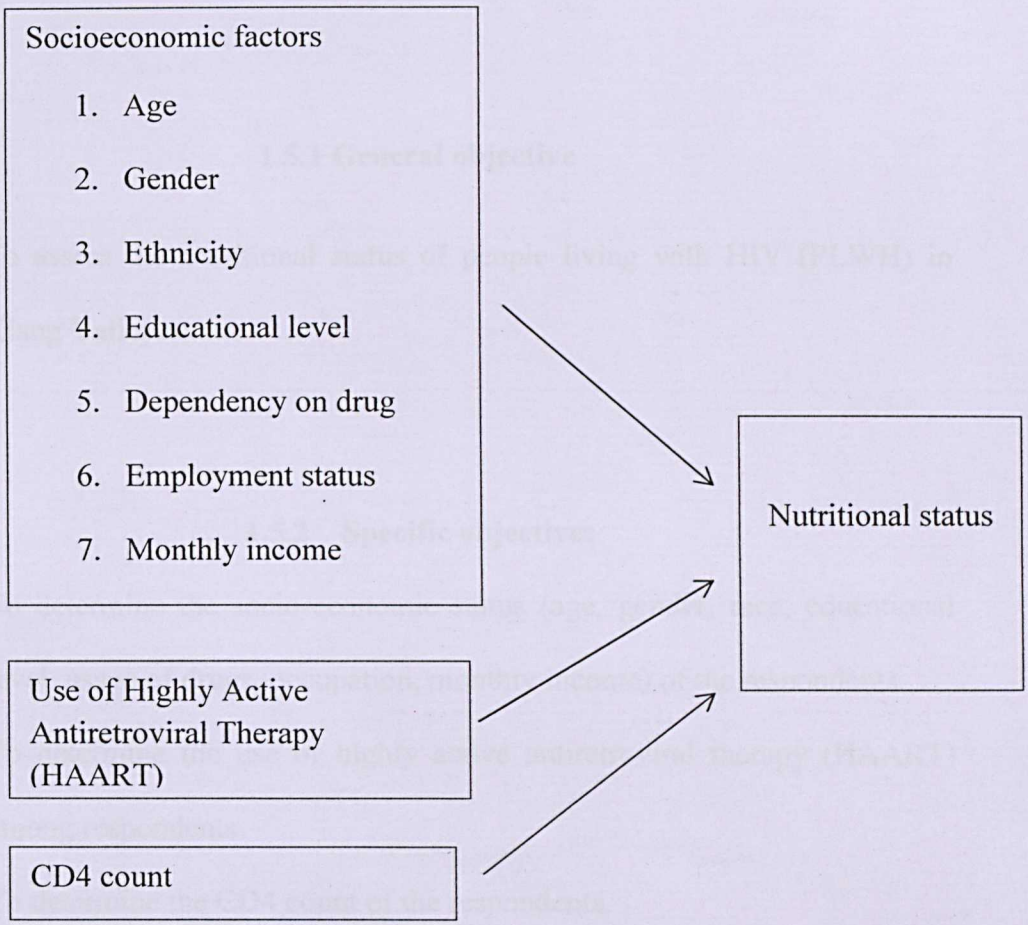

Figure 1: Conceptual framework of the study

1.5 Objectives

1.5.1 General objective

To assess the nutritional status of people living with HIV (PLWH) in Klang Valley.

1.5.2 Specific objectives

1. To determine the socio-economic status (age, gender, race, educational level, usage of drugs, occupation, monthly income) of the respondents.
2. To determine the use of highly active antiretroviral therapy (HAART) among respondents.
3. To determine the CD4 count of the respondents.
4. To determine the nutritional status of the respondents by using anthropometric measurements (height, weight, BMI) and dietary assessment (24-hour dietary recall).
5. To determine the relationship between socio-economic status and nutritional status.
6. To determine the relationship between the use of HAART and nutritional status among respondents.
7. To determine the relationship between CD4 count and nutritional status.

1.6 Null hypotheses

1. There is no significant relationship between socioeconomic status and nutritional status.

2. There is no significant relationship between use of HAART with nutritional status.

3. There is no significant relationship between CD4 count and nutritional status.

CHAPTER 2

LITERATURE REVIEW

2.1What is HIV?

The human immunodeficiency virus (HIV) is a lentivirus (slowly replicating retrovirus) that cause the acquired immunodeficiency syndrome (AIDS), a condition in humans in which reformist failure of the immune system allows life-threatening opportunistic infections and cancers to thrive. HIV infects vital cells in the human immune system such as helper T cells (specifically CD4+ T cells), macrophages, and dendritic cells. Through a number of mechanisms including: apoptosis of uninfected bystander cells, direct viral killing of infected cells, and killing of infected CD4+ T cells by CD8 cytotoxic lymphocytes that recognize infected cells, HIV infection leads to low levels of CD4+ T cells. Declining of CD4+ T cell numbers below a critical level will cause loss of cell-

mediated immunity and progressively increase body's susceptibility to opportunistic infections.

Opportunistic infections are mild to severe infectious diseases in a compromised host. Compromised host are individuals whose immune system or other physiological defenses are impaired in some way. The inability to attacksuch opportunistic infections is usually caused by an underlying disease or trauma, or from procedures and/or drugs that were used to treat another medical condition. The infections are caused by microorganisms such as bacteria, fungi, viruses, or parasites that normally do not cause serious disease in healthy people. Symptoms vary according to the microorganism involved and the degree of involvement. Treatment or medical management of opportunistic infections might be difficult because some of these microorganisms may be resistant to standard antibiotic therapy. In some cases an affected individual might have a dysfunctional immune system (compromised) that was not able to fight the infection.

2.2 Overview of epidemic

Worldwide, the number of people newly infected by HIV continues to fall. The number of people (adults and children) acquiring HIV infection in 2011 (2.5 million [2.2 million–2.8 million]) was 20% lower than in 2001 (UNAIDS, 2012). During the past decade, many national epidemics have changed drastically. In 39 countries, the incidence of HIV infection among adults fell by more than 25% between 2001 and 2011.

Twenty-three of the countries with abrupt declined in HIV incidence were in sub-Saharan Africa, where the number of people who acquired HIV infection in 2011 (1.8 million [1.6 million–2.0 million]) was 25% lower than in 2001 (2.4 million [2.2 million–2.5 million]). Despite these improvements, sub-Saharan Africa accounted for 71% of the adults and children newly infected in 2011, emphasizing the importance of continuing and strengthening HIV prevention efforts in the region.

Malaysia is a country with a concentrated HIV epidemic based on WHO classification with infection rates remains above 5% among most-at-risk populations (MARPS) especially among injected drug users (IDUs), sex workers and the transgender population. Since the first case of HIV/AIDS made its entrance into this country 25 years ago till December 2011, number of people living with HIV (PLWH) was estimated at 81,012. By the end of 2011, Malaysia had a cumulative figure of 94,841 HIV, 17,686 AIDS and 14,986 deaths, thus giving reported PLWH of 79, 8551 (Global Aids Response Progress Report, 2012).

Global Aids Response Progress Report (20012) also stated that, HIV in Malaysia is primarily male as they constitute 90% of cumulative HIV cases of whom majority are IDUs. However, the ratio female: male is changing from 1:99 in 1990 to 1:10 in 2000 to 1:4 in 2011. In the earlier phase of the pandemic, drug used was the driven factor. This trend had eventually transformed over time from only 1 sexual transmission for every 9 IDU in 1990 to 2 sexual transmission for every 8 IDUs in 2000 and 5 sexual transmission for every 5 IDUs in 2010. The implementation of harm reduction programs since 2005, Malaysia was able to reduce the number of HIV infection through sharing of infected needles. Thus, in

2011 sexual transmission outstripped IDUs as the main driving factor for the epidemic with ratio of 6 sexual transmissions for every 4 IDU reported.

2.3 Nutrition and HIV

HIV/AIDS has significant impacts on nutrition status of the individual, household and community (Haddad & Gillespie, 2001). The American Dietetic Association's (2004) pointed out that achieving optimal nutritional status is a challenge for anyone living with HIV. Nutritional issues facing HIV-affected populations challenge the development and implementation of resolutions to the problem of world hunger and malnutrition. Besides that, nutrition- related deficiencies affecting immune functions mightcan range from an array ofanaemias and antioxidant depletion to protein-energy malnutrition. Adequate calorie, protein, and micronutrient intake is essential to the conservation and renewal of malnutrition- related immune dysfunction (Vàsquez et al., 2002).According to Lichtenstein et al., (2001), metabolic abnormalities, including changes in organ or other tissue function, cause for changed utilization, storage, and excretion of nutrients, may occur as a consequence of immune dysfunction, medication side effects, infection, or changes in the hormonal milieu, or through the effects of HIV itself in adults and children.

2.4 Malnutrition among HIV Positive People

Individuals at all stages of the HIV disease are at risk of nutritional deficiency, and nutritional status is a strong predictor of disease progression, survival, and functional status during the course of the disease. HIV/AIDS had substantial impacts on nutrition at the level of the individual, household and community. Malnutrition in turn increases both the susceptibility to HIV infection and the vulnerability to its various impacts. HIV infection essentially hastens the vicious cycle of inadequate dietary intake and disease that leads to malnutrition at the individual level, while, malnutrition can also increase the risk of transmission from mother to babies and the progression of its infection (Piwoz and Preble, 2000).

It is well established that HIV infection is associated with observable nutritional alterations that occur across all stages of the disease (Fields-Gardner & Fergusson, 2004). According to Swaminathan S et al., (2008), HIV-positive individuals—including both those without TB and those treated for TB—had significantly lower body weight, waist circumference, mid-arm circumference, hip circumference, and, BMI compared with HIV-negative individuals from the same socioeconomic background.The study population consisted of HIV-positive adults enrolled in 2 different randomized clinical trials at Tuberculosis Research Centre clinics in Chennai and Madurai, India, from 1 July 2003 through 31 July 2004.

Generally, the daily intake of calories and proteins of participants was below the recommended dietary allowance for Indian individuals of the same weight and activity type and a gradient in all of the anthropometric parameters was observed across the groups in the study, with the HIV-positive, TB-negative patients having poorer parameters compared to the HIV negative individuals. This is of concern, because weight loss and BMI have both been shown to be strong and independent predictors of survival in HIV-infected patients, especially when they are associated with lower CD4+ cell counts (Mangili et al., 2006).

Nnyepi MS (2009) in Botswana found that in a population of 145 free-living HIV-positive adults 20 to 50 years of age, 30% of them had a BMI < 18.5 kg/m^2 and could be classified as malnourished. Consistent with the prevalence of BMI < 18.5 kg/m^2, subjects' diet were generally inadequate in energy and predominantly consisted of starch. Meanwhile Champa et al., (2005) reported similar findings. They pointed out that HIV-related wasting continues to be common among HIV-infected drug users, even among HAART recipients. HIV-positive drug abusers had a body mass index (BMI) that was significantly lower than that of HIV-positive non-drug abusers (Forrester et al, 2013).

2.5 Metabolic syndrome among HIV people

Besides malnutrition, there is another common nutritional problem among HIV-positive people. Metabolic abnormalities are known to often occur in HIV-infected individuals and include dyslipidemia, insulin resistance and diabetes, endothelial dysfunction, and altered fat distribution (Triant et al., 2007). Metabolic abnormalities are also known as metabolic syndrome. Metabolic syndrome is the name for a group of risk factors that increases the risk for heart disease and other health problems, such as diabetes and stroke (NHLI).

According to the National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III guidelines (2005), metabolic syndrome is defined as having three or more of the following criteria: (i) waist measurement ≥80 cm for women and ≥90 cm for men; (ii) TG level of ≥150 mg/dL or drug treatment for elevated TG level; (iii) HDL-C of ,50 mg/dL for women and ,40 mg/dL for men or drug treatment for reduced HDL-C; (iv) elevated blood pressure (systolic ≥130 mmHg or diastolic ≥85 mmHg, using the average of two seated measurements) or antihypertensive drug treatment; and (v) fasting glucose ≥100 mg/dL or currently using anti-diabetic medications.

A few studies have been conducted on the prevalence of metabolic syndrome among HIV people. A cross-sectional study was carried out on HIV-infected patients managed at the outpatient Infectious Disease Unit of the Hospital del Mar, Barcelona, over a period of 1 year, from January through December 2003, reported that of 710 patients, 121 patients (86 men, 35 women) met some of the metabolic syndrome criteria, yielding a prevalence of 17% (95% CI 14–20%). Patients with the metabolic syndrome were older in age and BMI,

lower percentage of intravenous drug users, and lower CD4 nadir cell count compared with those without the metabolic syndrome (Jerico et al., 2005)

A similar cross-sectional study conducted in Taiwan in 2008 found that of 877 HIV-infected subjects who were aged ≥18 years and sought HIV care at the HIV clinic of the National Taiwan University Hospital from 1 May 2008 to 30 April 2009. The prevalence of metabolic syndrome was higher than the previous study. Out of 877 patients, 210 of them were diagnosed with metabolic syndrome which equal to 26.2% prevalence with metabolic syndrome. Patients with metabolic syndrome were more likely to have higher levels of TG, total cholesterol, systolic and diastolic blood pressures, body mass index (BMI) and CD4 counts, were of older age, and were more likely to have a family history of diabetes, hypertension and cardiovascular disease compared with patients without metabolic syndrome (Wu et al., 2012).

Between the two studies there some differences in term of age, BMI and also CD4 counts. For age and BMI, both studies found that people with higher age and BMI more common to have metabolic syndrome but for CD4 counts, the study conducted in Taiwan found that patients with metabolic syndrome were more likely to have higher levels of CD4 counts and this is opposite to what had been found in the study conducted in Barcelona.

2.6 Highly Active Antiretroviral Therapy (HAART)

Beginning in the mid-1990s, significant advances have been made in the treatment of human immunodeficiency virus type 1 (HIV) infection, and new antiretroviral nucleoside reverse transcriptase inhibitors (RTIs) are now routinely used in combination with potent protease inhibitors and non-nucleoside RTIs (Gange et al., 2002). According to WHO (2009), currently available drugs do not cure HIV infection but they do prevent the development of AIDS. It can stop the virus being made in the body and this stops the virus from damaging the immune system, but these drugs cannot eliminate HIV from the body. Hence, people with HIV need to continuously take antiretroviral drugs. Besides that, the used of antiretroviral (ARV) therapy in combinations of three or more drugs as a HIV treatment has dramatically improved the quality of life for people with HIV and prevented them from dying early, since 1996 in countries where they were widely accessible.

There were a few studies concerning the effectiveness of HAART therapy (Brechtl et al., 2001; Gange et al., 2002; Cohen et al., 2011). According to Brechtl et al., (2001), survival, CD4 lymphocyte counts, HIV-1 RNA viral load testing, and the occurrence of opportunistic infections were the parameter that were usually used to measure the effect of highly active antiretroviral therapy (HAART) in the treatment of HIV. This pilot study sought to measure the impact of HAART treatments on a wide range of clinical outcomes and psychological variables in a sample of patients with advanced HIV infection. Seventy patients with advanced AIDS who were protease inhibitor naïve were started on HAART regimens. Patients were admitted to an AIDS inpatient unit of a long-term care facility that provides treatment and palliative care. All patients were diagnosed

with AIDS, had CD4 cell counts below 300/cc 3, and had a projected survival of greater than one month.

Patients were started on triple-drug HAART regimens with daily medical supervision and observation. In addition to standard clinical and laboratory markers, a series of observer-rated and self-report instruments were used to measure various physical and psychological factors (e.g., pain and symptom distress, psychological well-being, depression). Data were collected at baseline and after 1 and 3 months of HAART therapy. As expected, the CD4 count increased and viral load levels decreased significantly over the 3-month study period. In addition, patients improved significantly in body weight, and serum albumin and ferritin levels. The only psychosocial measure that improved significantly with treatment was depression. Ratings of pain intensity, physical and psychological symptom distress, and overall quality of life did not change. As the conclusion for this study, HAART regimens appear to have positive effects on CD4 count, HIV viral load, and several other measures of physical well-being in patients with advanced AIDS.

Gange et al., (2002) focused specifically on the long term effectiveness of HAART in women and ethnics minorities who at that time was the population where HIV has expanded the most. Beginning in April 1996, the self-reported use of HAART increased over time, with more than 50% of the cohort reporting HAART use in 1999. There was a 23% decline per semester in the incidence of AIDS from April 1996 (95% confidence intervals (CI) -29% to -16%). Furthermore, there was a 21% decline of the semi-annual mortality rates among those with AIDS at baseline (95% CI -27% to -14%) and an 11% decline among those AIDS free at baseline (95% CI -3% to -18%). CD4+ lymphocyte counts

either increased (women with baseline AIDS) or stabilized (women without baseline AIDS) after April 1996, and HIV RNA levels dramatically declined in both groups, although the percentage of women with HIV RNA above 4000 cps/ml remained stable at approximately 40% since mid-1997. Despite concerns regarding the use of antiretroviral therapies in this population, the use of therapies led to improved immunological function, suppressed HIV disease activity, and dramatic declines in morbidity and mortality.

Besides adults, children and adolescents also benefit from HAART. Patel et al., (2008) observed long-term effectiveness of HAART on the survival of children and adolescents with HIV infection in a 10 year follow-up study. The study included 1,236 children and adolescents who were prenatally infected with HIV, who were on study or enrolled after January 1996 in a United States–based multicenter prospective cohort study (Pediatric AIDS Clinical Trials Group 219/219C), and who were not receiving HAART at baseline; subjects were observed for a maximum of 10 years through June 2006. A weighted Cox regression model was used to estimate the effect of HAART on survival, appropriately adjusted for time-varying confounding by severity.

At the end of the 10-year follow-up period (median duration of follow-up, 6.3 years; interquartile range, 4.3–9.8 years), 70% of participants had initiated HAART. Lower CD4 cell percentages, total lymphocyte counts, and albumin levels were associated with an increased probability of initiating HAART. Eighty-five deaths were observed, and the mortality hazard ratio associated with HAART, compared with non-HAART regimens, was 0.24 after adjusting for measured confounding by severity (95% confidence interval, 0.11–0.51). In a nutshell, this study concluded that, the use of HAART was highly effective in

reducing mortality during the period 1996–2006 among children and adolescents infected with HIV.

CHAPTER 3

METHODOLOGY

3.1: Study design

This was a cross-sectional study to determine the nutritional status of people living with HIV (PLWH) and to relate it to their socio-economic status and the use of antiretroviral therapy. HIV positive adults who were willingly participated in the study were included.

3.2: Study location

This study was carried out at a PT Foundation's drop in centre and, with theKajang Hospital's support group. PT Foundation is the largest community based organization working with the communities most affected by HIV in Kuala Lumpur. They hold many HIV workshops and provide HIV training for more than 3000 people each year. The Kajang Hospital's support group is a non-formal support group which meets regularly to give support to one another. Unfortunately they do not have a drop in center but instead their meetings are usually away from the hospital.

3.3: Sample size

The determination of sample size was done by using a formula for calculation of sampling size for estimating prevalence. The formula was:

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

Where,

n = sample size

Z = Z statistic for a level of confidence, (Z= 1.96)

P = expected prevalence or proportion

d = precision (d = 0.05)

Sample size was determined to ensure that sample was sufficiently large to be able to conduct the statistical test and make a valid conclusion for the population. The sample size was depends on accuracy level, confidence level as well as appropriate prevalence. After taking account 95% of confidence level, 10% of accuracy level and 0.96 % prevalence of adults receiving antiretroviral therapy by WHO in 2010, sample size for this study was:

$$n = \frac{(1.96)^2 \times 0.96(1 - 0.96)}{(0.05)^2}$$

$$= 59 \text{ participants}$$

Using prevalence was not the best but like other studies, it was difficult to find enough PLHW unless we use hospital records, which again was problematic.

3.4: Selection of subject

Respondents who were involved in this study had fulfilled all the inclusion and exclusion criteria as stated below:

Table 1: Inclusion and exclusion criteria for subject selection

Inclusion criteria	Exclusion criteria
- Adults aged 20 years and above, living with HIV	- Adults aged below than 20 years even though living with HIV
- Residing in the Klang Valley	- Residing outside the Klang Valley
- Willing to participate	- Refuse to participate
	- Bed ridden and critically ill

3.5: Sampling method

Snowball sampling method was used in this study as the participants in this field were difficult to access and confidentiality was of utmost importance to PLWH. Snowball sampling is a multi-step process in which more and more people were added to the sample with each step. In this situation, a participant who fulfilled the inclusion and exclusion criteria of the study led or directed the researcher to another participant and in turn this participant had leads to another participant. This situation is continued until the target number of participants was achieved as close as to what had been estimated and until the date line for data collection was due.

3.6: Instruments use

A face-to-face interview questionnaire was used to obtain information such as socio-economic status background, use of antiretroviral therapy, current CD4 count, appetite status and their dietary intake. As for anthropometric measurements, a Tanita weighing scale and a SECA body meter were used to assess participant's weight and height respectively. A two-day 24-hour dietary recall interview was used to obtain the data on dietary intake, one day for a weekday and another one for a weekend day.

3.7: Data collection

The data collection was carried out from 13th January 2014 to 16th March 2014 after getting the approval from Medical Research Ethics Committee, Faculty of Medicine and Health Sciences, University Putra Malaysia. All positively diagnosed with HIV case had been approached at the selected study locations until the number of participants needed was achieved. Participants approached were briefed on the interview session and they were informed that they have the right not to participate in the study. Consent form and subject information sheets were given prior to the interview session.

3.7.1: Socio-economic factors

An interview based questionnaire was used to determine the socio-economic background of participants. Questions such as age, gender, ethnicity, educational level, history of taking drug, employment status and monthly income was asked to each respondent.

3.7.2: Antiretroviral therapy

Questions on the use of HAART and the duration since the starting use of HAART was asked during the face-to-face interview.

3.7.3: Anthropometric data

The anthropometric data that was calculated were height, weight, and body mass index (BMI).

3.7.3.1: Height

Height was measured by using SECA Body meter. This method can only be used for subject who can stand straight without being assisted by other people. Subjects stood with their scapula, buttocks and heels resting against a wall, the neck was held in a natural non-stretched position which means the toe will touched each other, he toe tips formed a 45° angle and the head was held straight with the inferior orbital border in the same horizontal plane which known as Frankfort's plane.

3.7.3.2: Weight

Weight was measure by using a TANITA weight scale. The weighing scale was put on a flat, hard surface that will allow them to sit securely without rocking or tipping over. Body-weight must be recorded in indoor clothing, without shoes, using a portable scale.

3.7.3.3: Body Mass Index (BMI)

Body mass index (BMI) wascalculated and categorized by using the cut-off points proposed by WHO in year 2000. BMI was calculated by using the formula:

$$BMI = Weight\ (kg) / Height\ (m^2)$$

The cut-off points for BMI status are shown in the table below:

Table 2: Classification of weight status in adults according to BMI

BMI (kg/m^2)	**Classification**
< 18.5	Underweight
18.5 – 24.9	Normal
≥ 25.0	Overweight
25.0 – 29.9	Pre-obese
30.0 – 34.9	Obese Class I
35.0 – 39.9	Obese Class II
≥ 40	Obese Class III

(WHO, 2000)

3.7.5: CD4 count

Respondents were asked to recall their current CD4 count and classification system for HIV infection was based on CDC categorization. Table 3 shows CDC classification system for HIV- infected adults and adolescents.

Table 3: CDC classification system for HIV-infected adults and adolescents

CD4 cell categories	**Clinical categories**		
	A Asymptomatic, Acute HIV, or PGL	B Symptomatic Conditions, not A or C	C AIDS-Indicator conditions
≥ 500 cells/µL	A1	B1	C1
200 – 499 cells/µL	A2	B2	C2
< 200 cells/ µL	A3	B3	C3

PGL = persistent generalized lymphadenopathy

3.7.6: Dietary intake

24-hour dietary recall was used to determine the dietary intake of the subjects. The dietary recall was conducted for two days, one for a weekdays and another one for a weekend respectively. The measuring utensils used for the dietary assessment were measuring cups and the Atlas of Food Exchange and Portion Sizes, second edition.

The data obtained were then used to calculate the energy, macronutrients and micronutrients of respondents. Nutritionist Pro™ Nutrition analysis Software Axxaya Systems (2005) was used for dietary data analysis. The components that were computed in this study were the total energy (kcal), and carbohydrate, protein and fat intake in terms of grams and kilocalorie and also all micronutrients that are available in the recommended nutrient intake (RNI) table.

Percentages of energy derived from macronutrients were also calculated. Using this data, percentage of energy, macronutrients, and micronutrients achievements based on the recommended range were computed (NCCFN, 2005). For some local processed foods which were not found in the database, the food labels were used as references. As for mixed dishes, recipes were obtained from local recipe books.

3.8: Pre-test

A pre-test was involved by those who have the similar criteria with targeted population. It involved 10 subjects that similar inclusion and exclusion criteria with the targeted population. However the subjects for the pre-test were not included in the study sample. The outcome of the pre-test was used as guideline to modify the questionnaire.

3.9: Statistical analysis

Nutritionist Pro 2013 software was used to determine the amount of energy, macronutrients, and micronutrients consumed by each respondent. All data collected wereanalysed by using SPSS Version 21. Descriptive data were presented in the form of mean, standard deviation, frequency and percentage. Since sample population was abnormally distributed,Spearman rho correlation was used to determine the relationship between the continuous variables. For categorical variables, Fisher exact test was used since the sample size was small and violated Chi-square rules.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The study was carried out to determine the nutritional status of people living with HIV (PLWH) in the Klang Valley. It was conducted in PT Foundation's drop in center and also Hospital Kajang's support group from 13th January 2014 to 16th March 2014. A total of 37 respondents were recruited in this study. Figure 2 shows the distribution of respondents recruited at the two different places.

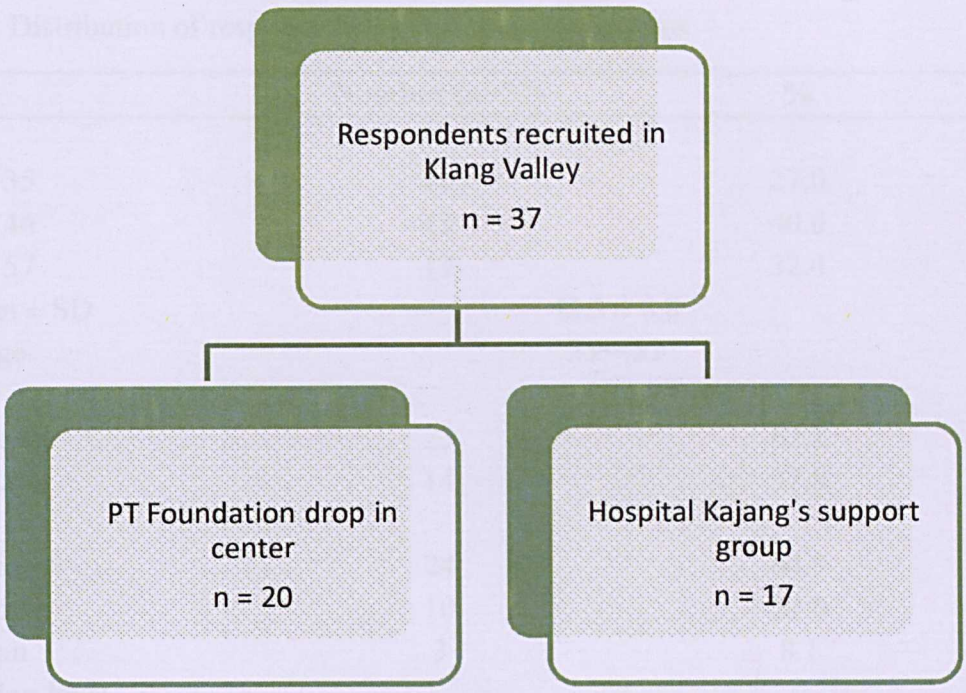

Figure 2: Distribution of respondents at two different study location

4.2: Socioeconomic status

Socioeconomic status of the respondents was presented in Table 4.

Table 4: Distribution of respondents by socioeconomic status

	Number (n=37)	%
Age		
25 - 35	10	27.0
36 - 46	15	40.0
47 - 57	12	32.4
Mean ± SD	42.3 ± 8.8	
Range	25 – 57	
Gender		
Male	23	62.2
Female	14	37.8
Race		
Malay	24	64.9
Chinese	10	27.0
Indian	3	8.1
Education level		
No-formal	1	2.7
Primary	8	21.6
Secondary	20	54.1
Tertiary	8	21.6
Dependency on drug		
Yes	8	21.6
No	29	78.4
Employment status		
Employed	20	54.1
Unemployed	17	45.9
Monthly income (RM)		
0	8	21.6
≤ 499	10	27.0
500 – 2000	13	35.1
>2000	6	16.2
Mean ± SD	1011.59 ± 1246.1	
Range	0 – 6000	

Majority of the respondents (40.0%) were in the age range of 36 to 46 years. The youngest was 25 years old while the eldest was 57 years old. Mean age of all the respondents was 42.3 ± 8.8 years. Of the 37 respondents, 23 (62.2%) of them were male while 14 (37.8%) were female. Respondents for this study included all three major races in Malaysia. Malays contributed the highest number of respondents, 24 (64.9%) followed by Chinese, 10 (27.0%) and Indian, 3 (8.1%). Educational level was categorized into four groups. Most of the respondents, 20 (54.1%) of had studied up to secondary level while 8 (21.6%) had primary and the same number had tertiary level education. Out of 37 respondents, only a person (2.7%) had never been to school.

Majority of the respondents (29.0%) were free from taking any drug but 8.0% of them were a drug user. Of all of the respondents, 20 (54.1%) of them were working and 17 (45.9%) of them were unemployed. There was a big range for the monthly income since some of the respondents were working and some were not. The minimum income of the respondents was RM 0 and the maximum income was RM 6,000. There were 8 (21.6%) respondents who hadno income, 10 (27.0%) had incomes ≤ RM 499, 13 (35.1%) had incomes ranging fromRM 500 to RM 2,000 and 6 (16.2%) had monthly income>RM 2,000. The mean ± SD of monthly income for all respondents was RM 1011.59 ± 1246.1.

4.3 Use of highly antiretroviral therapy (HAART)

Antiretroviral therapy (ART) is a treatment for people infected with human immunodeficiency virus (HIV) using anti-HIV drugs. The standard treatment consists of a combination of at least three drugs (often called "highly active antiretroviral therapy" or HAART) that suppresses HIV replication. Three drugs were used in order to reduce the likelihood of the virus developing resistance. ART has the potential both to reduce mortality and morbidity rates among HIV-infected people, and to improve their quality of life (WHO, 2014).

A total of 27 (73.0%) of the respondents were taking HAART at the time of study while another 10 (27.0%) were not on HAART medication at all. The duration of the treatment varied among the respondents. Some had just begun to take the treatment for a month. At the same time, the longest duration for the respondent taking the treatment was eleven years. The mean ± SD period of using HAART by respondents was 34.4 ± 39.3. Figure 3 shows the percentage of using HAART by gender.

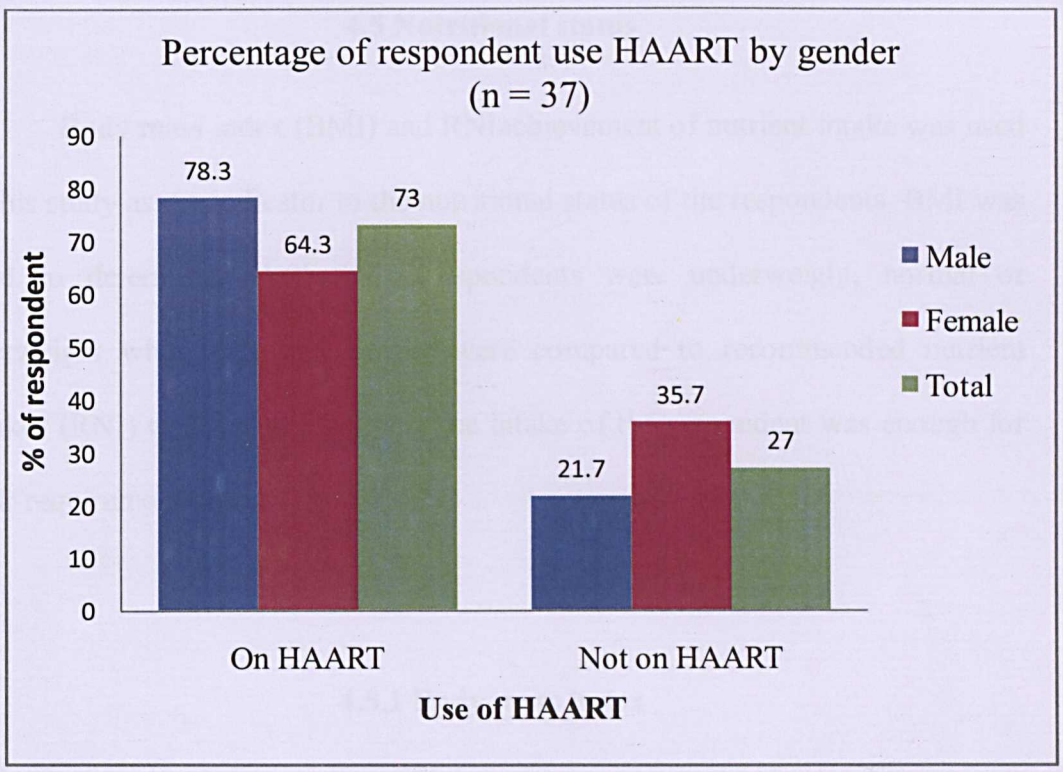

Figure 3: Distribution of respondents using HAART by gender

4.4 CD4 Count

Table 5: Distribution of respondents by CD4 count

CD4 count	Number (n=37)	%
<200	12	32.4
200 - 499	17	45.9
>499	8	21.6
Mean	330.76 ± 182.1	
Range	122 – 748	

From three categories of CD4 count, majority of the respondent (45.9%) have CD4 count in the range of 200 to 499, 12 (32.4%) of them had lower than 200 and 8 (21.6%) of them have more than 499.

4.5 Nutritional status

Body mass index (BMI) and RNIachievement of nutrient intake was used in this study as the indicator to the nutritional status of the respondents. BMI was used to determine whether the respondents were underweight, normal or overweight while nutrients intakes were compared to recommended nutrient intakes (RNI) to determine whether the intake of the respondent was enough for their requirement or not.

4.5.1 Body mass index

Table 6 shows the distribution of respondent's nutritional status according to the BMI categories.

Table 6: Distribution of respondent's nutritional status according to their BMI category.

Body mass index (BMI)	**Number (n=37)**	**Percentage (%)**
Underweight (< 18.5)	6	16.2
Normal (18.5 – 24.99)	22	59.5
Overweight (≥25.0)	9	24.3
Mean ± SD	22.8 ± 5.8	
Range	13.0 – 40.1	

Majority of the respondents (59.5%) was in a normal range of BMI, 9 (24.3%) was overweight while 6 (16.2%) was underweight. The mean ± SD for BMI of the respondents was 22.8 ± 5.8 with the lowest value was 13.0 kg/m^2 and highest value was 40.1 kg/m^2.

4.5.2 Nutrient intake

Nutrition plays an important role in achieving better nutritional status, health status as well as quality of life. In order to assess their nutrients intakes, all 37 respondents were interviewed for a two-day 24 hour diet recall which included a weekday and a weekend. The facts that we only know the amount of nutrients intake by HIV people was meaningless without identifying whether it is sufficient or not. Therefore, it is important to compare their nutrients intakes with the recommended values so that sufficiency of the nutrients can be determined.

Since there was no specific recommendation for people living with HIV had been published the recommended nutrients intake for Malaysia (RNI) was used as the reference values. The RNIs are essential standards against which nutrients in food eaten can be assessed for its adequacy in any given population. So far, only WHO recommended that energy requirement of asymptomatic adults and children was 10% higher than uninfected individuals to maintain body weight. For adults at symptomatic stage, energy requirement was likely to increase about 20-30% where as children who were experiencing weight loss, energy intake should increase by 50% to 100% than normal requirement.

Table 6 summarizes the nutrients intake and percentage of RNI achieved by respondents. The differences between maximum and minimum intake of all nutrients was quite big. This might be due to error during the recall as this method depends a lot on respondent's honesty and memory.

Table 7 (a): Intake of various nutrients and percentage of RNI achieved among male respondents

	Recommended by RNI	Number	Percentage achievement ofRNI (%)	Max	Min	Mean±SD
Energy (kcal/day)				3851.67	586.94	1620±746.6
19–29 years	2684	0	0			
30-59 years	2706	2	9.1			
Carbohydrate	55-75% from total energy	9	39.1	525.69	85.84	224.20±111.8
Protein (g/day)	62	9	39.1	150.6	18.2	61.6±28.9
Fat	15-30% from total energy	9	39.1	126.79	17.31	55.29±27.9
Calcium (mg/day)	800	1	4.3	1251.27	84.54	342.99±247.8
Iron (mg/day)	14	8	34.8	35.81	4.52	14.52±8.2
Zinc (mg/day)	6.7	2	8.7	12.09	0	3.50±2.9
Selenium (mg/day)	33	12	52.2	131.04	0	35.33±30.1
Thiamin (mg/day)	1.2	3	13	2.27	0.13	0.73±8.2
Riboflavin (mg/day)	1.3	5	21.7	2.57	0.23	1.00±0.5
Niacin(mg NE)	16	3	13	25.67	2.43	10.29±5.2
Folate (µg/day)	400	23	0	277.86	0.48	55.52±59.0
Vit C (µg/day)	70	5	21.7	254.29	2.00	54.9±67.6
Vit A (mg/day)	600	14	60.9	2957.46	143.39	1052.95±773.2
Vit E (mg/day)	10	0	0	9.24	0.00	3.02±2.4

Table 7 (b): Intake of various nutrients among female respondents

	Recommendation By RNI	Number (n)	Percentage achievement ofRNI(%)	Max	Min	Mean±SD
Energy (kcal/day)				2454	1090	1518±457.3
19–29 years	2200	0	0			
30-59 years	2398	1	7.7			
Carbohydrate	55-75% of from total energy	2	14.3	334.79	97.11	172.71±79.6
Protein (g/day)	55	9	64.3	98.95	35.52	63.75±18.1
Fat	15-30% from total energy	2	14.3	85.42	12.81	61.25±20.2
Calcium (mg/day)				606.91	152.80	381.42±151.0
19-50 years	800	0				
51-59 years	1000	0				
Iron (mg/day)				24.64	7.00	13.72±4.8
19-50 years	29	0	0			
51-59 years	11	0	0			
Zinc (mg/day)	4.9	3	21.4	7.57	1.07	3.42±3.3
Selenium (mg/day)	25	4	28.6	55.63	0.00	17.73±14.1
Thiamin (mg/day)	1.1	4	28.6	1.84	0.24	0.82±0.5
Riboflavin (mg/day)	1.1	10	71.4	3.43	0.44	1.49±0.8
Niacin (mg NE)	14	5	35.7	22.23	4.12	12.03±4.8
Folate (µg/day)	400	0	0	92.14	17.72	61.72±22.5
Vit C (µg/day)	70	4	28.6	141.68	5.61	57.05±43.7
Vit A (mg/day)	500	11	78.6	1814.05	321.87	971.62±501.9
Vit E (mg/day)	7.5	0	0	7.12	2.07	4.29±1.6

4.5.2.1 Energy

Energy intake recommend by RNI were different by gender and age group. For males age 19 to 29 years, the recommendation was 2440 kcal per day while for female it was 2000 kcal per day. For age group 30 to 56 years, 2460 kcal per day was recommended for male and 2180 was recommended for female. After adding 10.0% from the recommendation, the energy requirement for male in the age of 19 to 29 was 2684 kcal and female was 2200 kcal while for those in the age 30 to 59, for male it was 2706 kcal and for female it was 2398 kcal per day. Both male and female in the age group 19 to 29 years did not achieve their respectiveRNI recommendation (0.0%) while for age group 30 to 59, only 9.1% of the males achieved and female only 7.7%.

Studies point to low energy intake combined with increased energy demands due to HIV infection and related infections as the major driving forces behind HIV-related weight loss and wasting (WHO, 2003). Based on increased resting energy expenditure (REE) observed in studies of HIV-infected adults, it was recommended that energy be increased by 10.0% over accepted levels for otherwise healthy people. The goal was to maintain body weight in asymptomatic HIV-infected adults. Maximum amount of dietary energy intake is essential for body-weight maintenance and work performance (RNI, 2005).

4.5.2.2 Carbohydrate

In the population nutrient intake goals recommended by WHO (1990, 2003) for the prevention of diet-related chronic diseases, intake of total carbohydrate has been suggested to be from 55.0% to 75.0% of total energy. Both male and female respondents failed to achieve the recommendation. For males, only 9 (39.1%) respondents achieved the recommendation with the mean ± SD intake for carbohydrate was 224.20 ± 118.84. The maximum carbohydrate intake by male respondents was 525.69 gram (g) while the minimum intake was 85.84 g. For female respondents, only 2 (14.3%) of them achieved the recommendation. The mean ± SD for carbohydrate intake by female was 172.71 ± 79.62 g. The maximum intake by them by 334.79g and minimum intake was 97.11g.

Carbohydrates are important sources of energy in human diets comprising some 40.0% – 80.0% of total energy intake. In addition to providing easily available energy for oxidative metabolism, carbohydrate-containing foods are vehicles for important micronutrients and phytochemicals. Dietary carbohydrate is vital to maintain glycemic homeostasis and for gastrointestinal integrity and function. Unlike fat and protein, high levels of dietary carbohydrate, provided it is obtained from a variety of sources, is not associated with negative health effects. Finally, diets high in carbohydrate as compared to those high in fat, reduce the probability of developing obesity and its co-morbid conditions. Those are several reasons why it is desirable that carbohydrates should provide the main source of energy (FAO/WHO, 1998).

4.5.2.3 Protein

The recommendation for protein was only different between genders but the same for each age category. For males, the recommended value for protein is 62 g while for women it is 55 g. Out of 23 male respondents only 9 (39.1%) of them achievedRNI for protein. The mean ± SD protein intake of 23 male respondents was 61.6 ± 28.9 g ranging from 18.2 to 150.6 g. For females, out of 14 respondents, 9 (64.3%) of them achieved the recommendation with the protein intake mean±SD of 63.75 ± 18.1g. The protein intake by female respondents ranged from 35.52 to 98.95 g

Deficiency of protein stores and abnormal protein metabolism occur in HIV and AIDS, but no evidence exists for increased protein intake over and above that necessary to accompany the required increase in energy (WHO, 2005b). However, with opportunistic infections (OIs), an additional 10% increase in protein intake is recommended because of increased protein turnover (WHO, 2005b).

4.5.2.4 Fat

The Malaysian Dietary Guidelines (NCCFN, 1999) has recommended a desirable fat intake range of 20%-30% energy, which was adopted by the Technical Sub-Committee (TSC) on Energy and Macronutrients in establishing recommended fat intakes. These dietary fat levels are within the range of 15-30% energy recommended by several WHO/FAO Expert Consultations over the years.

Fat is the major determinant of the energy density of diets, providing a high 9.0kcal/g compared with the much lower 4.0 kcal/g for carbohydrate and protein.

For male respondents, 9 out of 23 respondents (39.1%) achieved the recommendation with the mean ± SD 55.29 ± 27.9 g. The maximum fat intake was 126.79 g and the minimum intake was 17.41 g. For female respondents, only 2 out of 14 respondents (14.3%) achieved the RNI. The mean ± SD intake was 61.25 ± 20.2 g, ranging from a minimum of 12.81 g to a maximum of 85.42 g.

4.5.2.5 Calcium

Calcium is the most abundant mineral in the body. Ninety-nine percent of the body's calcium is in the bone (and teeth), where it plays two roles; first, it is an integral part of bone structure, providing a rigid frame that holds the body upright and serves as attachment points for muscles, making motion possible. Second, it serves as a calcium bank, offering a readily available source of mineral to the body fluids should a drop in blood calcium occur. The remaining 1 % of the body calcium is in the body fluids.

RNI for male is 800 milligram (mg) per day. Only one male respondent (4.3%) had achieved that recommendation. The highest calcium intake by male respondents was 1251.27 mg while the least was 84.54 mg. The mean ± SD for calcium intake was 342.99 ± 247.8. For females, calcium recommendation was different between the age group. For age 19 to 50 years, 800 mg per day is recommend while for 51 to 59 years, 1000 mg per day was recommend.

However, none of the respondent was able to achieve the recommendation. The highest calcium intake by female respondents was 606.91 mg and the least was 152.80 mg with the mean ± SD 381.42 ± 151.0 mg.

High dietary calcium intakes are associated with decreased prevalence of overweight and obesity. The mechanism for this effect appears to be related to depression of the parathyroid hormone (PTH) and 1, 25 hydroxy vitamin D, which leads to inhibition of lipogenesis and increased lipolysis; and increased excretion of fecal fat caused by soaps formation (Heaney and Rafferty, 2009).

4.5.2.6 Iron

Iron has been recognized as an essential nutrient for more than a century. The recommendation for iron by RNI is 14 mg per day for male. Out of 23 respondents, only 8 from them (34.8%) were able to achieve the recommendation. The mean ± SD for iron intake was 14.52 ± 8.2 mg with the highest intake being 35.81 mg and the lowest was 4.52 mg per day. For females, iron recommendation was different between age group. For age group 19 to 50 years, the recommendation is 29 mg per day while for 51 to 59 years 11 mg per day. However, once again same like what happened to calcium intake, none of female respondents was able to achieve the recommendation. The mean ± SD intake for iron by 14 female respondents was 13.7 ± 4.8 mg. The highest intake was 24.6 mg while the least intake was 7.0 mg.

Adequate iron intake is essential for the normal function of the immune system. Iron overloads and deficiencies result in changes in the immune response. Concentration of circulating T- lymphocytes decrease in individuals with an iron

deficiency and the mitogenic response is typically impaired. Natural killer (NK) cell activity also decreases. Production of interleukin-1 is reduced in iron-deficient animals, and interleukin-2 production has been reported. Two iron-binding proteins which are transferrin and lactoferrin seem to protect the body against infection by withholding iron from microorganisms that need it for proliferation.

4.5.2.7 Zinc

Zinc is abundantly distributed throughout the human body, second only to iron among trace elements. The human body has approximately 2 to 3 g of zinc, with the highest concentration in liver, pancreas, muscle, kidney, and bone. For male, RNI recommendation is 6.7 mg per day. Out of 23 respondents, only 2 respondents (8.7%) were able to achieve the recommendation. The mean zinc intake by male respondents was 3.50 ± 2.9 mg with the highest intake of 12.09 mg and minimum intake of 0.0 mg. RNI recommendation for female was 4.9 mg per day. About 21.4% of total the female respondents were able to achieve the recommendation with the mean intake 3.42 ± 3.3 mg. The maximum intake of zinc by female was 7.57 mg and minimum intake was 1.07 mg per day.

Zinc deficiency results in various immunologic defects. Severe deficiency is accompanied by thymic atrophy, lymphopenia, reduction in lymphocyte proliferative response to mitogen, a selective decrease in T-helper cells, decrease NK cell activity, anergy, and deficient thymic hormone activity. Even mild zinc deficiency can reduce immune function, such as impaired interleukin-2

production. Moderate zinc deficiency is associated with anergy and diminished NK cell activity but not with thymic atrophy or lymphopenia.

4.5.2.8 Selenium

Selenium is nutritionally essential for human as it is constituent of more than two dozen selenoproteins that play critical roles in reproduction, thyroid hormone metabolism, DNA synthesis, and protection from oxidative damage and infection. RNI recommendation for male was 33 mg per day and half (52.2%) of the respondents were able to achieved the recommendation with the mean ± SD intake was 35.33 ± 30.1 mg. The maximum intake of selenium was 131.04 mg while the least was 0.0 mg per day. For females, the recommendation was 25 mg per day. 28.6% of female respondent able to achieve the RNIwith the mean ± SD intake of 17.73 ± 14.1 mg. The highest selenium intake was 55.63 mg while the least was 0.0 mg per day.

Selenium appears to have a multifactorial role in HIV infection. Selenium status affects HIV disease progression and mortality through various potential mechanisms (R Kupka et al., 2005). In two previous studies, deficiency of selenium has been associated with elevated measure of HIV infectivity and increased potential to transfer the infection (JMBaetan et al., 2001 & R Kupka et al., 2005). Selenium is required for the function of gluthatione peroxidase, a biological antioxidant that protects against oxidative stress. Other selenoproteins may also act as antioxidants by the incorporation of selenocysteine in their molecules (Jamason et al., 2002). In HIV-infected persons, dietary selenium

intake was strongly associated with reduced measures of oxidative stress (Mcdermid et al., 2002).

4.5.2.9 Thiamin

Thiamin plays essential roles in carbohydrate metabolism and neural function. The recommendation of thiamin for male is 1.2 mg per day. Only 3 out of 23 respondents (13.0%) were able to achieve the recommended intake. The mean ± SD for thiamin intake for males was 0.73 ± 8.2 mg ranging from 0.13 mg to2.27 mg. The recommendation for female was slightly lower than male which was 1.1 mg per day. The mean ± SD for thiamin intake by female respondents was 0.82±0.5. The maximum intake by female was 1.84 mg while the minimum was 0.24 mg per day.

4.5.2.10 Riboflavin

Riboflavin is essential for the metabolism of carbohydrates, amino acids, and lipids and supports antioxidant protection. RNI of riboflavin for male is 1.3 mg per day and 21.7% of males respondents were able to achieved the recommendation with the mean ± SD intake 1.00±0.5 mg. The highest intake by male respondents was 2.57 mg and least intake was 0.23 mg per day. In the case of the females, their RNI for riboflavin is 1.1 mg per day. In this study, 10 (71.4%) of female respondents were able to achieve the recommendation. Mean ± SD for total riboflavin intake by female respondents was 1.49±0.8 mg with the maximum of 3.43 mg and the minimum was 0.44 mg.

4.5.2.11 Niacin

Niacin is the generic term for nicotinamide and nicotinic acid. It functions as a component of pyridine nucleotide coenzyme, nicotinamide adenine dinucleotide (NAD) and NADPH, which are essential in all cells for energy production and metabolism. The recommendation of niacin for males is 16 mg NE per day. Only 3 (13.0%) of male respondents were able to achieved the recommendation with the mean ± SD of 10.29±5.2 mg. The maximum intake was 25.67 mg and the minimum intake was 2.43 mg. For females, the recommendation was 14 mg NE per day and only 28.6% from the female respondents were able to achieve the recommendation with a mean ± SD of 12.03±4.8 mg, ranging from 4.12 mg to 22.23 mg.

4.5.2.12 Folate

Folate is essential for the formation of red and white blood cells in the bone marrow and for their maturation and is a single-carbon carrier in the formation of heme. RNI of folate for male was 400 µg per day and none of the male respondents (0.0%) was able to achieve it. The highest intake of folate was 277.86 µg while the least was 0.48 µg per day. The mean ± SD of total folate intake by male respondents was 55.52 ± 59.0µg. For female respondents, RNI recommendation was same as male recommendation, 400 µg per day. None of female respondents were able to achieve the recommendation. The mean ± SD of total folate intake by female respondents was 61.72±22.5µg. The maximum intake folateof was 92.14 µg while the least was 17.72 µg.

4.5.2.13 Vitamin C

Vitamin C or ascorbic acid is synthesized from glucose and galactose by plants and most animals. RNI recommendation of vitamin C for both male and female is 70 µg per day. Only 5 (21.7%) of the male respondents were able to achieved the recommendation with the mean ± SD of 54.9±67.6. The maximum intake of vitamin C is 254.29 µg while the minimum intake was 2.00 µg. For females, 4 out of 14 (28.6%) of the respondents were able to achieve the recommendation with the mean intake of 57.05±43.7µg. The maximum intake of Vitamin C among female respondents was 141.68 µg and the minimum was 5.61 µg per day.

Vitamin C acts as antioxidant as it undergoes single-electron oxidation to the ascorbyl radical and dehydroascorbate. By reacting with potentially toxic and reactive oxygen species such as the superoxide or hydroxyl radical, the vitamin can prevent oxidative damage. It also may promotes resistance to infection through its involvement with the immunologic activity of leukocytes, the production of interferon, the process of inflammatory reaction, and the integrity of the mucous membranes.

4.5.2.14 Vitamin A

Vitamin A refers to three pre-formed compounds that exhibit metabolic activity: the alcohol (retinol), the aldehyde (retinal or retinaldehyde), and the acid (retinoic acid). It is recommended for male to take 600 mg of Vitamin A per day and in this study 60.9% of the male respondents were able to achieve the requirement with the mean intake of 1052.95±773.2 mg. The highest intake was

2957.46 mg while the least was 143.39 mg per day. For females, RNI for the Vitamin A is 70 mg per day and 4 (28.6%) of the respondents were able to achieve that recommendation. With the mean intake of 971.62±501.9, the highest intake of Vitamin A was 1814.05 mg and the least was 321.87 mg per day. Vitamin A had the highest percentage of respondents that able to achieve it recommendation. This may be due to high intakes of food that are rich in Vitamin A such as dark green, leafy and yellow-orange vegetables and fruits.

4.5.2.15 Vitamin E

According to the RNI, it is recommended that males have 10 mg per day of vitamin E. None of the 23 male respondents was able to achieve the recommendation. The maximum intake was 9.24 mg while the minimum intake was 0.0 mg per day. For females, their recommendation is 7.5 mg per day and similar with the male, none of the female respondents was able to achieve the recommendation. The mean intake of Vitamin E among female respondents was 4.29±1.6 with the maximum intake of 7.12 mg and the minimum was 2.97 mg per day.

4.6 Relationship between use of HAART and nutritional status

Beginning in the mid-1990s, significant advances have been made in treatment of HIV infection, and new antiretroviral nucleoside reverse transcriptase inhibitors (RTIs) are now routinely used in combination with potent protease inhibitors and non-nucleoside RTIs which known as HAART. This therapy can significantly reduce the morbidity and mortality among PLHIV by controlling the multiplication of the virus in the body. Gange(2002) in Baltimore, USA found that the use of HAART led to improved immunological function, suppressed HIV disease activity, and dramatic declines in morbidity and mortality.In Malaysia HAART is generally prescribed for PLWH whose CD4 count is 350 cells/mm^3 or less provided the patient has goes off drug and will be complaint with the medication. In this study, 27 (73.0%) were on HAART. While it can be assumed that they were still not on HAART for the above reasons, there were also a few caseswho were newly diagnosed and were not on HAART yet.

4.6.1 Relationship between use of HAART with BMI

The availability of ART in resource limited settings has dramatically decreased the morbidity and mortality among HIV-infected individuals worldwide. However, weight loss and malnutrition continue to be common problems among HIV-infected patients in such settings, even in the era of ART (Liu et al., 2011). The result of this study revealed that there was no significant relationship between the use of HAART and the nutritional status of the respondents. Table 7 shows the distribution of nutritional status according to the use of HAART.

Table 8: Relationship between the use of HAART and respondent's BMI

	BMI Category			*P*
	Underweight n(%)	Normal/ Overweight n(%)	Total	
HAART[b]				0.75
Yes	5 (18.5)	22 (81.5)	27 (73.0)	
No	1 (10.0)	9 (90.0)	10 (27.0)	

[b] Fisher Exact test was used to test relationship

There was a total 27 (73.0%) of the respondents who were on HAART at the time of study. Of these respondents, 22 (81.5%) of them were normal or overweight while 5 (18.5%) were underweight in accordance to WHO BMI classification. As shown in Table 8, 10 (27.0%) of the respondents were not using HAART. Among them, majorities (90.0%) of them were normal or overweight and only one respondent was underweight. There is no significant relationship (p= 0.75) between the use of HAART and BMI of the respondents in this study.

The finding of this study was not consistent with the study conducted by Brechtl et al., (2001). Brechtl measured the impact of HAART treatments on a wide range of clinical outcomes and physiological variables in a sample of people with advanced HIV infection. Several people with advanced AIDS who were protease inhibitor naïve were started on HAART regimes. Respondents for this study were admitted to an AIDS inpatient unit of a long-term care facility that provides treatment and palliative care. After 3 months, they found that CD4 count of the respondents, body weight, serum albumin, and ferritin level increased. However this study cannot be compared directly with the present study since the setting and severity of HIV were different which may influence the effect of weight changes among the respondents.

Whether usage of HAART contributed in weight changes to it user or not is still controversal. There were a lot of factors contributing to weight changes in people living with HIV despite of HAART alone such as depression syndrome which lead to reduced dietary intake and physiological condition of the body where damaged of intestinal villi which cause energy malabsorption. However, BMI is still important as a predictor of survival among PLHIV. In study conducted by Van der Sande et al., (2004), they found that the mortality hazard ratio (HR) of those with a baseline BMI <18 compared with those with a baseline BMI >18 was 3.4 (95% CI, 3.0–3.9). The median survival time of those presenting with a BMI <16 was 0.8 years, in contrast to a median survival of 8.9 years for those with a baseline BMI >22. Baseline BMI <18 remained a highly significant independent predictor of mortality after adjustment for age, sex, co-trimoxazole prophylaxis, tuberculosis, reported wasting at diagnosis, and baseline CD4+ cell count (adjusted HR = 2.5,95% CI 2.0–3.0). As conclusion for the study, BMI at diagnosis was a strong, independent predictor of survival in PLHIV.

4.6.2 Relationship between usages of HAART with percentage of RNIachievement.

Reduction in nutrient intake was the predominant factor causing weight loss in people with HIV. Even in the current era of HAART, weight loss and muscle wasting remained a significant clinical problem (Grinspoon S et al., 2003). In this study, nutrient intake by respondents was compared with RNI as the standard guideline to determine whether respondent's intake achieved or not.

RNI was different according to sex and some of nutrients were different according to age group.

Figure 4 shows the percentage of each nutrient listed in RNI table that achieved by male respondents both with and without HAART. Daily intake of energy, protein, calcium, zinc, selenium, thiamin, riboflavin, niacin, vitamin C and A were higher in respondents who were on HAART butaverage intake of carbohydrate, fat, and iron were higher in respondents who were not taking HAART. For folate and vitamin E, both of group (with HAART and without HAART) were failed to achieve RNI standard.

For female respondents, the same graph can be seen on Figure 5. Different with male respondents, female respondents who were without HAART had a better percentage of RNI achievement in majorities of nutrient included energy, carbohydrate, protein, fat, selenium, thiamin, niacin and vitamin A. For female respondents who were taking HAART, they have higher percentage intake for zinc and riboflavin. Iron, calcium, folate, and vitamin C were nutrient than none of female respondent able to achieve RNI level.

From the result, this study can conclude that whether taking HAART or not, achievement of RNI among PLWH was still poor. Male respondents have a better percentage of RNI achievement compared to female respondents. This might be explained as male respondents had higher income monthly and longer period of education compared to female respondents. By having higher income and higher education, respondents can be assumed to have a better opportunity to choose and buy more healthy and nutritious food. Low socio-economic status and poor income can limit access to adequate dietary intake(Sachdevaet al., 2011).

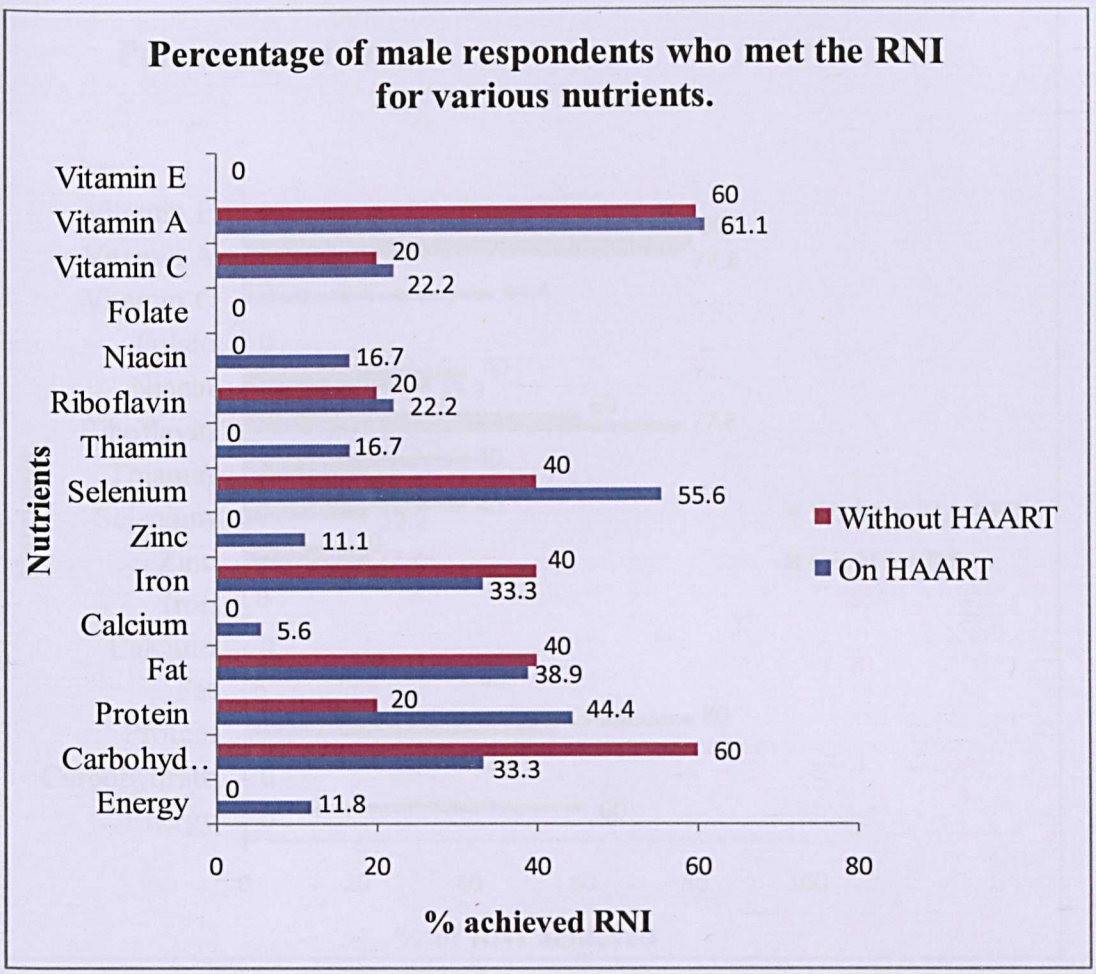

Figure 4: Percentage of male respondents who met the RNI for various nutrients for both group on HAART treatment and without HAART treatment.

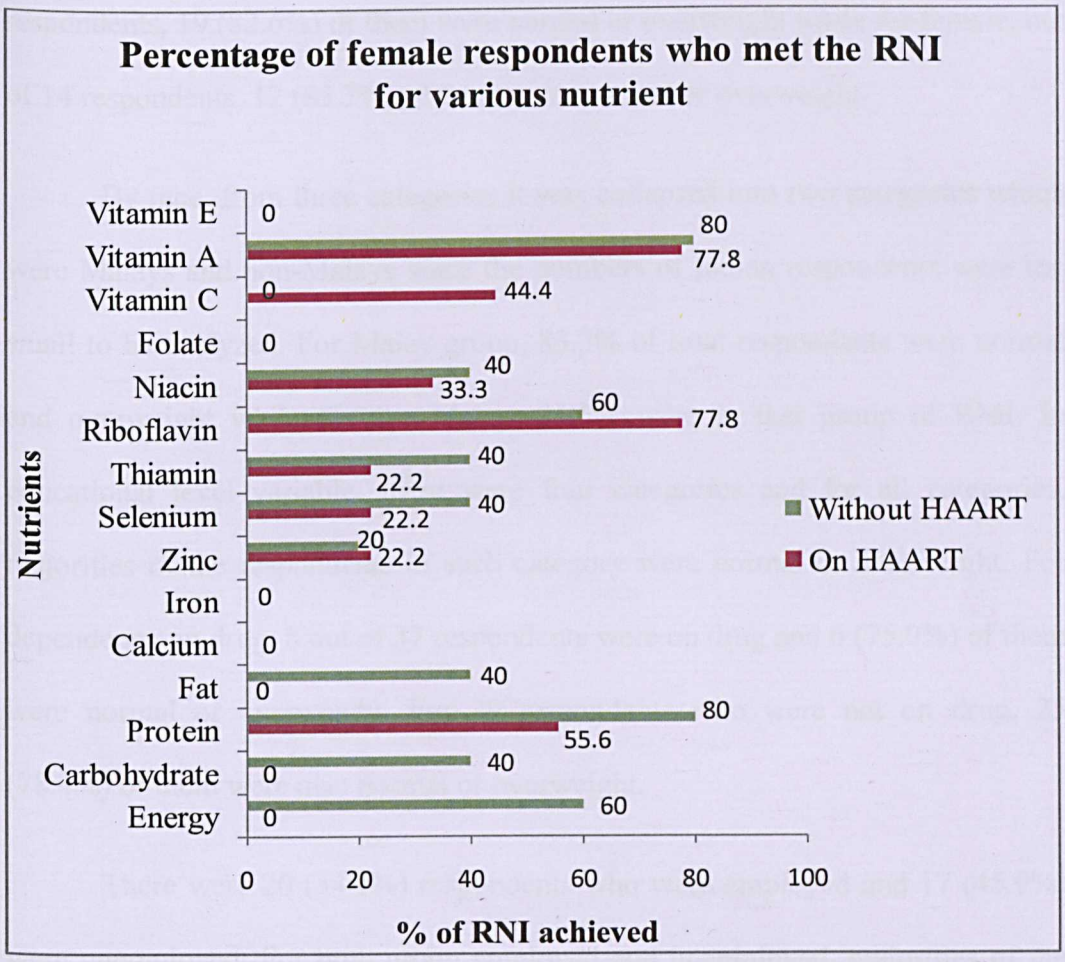

Figure 5: Percentage of female respondents who met the RNI for various nutrients for both group on HAART treatment and without HAART treatment.

4.7 Relationship between socioeconomic status and nutritional status.

This present study found that, most of the respondents were had BMI in the category of normal or overweight. For age group 25 to 35 years, majority (90.0%) of respondents was normal or overweight and only a respondent (10.0%) was underweight. For age group 36 to 46 years, 86.7% of the respondents were normal or overweight and 13.3% were underweight. The same pattern also can be seen for age group 47 to 57 where, majorities of the respondents (75.0%) were normal or overweight and only 25.0% were underweight. Out of 23 male

respondents, 19 (82.6%) of them were normal or overweight while for female, out of 14 respondents, 12 (85.7%) of them were normal or overweight.

By race, from three categories it was collapsed into two categories which were Malays and non-Malays since the numbers of Indian respondents were too small to be analyzed. For Malay group, 83.3% of total respondents were normal and overweight while for non-Malay, 84.6% were in that group of BMI. In educational level variable, there were four categories and for all categories, majorities of the respondents in each category were normal or overweight. For dependency on drug, 8 out of 37 respondents were on drug and 6 (75.0%) of them were normal or overweight. For 29 respondents who were not on drug, 25 (78.4%) of them were also normal or overweight.

There were 20 (54.1%) respondents who were employed and 17 (45.9%) were unemployed. For both group employed and unemployed, majorities of the respondents (80.0% for employed and 88.2% for unemployed) were normal or overweight. For income, there was a wide range of total monthly income of respondents started from RM 0 to RM 6,000. For 8 respondents who did not have any income, all of them were normal or overweight and for the rest who had their income majority of them in all categories were normal or overweight. Table 9 shows the relationship between socioeconomic status with BMI categories of respondents.

Table 9: Relationship between socioeconomic status and BMI category

	BMI Category			*r*	*p*
	Underweight n(%)	Normal/ Overweight n(%)	Total		
Age[a]				-0.18	0.30
25 – 35	1 (10.0)	9 (90.0)	10 (27.0)		
36 – 46	2 (13.3)	13 (86.7)	15 (40.5)		
47 - 57	3 (25.0)	9 (75.0)	12 (32.4)		
Sex[b]					1.00
Male	4 (17.4)	19 (82.6)	23 (62.2)		
Female	2 (14.3)	12 (85.7)	14 (37.8)		
Race[b]					1.00
Malays	4 (16.7)	20 (83.3)	24 (64.9)		
Non-Malays	2 (15.4)	11 (84.6)	13 (35.1)		
Educational level[a]				-0.06	0.73
Years of education					
No- formal	0 (0.0)	1 (100.0)			
Primary	1 (12.5)	7 (87.5)			
Secondary	4 (20.0)	16 (80.0)			
Tertiary	1 (12.5)	7 (87.5)			
Dependency on drug[b]					0.60
Yes	2 (25.0)	6 (75.0)	8 (21.6)		
No	4 (13.8)	25 (86.2)	29 (78.4)		
Employment[b]					0.67
Employed	4 (20.0)	16 (80.0)	20 (54.1)		
Unemployed	2 (11.8)	15 (88.2)	17 (45.9)		
Income[a]				-0.07	0.68
0	0 (0.0)	8 (100.0)			
1-499	3 (30.0)	7 (70.0)			
500-2000	2 (33.3)	11 (84.6)			
>2000	1 (16.7)	5 (83.3)			

[a]Spearman Rho was used to test the relationship

[b] Fisher Exact test was used to test the relationship

For all variables in socioeconomic status showed that there was no significant relationship with BMI of respondents. Small sample size can be considered as one of the factors for the insignificant relationship between those two variables.

4.8 Relationship between CD4 counts with nutritional status

CD4 count is one of the biomarkers used to assess the progression of HIV. In this study, CDC categorization had been used to classify the progression of HIV. From the total of 37 respondents, 8 of them had CD4 count more than 499 and in this category, 2 (25.0%) of them was underweight while 6 (75.0%) were normal or overweight. For respondents who had CD4 count in the range of 299 until 499, majority (88.2%) of them were normal and overweight and 11.8% of them were underweight. The last category for CD4 count which was CD4 count less than 200 have a total 12 respondents in that category. In this category, 10 (83.3%) of them were normal and overweight while only two respondents (16.7%) were underweight. All three categories had the same pattern in term of the distribution of the respondents based on their BMI. For all categories, they were more respondents in normal and overweight compared to underweight.

However, there is no relationship between CD4 counts with BMI category. A study conducted by Sachdeva et al., (2011) had the same finding with this current study. Their study aimed to evaluate the dietary intake of PLHIV in North India and compare it with the recommendation dietary allowances (RDA), and to assess the interplay of various HIV-related factors with dietary intake. One hundred consecutive HIV infected individuals were interviewed from the

Immunodeficiency Clinic of a tertiary care center at Chandigarh. Dietary intake was assessed by 24 h recall method. Mean carbohydrate, protein and fat intakes were evaluated. Mean difference in the calorie intake from recommended dietary intake was then calculated. Mean absolute CD4 cell count was calculated and correlated with BMI and mean calorie intake. For CD4 cell count and BMI, there was no significant correlation found between these two variables (r = 0.11, p= 0.53).

Table 10: Relationship between CD4 counts with nutritional status

	BMI Category			*r*	*P*
	Underweight n(%)	Normal/ Overweight n(%)	Total		
CD4 count[b]				0.11	0.53
>499	2 (25.0)	6 (75.0)	8 (21.6)		
200-499	2 (11.8)	15 (88.2)	17 (45.9)		
<200	2 (16.7)	10 (83.3)	12 (32.4)		

[b] Fisher Exact test was used to test the relationship

4.9 Hypothesis testing

The first null hypothesis for this study was there is no relationship between the uss of HAART with nutritional status of respondents. Since p-value was p = 0.75 which was greater than significant value (0.05), we accepted the null hypothesis. For the second null hypothesis, there is no relationship between socioeconomic status and nutritional status of respondents. For all variables in socioeconomic factor such as age, sex, race, educational level, dependency on drug, employment status, and income the p-value was greater than 0.05 so, once again the null hypothesis was accepted. The last null hypothesis for this study

was there is no relationship between CD4 count and nutritional status. 0.53 was the p-value for this relationship so, the null hypothesis was accepted.

CHAPTER 5

CONCLUSION

5.1 Conclusion

Majority (62.0%) of respondents recruited in this cross- sectional study was male and 64.9% of total respondents were Malay. Respondents recruited were in the age range 25 – 57 years old with the mean of 42.3±8.8. For educational level, 54.1% of respondents had studied to secondary school while 2.7% of respondents never been to school. Most of the respondents recruited in this study were employed (54.1%) and have mean income ofRM 1011.59±1246.1. In socioeconomic background, dependency on drugs by respondents was also asked and we found that 21.6% of respondents were drug users.

For anthropometric measurement, mean BMI of respondents was 22.8 ± 5.8 kg/m^2. Although weight loss is common among PLWH, only 6 (16.2%) of the respondents were underweight while, 22 (59.5%) respondents had normal BMI. In the overweight category, only 9 (24.3%) of the respondents were in this group.

In this study, there is no significant relationship between socioeconomic status and nutritional status. Higher socioeconomic status should result in better nutritional status. However, it may not have been shown in this study as the sample size was small.

As for CD4 count, 45.9% of respondents have CD4 count in the range of 200-499, 32.4% of respondent have < 200, and 21.6% of respondents have > 499 CD4 count. For male respondents majority of them (87.5%) were in category which their CD4 count >499 while for female, majority of them (57.1%) have CD4 count in range of 200-499. There is no significant relationship between CD4 count and nutritional status was found in this study ($r = 0.45$, $p= 0.661$). CD4 counts were reported as the number of cells in a cubic millimeter of blood. A normal CD4 count is 500 to 1,500 cells per cubic millimeter of blood. It is more important to pay attention to the pattern of the result than to any one test result since the reading might be affected by different factor such as menstrual cycle and using of oral contraceptive among women.

For use of HAART, at the time of study, 73.0% of respondents were taking HAART while 27.0% of them were not. For those who were not taking HAART, they might probably have CD4 count lower than recommended level to start the therapy which is >350. The mean duration of taking HAART by respondents was 34.4 ± 39.3. In this study, there is no significant relationship between use of HAART and nutritional status was found ($r = -0.55$, $p= 0.75$). In future studies, it would be best if the class of drug on HAART can be specified as different class of ARV has different side effects which can alter nutritional status in different degree.

For dietary intake, we found that male respondents have a better RNI achievement compared to female respondents except for protein, vitamin A, and vitamin C. when comparing percentage of RNI achievement between respondent who were on HAART and who were not, in male population, those who taking HAART have better achievement while in female population, those who were not taking HAART have a better achievement. Small sample size had limit the accuracy of this comparison since the number of female respondents was less than male respondents.

5.2 Limitations and Recommendations

Findings in this study were limited by non-probability sampling method used and small sample size of respondents. Due to issue of confidentiality and time constrain, only a small group of PLWH in the Klang valley were included in the study through a snowball method. Probability sampling and larger number of respondents should be recruited to make the results more representative to the population of PLWH. There for, there is a need for further research on a larger scale recruited through a probability sampling method.

This study only took into account the use of HAART among respondents but not the type of HAART that they were on. It is important to know the types of HAART that they take so that the effects of the different type of drug on nutritional status can be studied. Apart from this, interactions between nutrition and HAART have to be studied to provide better understanding on the effects of the medication to PLWH.

Quality of life among PLWH also can affect their nutritional status. This study did not take into account the quality of life among the respondents in the term of physical and mental health. By assessing on quality of life among PLWH, it can be baseline data for policy makers and also intervention program in order to achieve effectiveness of approaches in improving PLWH quality of life as well as increase productivity of the country.

Scientific evidence is needed to provide nutrition recommendation for PLWH since it is not appropriate to use recommendation for normal healthy population since PLWH have alteration in their metabolism process. Realizing that number of PLWH is increasing rapidly, the recommendation is very important at in this time. By having optimum nutrient in the altered metabolism process, it is hoped that the progression of the virus can be slowed down and PLWH will achieve better nutritional status.

Lack of proper diet is one of the major causes of the malnutrition problem among PLWH. This might due to deficits in nutrition knowledge among this population. Nutrition counseling is an effective intervention to improve weight gain and modify disease progression (Tabi and Vogel., 2006). Therefore, nutritional education appears to be necessary to ensure that PLWH take adequate nutrition to ensure their quality of life.

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APPENDICES

Appendix A

Appendix B

Appendix C

Appendix D

JAWATANKUASA ETIKA UNIVERSITI UNTUK PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM)
UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG,
SELANGOR, MALAYSIA

FORM B1: RESPONDENT'S INFORMATION SHEET AND CONSENT

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

1. STUDY TITLE :

Nutritional status among adults living with HIV

2. INTRODUCTION:

The aim of this study is to assess nutritional status among people living with HIV. The status will be measured using anthropometry assessment including measurement of weight, height, and body mass index (BMI). Besides that, this study also aimed to determine the relationship between socio-economic factors and antiretroviral therapy with nutritional status.

3. WHAT WILL YOU HAVE TO DO?

Respondents need to fill in the consent form as an agreement to involve in this study.Height and weight of responedent will be measured and recorded by researcher. Respondents need to answer a few questions related to socio-economic status, daily meals intake and current treatment undergone. Interview session will take approximately 30 minutes.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

Who are less than 20 years old, residing outside the Klang Valley, refuse to participate, bed ridden and critically ill.

5. WHAT WILL BE THE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?

You will be able to know your current nutritional and health status.

(b) TO THE INVESTIGATOR?

This study gives a chance for researcher to get detailed information related to nutritional and health status among people living with HIV and compare the status between receivers of antiretroviral therapy and those who are not received.

9. CONSENT

I ..... Identity Card No. .....

address.....

.....hereby voluntarily agree to take part in the research stated above *(clinical /drug trial/video recording/ focus group/interview-based/ questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential and all information provided with regard to my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable)

* delete where necessary

Signature ..... Signature .....
(Respondent) (Witness)

Date :..... Name :.....

I/C No. :.....

I confirm that I have explained to the respondent the nature and purpose of the above-mentioned research.

Date ..... Signature .....
(Researcher)

JAWATANKUASA ETIKA UNIVERSITI UNTUK
PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM)
UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG,
SELANGOR, MALAYSIA

BORANG B1: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1.TAJUK KAJIAN

Taraf Pemakanan dalam Kalangan Penghidap HIV di Sekitar Lembah Klang

2. PENGENALAN

Kajian ini dijalankan bertujuan untuk mengakses taraf pemakanan dalam kalangan penhghidap HIV . Taraf pemakanan tersebut akan ditentukan melalui ukuran antropometri yang melibatkan tinggi, berat dan jisim tubuh badan serta melalui penilaian pemakanan. Selain itu, kajian ini juga bertujuan bagi melihat perkaiatan di antara taraf sosio-ekonomi dan penggunaan terapi antiretroviral dengan taraf pemakanan.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Responden perlu menandatangani borang persetujuan untuk menyatakan persetujuan untuk melibatkan diri dalam kajian ini dan akan ditemubual secara bersemuka oleh penyelidik. Ketinggian dan berat responden akan diukur dan ditimbang oleh penyelidik. Responden dikehendaki menjawab beberapa soalan berkaitan maklumat peribadi, amalan pemakanan seharian dan rawatan yang sedang diterima.Sesi temubual akan mengambil masa sekitar 30 minit.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Responden yang berumur 20 tahun ke bawah, tidak menetap dalam kawasan Lembah Klang, tidak bersetuju untuk terlibat dalam kajian, tidak berupaya untuk melakukan aktiviti harian dan yang terlantar sakit tenat.

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) KEPADA ANDA SEBAGAI PESERTA?

Responden berpeluang untuk mengetahui mengenai taraf pemakanan dan taraf kesihatan semasa mereka.

9. PERSETUJUAN

Saya……No Kad Pengenalan.

……..beralamat ……..……..dengan ini bersetuju untuk mengambil bahagian secara sukarela dalam penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-ubatan/rakaman video/kumpulan sasaran/temuduga/ soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Penerangan Responden). Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan.Saya juga memahami bahawa sebarang maklumat yang berkaitan identiti saya akan dirahsiakan.

Saya* berminat/ tidak berminat untuk mengetahui keputusan kajian yang melibatkan saya.

Saya setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

*potong yang tidak berkenaan

Tandatangan ……..……
(*Responden*)

Tarikh:……..…..

Tandatangan ……..……..
(*Saksi*)

Nama: ……..

No. K/P: ……..…...

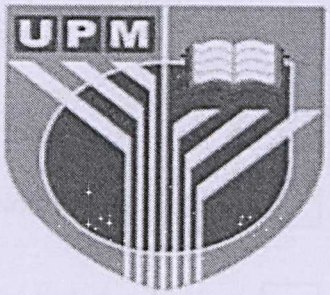
Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan tujuan penyelidikan yang tersebut di atas.

Tarikh……..……

Tandatangan……
(*Penyelidik*)

Appendix E

Reference No: | | | |



UPM
UNIVERSITI PUTRA MALAYSIA
BERILMU BERBAKTI

DEPARTMENT OF NUTRITION AND DIETETICS

FACULTY OF MEDICINE AND HEALTH SCIENCES

UNIVERSITI PUTRA MALAYSIA

FACE-TO-FACE QUESTIONNAIRE

RESEARCHER: NUR ADILAH BT MUHAMMADUN BASAR

SUPERVISOR: ASSOC. PROF. DR. MARY HUANG

Your personal information given is for research purpose only. It will be kept strictly confidential. Your co-operation is very much appreciated.

Part 1: SOCIO-ECONOMIC BACKGROUND

Age: _____

Gender: Male ☐ Female ☐

Ethnicity: Malay ☐ Chinese ☐ Indian ☐ Others (please state): _____

Education level: Non formal school ☐ Primary school ☐

Secondary school ☐ Tertiary school ☐

Years of formal education: _____

Drug user: Yes ☐ No ☐

Occupation: Employed ☐ Unemployed ☐

Household income: _____

Part 2: ANTIRETROVIRAL THERAPY

Under Antiretroviral therapy: Yes ☐ No ☐

Since when start HAART: _____

Part 3: ANTHROPOMETRY MEASUREMENTS

Measurement	1st Reading	2nd Reading	Average
Weight (kg)			
Height (cm)			

BMI: _____

Category of BMI: Underweight/ Normal/ Overweight/ Obese

Part 3: CD 4 count

My current CD 4 count is: _____

Part 5: 24-HOUR DIETARY INTAKE

Weekday (Monday, Tuesday, Wednesday, Thursday, Friday)

Time	Food and drinks	Amount
BF		
MT		
LN		
AT		
DN		
SP		

Weekend (Saturday/Sunday)

Time	Food and drinks	Amount
BF		
MT		
LN		
AT		
DN		
SP		
