Nutritional Status and Dietary Diversity Among HIV-Positive Adults: A Cross-Sectional Study in South Delhi, India

# ABSTRACT

|  |
| --- |
| **Aims:**  The aim of this study is to evaluate the nutritional status of HIV-positive adults by anthropometric measurements and dietary intake. Study also aims to assess prevalence of malnutrition and food consumption patterns, nutrient intake, and adherence to dietary recommendations to understand how nutrition impacts on overall health among HIV-positive adults.  **Study design:** This study was a cross-sectional study.  **Place and Duration of Study:** This study was conducted at ART center of Safdarjung hospital New Delhi, between August 2023 till May 2024.  **Methodology:** 100 HIV-Positive adults (aged 18-35 years including both gender males and females) seeking treatment were invited to take part in the study & compare the dietary factors associated with Nutritional intake and Dietary practices among HIV-Positive adults. Purposive sampling was used to collect data. Structured questionnaire was used to collect data on demographic information. Height and weight of the subjects were recorded with standard procedures and BMI was calculated. Food and nutrient intake of subjects was calculated by 24-hour dietary recall method.  **Results:** Study showed that the mean age of subjects was 28.98 years with 61% male and 39% female. It was observed that out of 100 subjects, 70% were married 28% were unmarried and 2% were divorced and in terms of their literacy, only 8% were above graduate. The mean BMI of the respondents was 22.49 ±3.52. The mean nutrient intake for energy among sedentary male was 1805 Kcal/day, protein 51g/day, & fat 57g/day and carbohydrate 271g/day, while the mean nutrient intake of Male (heavy active) was very poor with the consumption of energy 1547Kcal/day, protein 39.9g/day, fat 47.9g/day and carbohydrate 239g/day. Study showed that the mean nutrient intake was exceeded from the recommended level among sedentary females.  **Conclusion:** In conclusion, the study revealed diverse demographics and lifestyles among subjects with varied marital status, literacy levels, and nutrient intakes. Sedentary males had adequate nutrient intake, while heavily active males had poor nutrient intake. Interestingly, sedentary females' nutrient intake exceeded recommended levels. These findings underscore the importance of tailored nutritional recommendations based on activity levels and demographics to ensure optimal health. A good nutrition status can prevent developing from co-morbidities because most of the patients with AIDS disease become undernourished, malnourished, and die of infections other than HIV. |

***Keywords:*** *HIV, AIDS, BMI, ARVS, ART*

# INTRODUCTION

According to UNAIDS (Joint United Nations Programme on HIV/AIDS), an estimated 40.3 million people are globally living with HIV. Acquired immunodeficiency syndrome (AIDS) was first recognized in the United States in July 1981, and in August 1981, AIDS was reported in intravenous drug users. Human immunodeficiency virus (HIV) is a viral disease caused by a virus, the final stage of the disease is AIDS: acquired immune deficiency syndrome, which takes from 2 to 15 years to develop. In the stage of AIDS, the immune system becomes weaker because the virus attacks the body’s immune system, compromising the body's ability to fight off infections, diseases, opportunistic infections, and various other illnesses (Williams, 2015, & Arora & Bala 2020). The human immunodeficiency virus (HIV) and its end stage, acquired immunodeficiency syndrome (AIDS), are nutrition-related conditions. Nutrition status and nutrition interventions are critical in the care of people living with HIV. Several international studies have shown that mild to moderate malnutrition impairs the immune response and increases the severity and mortality of infections. Although the advent of potent combined antiretroviral therapy (cART) has not provided a permanent cure, it has transformed HIV into a manageable chronic disease. Several international studies have also shown that over time some classes of ART drugs slowly became resistant at the same time tenofovir disoproxil fumarate (TDF) is a component of ARVs and tends to gain weight (Bantie *et al.* 2024), so overweight and obese will remain concerned about heart disease of HIV-positive adults, as a consequence, nutrition interventions in those living with HIV are rapidly evolving to tailor nutrition support to the special needs created by the stages of the infection and its treatment. HIV and nutrition are interrelated due to side effects of ARVs (Antiretroviral drugs) such as body fat changes are a daily concern, and unintentional weight loss was found to be significantly associated (Carvalho *et al.* 2017), thus nutritional status of HIV-positive adults is a critical aspect of their overall health and well-being, a good nutritional status is important to support the overall health and immune function of adult living with HIV/AIDS. Adequate nutrition refers to the intake of a diet that meets the specific nutritional needs of the specific individual for that particular period in time (Anand, 2013 and Banwat, 2013). Proper dietary changes and inclusion of healthy foods can boost immune system, improve medication absorption which can further reduce side effects of medications. This will help in maintaining healthy weight and managing Co-morbidities in HIV positive adults.

## Need of the study

Addressing the nutritional needs of HIV-positive adults is a multifaceted approach that involves medical, nutritional, and psycho social support. Recognizing the importance of nutrition in HIV management is crucial for enhancing the overall health and quality of life for individuals living with the virus. HIV affects various aspects of nutritional health, leading to weight loss, muscle wasting, and nutritional deficiencies. Adequate nutrition is crucial for maintaining strength, managing opportunistic infections, and supporting the effectiveness of antiretroviral therapy. Malnutrition and undernutrition are common among HIV-positive individuals and can exacerbate the progression of the disease, impair immune function, and increase susceptibility to infections. This research, once approved, will shed light on the importance of targeted nutritional education and counselling as a means to achieve these goals, ultimately benefiting society as a whole. The findings may have practical implications for healthcare providers, policymakers, and organizations involved in nutrition and health among HIV-positive adults, helping them design more effective interventions and support systems for HIV-positive adults.

# Importance of the Study

# This manuscript addresses a crucial public health concern by examining the nutritional status and dietary diversity among HIV-positive adults. Given the increased metabolic demands and nutritional challenges faced by this population, the study provides valuable insights that can guide targeted interventions. The findings have significant implications for healthcare providers, policymakers, and researchers, particularly in resource-limited settings where malnutrition and food insecurity exacerbate HIV-related complications. By contributing to the growing body of knowledge on HIV and nutrition, this study can support the development of evidence-based dietary recommendations and public health strategies.

# Materials and Methods

A Cross-sectional study was undertaken using the purposive sampling method. The study location was ART center of Safdarjung Hospital New Delhi, India. The data collection was carried out from November 2023 to March 2024.

## Population and sample size

100 HIV-positive adults seeking ART treatment were included in the study Sampling Technique:

The following *inclusion criteria* were applied to both genders Male and Female at the time of collection of the data: Age 20-35 years, both genders (Male/Female), adult patients diagnosed HIV-positive at least 2 years earlier but not more than 10 years and the patient who had given a written consent to participate in the study. *Exclusion Criteria was:* HIV-positive Pregnant women’s, HIV-positive sex workers, HIV-positive Transgender, The person with mental illness, Hepatitis B and C co-infected patients, Loss of follow up,The Person suffering from critical illness and admitted to the hospital, The Person suffering from any chronic disease e.g. Diabetes, Chronic and acute renal failure, coronary heart disease, Tuberculosis, cancer, arthritis, etc. and Non-consenting HIV-positive adults.

## Data and sources

To collect data the subjects were explained about the study and informed consent was obtained from every subjects. The questionnaire was developed consisting of a socio-demographic profile, anthropometric profile, and 24-hour dietary recall and other relevant information to be obtained from the subjects. Questionnaire was then pretested on 20 subjects which were not included in the study and necessary changes were incorporated in the questionnaire. Interview method was used to collect data from the subjects based on their feasibility and comfort, after assuring that their data would never be leaked. A brief introduction of the study was given to the subjects to evaluate the anthropometric profile of the individuals, standardized procedures were followed, ensuring the accuracy and consistency in measurements. The 24-hour dietary recall nutrients calculation has been done with the help of a food exchange list and IFCT, 2017 at the same time, the nutrient

content of the reported dietary intake for each subject. Then a questionnaire including questions related to dietary diversity was given to the subjects to mark the responses according to their understanding. After that, the necessary data interpretation tools were used for analyzing the data.

## Data analysis

After the data collection period ended, the responses were entered into a spreadsheet for data analysis. Data were entered and analyzed using the IBM SPSS Statistics version 20. The nutritional status of the subjects was compared with the RDA Tables, a report of the expert group, 2020 by ICMR and NIN and conclusions were drawn from it. Appropriate statistical analysis techniques for analyzing quantitative data, such as descriptive statistics, mean, percentage, standard deviation, and t-test, were conducted. Bar Graphs, Pie charts, and tables were used to visually present data and facilitate interpretation.

# Results and Discussion

According to the data in Table- 1 distribution of subjects according to gender was males 61% and females 39% and the majority of subjects fell within the age group of 31-35 (43%), followed by 26-30 (33%) and 20-25 (24%). The mean age of the population is approximately 28.98 years with a standard deviation of 4.59 years, along with this most of them were married (70%), while 28% were unmarried and only 2% were divorced.

**Table 1:**

# Frequency distribution of the subjects based on their socio-demographic profile (N=100)

|  |  |  |
| --- | --- | --- |
| Parameters | | Freque ncy /% |
| Gender | Male | 61 |
| Female | 39 |
| Age in years | 20-25 | 24 |
| 26-30 | 33 |
| 31-35 | 43 |
| Age (Mean±SD) Years | | 28.98±  4.59 |
| Marital  Status | Married | 70 |
| Unmarried | 28 |
| Divorced | 2 |
| Educational Qualification s | Illiterate | 7 |
| Primary | 21 |
| Middle | 16 |
| High School | 29 |
| Graduate | 19 |
| Above Graduate | 8 |
| Employment  Status | Employed | 62 |
| Unemployed | 38 |
| Type of Activity | Sedentary | 84 |
| Mod Active | 11 |
| Heavy | 5 |
| Food Preference | Vegetarian | 45 |
| Non-Vegetarian | 55 |
| Family Type | Joint | 86 |
| Nuclear | 14 |
| Area | Urban | 92 |
| Rural | 8 |

The highest percentage falls under the category of high school (29%), followed by graduate (19%) and above graduate (8%) some of them had low levels of educational qualification; illiterate (7%) primary (21%) and middle were (16%). The majority are employed (62%), while 38% are unemployed while Sedentary activity was (84%), a small percentage engaged in moderate activity (11%) and (6%) involved in heavy activity and in terms of food preference, the individuals, 45% prefer vegetarian food, while 55% prefer non-vegetarian food family structure of the individuals (86%) belong to joint families, while a smaller percentage belong to nuclear families (14%). The majority reside in urban areas (92%), while only a small percentage reside in rural areas (8%). The study conducted by Pilcher *et al.* (2004) and Hoenigl, *et al* (2016) also supported acute primary infection in men,

**Table 2:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Paramete rs** | **Male (N=61)** | **Female (N=39)** | **Total (N=100)** |
|  | **Mean ±SD (Min-Max**  **)** | **Mean ±SD (Min-Max**  **)** | **Mean ±**  **SD**  **(Min-Max)** |
| **Height (cm)** | 162.56±9.  45  (143-213) | 153.18±7.0  7  (137-173) | 158.9±7.0  (137-213) |
| **Weight (kg)** | 58.84±10.  10  (20-78) | 52.56±11.2  0  (33-80) | 56.39± 10.9  (20-80) |
| **BMI**  **(kg/m2)** | 22.51±3.4  0  (10-29) | 22.46±3.74  (16-30) | 22.49±3.52  (10-30) |
| **Waist Circumference** | 93.7±2.2  (72-110) | 107±5.4  (81-119) | 100.35±3.8  (79-119) |
| **Hip Circumference** | 112±6.3  (91-123) | 125±8.1  (98-132) | 118.5±7.2  (91-132) |
| **Waist: Hip Ratio** | 0.83±0.3  (0.79-0.89) | 0.85±0.7  (0.82-0.90) | 0.84±0.5  (0.79-0.90) |

**Mean Anthropometric Measurements of the Respondents based on Gender**

Table 2 represents the average height for males were 162.56 cm, with a standard deviation of 9.45 cm and the average height for females was 153.18 cm, with a standard deviation of 7.07 cm, while minimum and maximum height was 137cm and 213cm. Similarly, the average weight for males was 58.84 kg, with a standard deviation of 10.10 kg, and the average weight for females was 52.56 kg, with a standard deviation of 11.20 kg, while the minimum and maximum 20 kg and 80 kg. The average BMI for males was 22.51 kg/m2, with a standard deviation of 3.40 kg/m2, and the average BMI for females was 22.46 kg/m2 with a standard

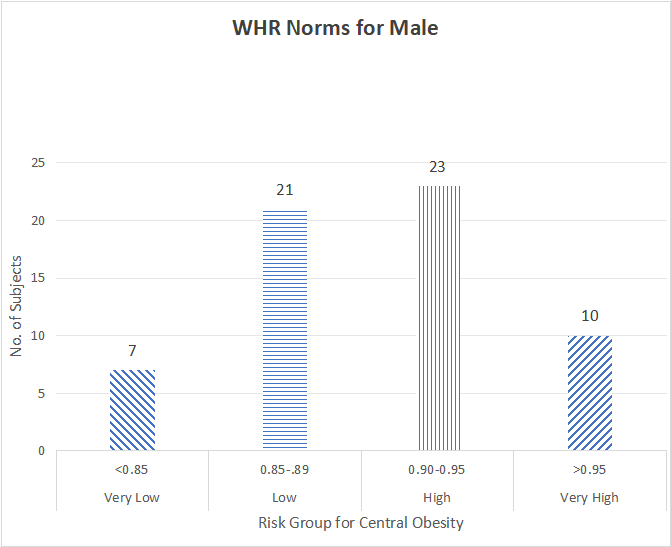
deviation of 3.74 kg/m2. For men, the average waist circumference is 93.7 cm with a standard deviation of 2.2 cm, and for women, The average waist circumference is 107 cm with a standard deviation of 5.4 cm, while the minimum and maximum BMI was 10 kg/m2 and 30 kg/m2.

**Table 3:**

**Distribution of the participants based on their waist hip ratio N=100**

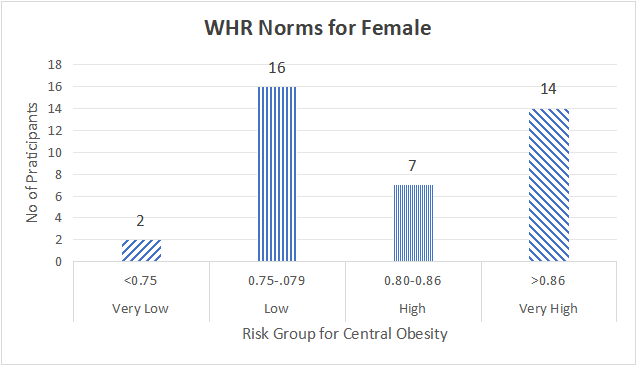
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Very | Low | High | Very |
| Low | Risk | Risk | High |
| Risk | (<0.86 | (<0.90 | Risk |
| (<0.8 | -0.89 | -0.95 | (<0.95 |
| 5 in | in | in | in |
| males | males | males | male |
| and | and | and | s |
| <0.75 | <0.76 | <0.80- | and |
| in | -0.79 | 0.85 | <0.8 |
| femal | in | in | 5 in |
| es) | female | femal | fema |
|  | ) | e) | les) |
| **Male (Frequency /**  **%)** | 7  (12%) | 21  (34%) | 23  (38%) | 10  (16%) |
| **Female**  **(Frequency /**  **%)** | 2  (5%) | 16  (41%) | 7  (18%) | 14  (36%) |
| **Total**  **(Frequency /**  **%)** | 9  (9%) | 37  (37%) | 30  (30%) | 24  (24%) |

The total average waist circumference across both men and women was 100.35 cm with a standard deviation of 3.8 cm with minimum and maximum measurements was 79cm and 119cm, the average hip circumference for males was 112 cm with a standard deviation of 6.3 cm, and for women the average hip circumference was 125 cm

with a standard deviation of 8.1 cm with minimum and minimum measurement was 91cm and 132cm. The total average hip circumference across both men and women was 174.5 cm with a standard deviation of 7.2 cm. Males had a 0.83 average waist-to-hip ratio with a standard deviation of 0.3. while females are 0.85 the average waist-to-hip ratio is with a standard deviation of 0.7. The total average waist-to-hip ratio across both men and women was 0.84 with a standard deviation of 0.5 with minimum and maximum waist-to-hip was 0.79-0.90

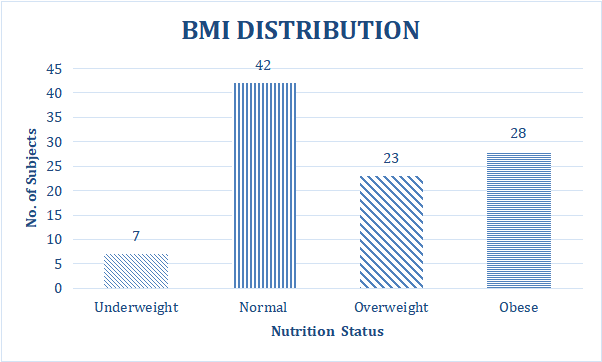
**Figure 1**

**Risk Group Representation: distribution of the Subjects Based on Central Obesity for male(N=61)**

**Figure 2**

**Risk Group Representation: distribution of the Subjects Based on Central Obesity for female (N=39)**

**Table 4**



**BMI Classification Based on Gender Nutrition Status; Male and Female (N=100)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **BMI**  **Categ ories** | **BM I**  **(Asi an Cut Off)** | **M**  **ale N= 61** | **Fe mal e N= 39** | **Total l Subject N= 100** | **Me an**  **± SD** |
| **Under**  **weight** | <18  .0 | 5 | 2 | 7 |  |
| **Norm al** | 18-  22.9 | 22 | 20 | 42 | 22.  49  ±3.  52 |
| **Over weight** | 23-  24.9 | 19 | 4 | 23 |
| **Obese** | >25  .0 | 15 | 13 | 28 |  |

According to Table 4, there are 7 individuals classified as underweight, with a BMI less than 18.0, and the majority of the sample population, comprising 42 individuals, falls within the normal weight range, with a BMI ranging from 18.0 to 22.9, Combined, 51 out of 100 individuals are classified as either overweight (23 individuals) or obese (28 individuals), suggesting that over half of the sample population has a BMI above the normal range, however, the mean BMI for these HIV-positive adults surprisingly 22.49, with a standard deviation of 3.52. Nanewortor *et al* (2021) reported prevalence of malnutrition among HIV positive adults undergone on ART treatment. Similar findings were reported by Khatri *et al*. (2020) and Naidoo *et al*. (2018) that most of the study participants were overweight/obese (39.1%).

**Figure 3**

**BMI Representation: distribution of the Subjects Based on Nutrition Status (N=100)**

According to Table 5 and 6 there are notable gaps in the intake of fruits and milk/milk products, especially among women and heavily active men. The intake of fats and oils had exceeded the recommended levels in women sedentary active males and moderately active males, and heavily active men met only 61% of the adequacy level whereas GLVs and other vegetable intake were found low in both males and females apart from these roots and tuber, pulse beans were also found low level in male and females. Whereas nuts and Oilseeds were observed not adequate from the recommended level in both males and females, although cereals and millets were low in males and females exceeded the recommended level of cereals and millets so it is observed that females had higher dietary adequacy than males in terms of adequacy percentage of food groups. Gender differences in dietary habits may influence the observed intake levels. Khatri et al (2020) reported similar findings that majority of the participants lacked diversified food.

**Table 5**

**Percent Adequacy of food groups in comparison to recommendation for male respondents (N=61)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Food Groups (grams/day)** | **RDA**  **for Sedentary Men** | **Male (N=45**  **)** | **%**  **Adequacy** | **RDA**  **for Moderately Men** | **Male (N=11)** | **%**  **Adequacy** | **RDA**  **for Heavy Active Men** | **Male (N=5)** | **%**  **Adequacy** |
| **Cereals and Millets** | 270 | 257 | 95.1 | 390 | 286 | 73.3 | 690 | 243 | 35.2 |
| **Pulses/Beans/Flesh foods** | 90 | 62 | 68.8 | 130 | 73 | 56.1 | 150 | 56 | 37.3 |
| **GLVs** | 100 | 70 | 70 | 100 | 81 | 81 | 100 | 61 | 61 |
| **Other Vegetables** | 200 | 86 | 43 | 200 | 79 | 39. | 200 | 69 | 48 |
| **Roots and Tubers** | 100 | 130 | 130 | 100 | 98 | 98 | 100 | 53 | 53 |
| **Fruits** | 100 | 71 | 71 | 100 | 62 | 62 | 100 | 36 | 36 |
| **Milk and Milk Products** | 300 ml | 325 | 108 | 300 | 283 | 94.3 | 300 | 192 | 64 |
| **Fats and Oils** | 30 | 32 | 106 | 30 | 39 | 139 | 55 | 34 | 61.8 |
| **Oilseeds and Nuts** | 40 | 17 | 42.5 | 45 | 12 | 26.6 | 55 | 7 | 12.7 |

**Table 6**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Food Groups  (grams/day) | | RDA for  Female | Female  (N=39) | %  Adequacy |
| Cereals Millets | and | 200 | 239 | 119.5 |
| Pulses/Beans/Flesh foods | | 65 | 67 | 97 |
| GLVs | | 100 | 73 | 73 |
| Other Vegetables | | 200 | 79 | 39.5 |
| Roots Tubers | and | 100 | 104 | 104 |
| Fruits | | 100 | 43 | 43 |
| Milk and Products | Milk | 300ml | 247 | 82.3 |
| Fats and Oils | | 20 | 29 | 145 |
| Oilseeds Nuts | and | 30 | 12 | 40 |

**Percent Adequacy of food groups in comparison to recommendation for females (N=39)**

According to Table 7, the mean energy intake of sedentary male respondents was (1805±209.7), for moderately active males (1781±222.3) and heavy worker males (1547±458.6), recommendations for all activity levels, with the percentage adequacy being 85%, 65%, and 44.5% respectively. The protein intake was (51±8.90) among Sedentary males, moderately active males (47±10.6), and heavy workers (39.9±14.6), with the percentage adequacy being 94%, 87%, and 66.5% respectively. Total fat intake was (57±10.3) among sedentary males and (54±9.4) among moderately active males, (47.9±17.09) among heavy worker males with 89%, 66%, and 46% adequacy respectively (to calculate % adequacy of total fat, average of limit and lower limit of fat intake of each category has been used).

**Table 7**

**Mean Intake of Nutrients and % Adequacy among Male Respondents (N=61)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Sedentary active Male N=45** | | | **Moderately active Male**  **N=11** | | | **Heavy active Male N=5** | | |
| **Nutrients** | **RDA/E**  **AR** | **Mean**  **Intake±SD** | **%**  **Adequacy** | **RDA/E**  **AR** | **Mean**  **Intake**  **±S D** | **%**  **Adequacy** | **RDA/E**  **AR** | **Mean**  **Intake**  **±SD** | **%**  **Adequacy** |
| **Energy (kcal)** | 2110 | 1805±209  .7 | 85 | 2710 | 1781±222.  3 | 65 | 3470 | 1547±458.  6 | 44.5 |
| **Protein (g)** | 54 | 51±8.09 | 94 | 54 | 47±10.6 | 87 | 60 | 39.9±14.6 | 66.5 |
| **Total fat (g)** | 58-70 | 57±10.3 | 89 | 75-90 | 54±9.4 | 66 | 96-116 | 47.9±17.09 | 46 |
| **Carbohydra te (g)** | 290-316 | 271±29.2 | 89.4 | 372-406 | 270±28.6 | 69.4 | 479-523 | 239±61.6 | 47.7 |
| **Vitamin C (mg)** | 80 | 47.7±30.2 | 59 | 80 | 55.6±26.7 | 70 | 80 | 37.40±21.4 | 46.7 |

The carbohydrate intake was (271±29.2) among sedentary males, (270±28.6) was in moderately active males, and (239±61.6) in heavy worker males with the percentage adequacy being 89.4%, 69.4%, and 47.7% respectively ((to calculate % adequacy of carbohydrate, an average of upper limit and lower limit of carbohydrate intake of each category has been used). whereas the Vitamin C intake was (47.7±30.2) among sedentary males, (55.6±26.7) were moderately active males, and (37.40±21.4) was for heavy worker males with the percentage adequacy being 59%, 70%, and 46.7% respectively. Wasihun *et al* (2020), and Hiremath *et al.* (2018) also supported the study that HIV positive people were underweight.

**Table 8**

**Mean Intake of Nutrients and % Adequacy among Female Respondents (N=39)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Sedentary Female N=39** | | |
| **Nutrients** | **RDA/ EAR** | **Mean Intake**  **±SD** | **%**  **Adequacy** |
| **Energy (kcal)** | 1660 | 1789±240.0  6 | 107.7 |
| **Protein (g)** | 46 | 50.7±11.8 | 110.2 |
| **Total fat (g)** | 46-55 | 60.2±9.8 | 119.2 |
| **Carbohydrate (g)** | 228-2  49 | 261.9±32.0 | 109.8 |
| **Vitamin C (mg)** | 65 | 35.3±23.6 | 55.2 |

According to Table 8, the mean energy intake of sedentary female respondents (1789 ± 240.06) along with % adequacy was 107.7%. The mean protein intake was (50.7 ± 11.) along with % adequacy: 110.2%. Total fat intake was (60.2 ± 9.8) with 119.2% adequacy (to calculate % adequacy of total fat, The mean protein intake was (50.7 ± 11.) along with % adequacy: 110.2%. Total fat intake was (60.2 ± 9.8) with 119.2% adequacy (to calculate % adequacy of total fat, average of upper limit and lower limit of fat has been used). The carbohydrate intake was (261.9 ± 32.0) along with a % adequacy of 114.8% (to calculate % adequacy of carbohydrate, the average of upper limit and lower limit of carbohydrate has been used). Vitamin C intake was (35.3 ± 23.6) along with % adequacy 55.2%. The observed intake of

sedentary females generally meet or exceeds the recommended levels for energy, protein, total fat, and carbohydrates. The intake of vitamin C falls below the recommended levels, indicating a potential gap in dietary diversity.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Macronutrient** | **Mean requirement of RDA/EAR**  **for male** | **Male**  **(N=6 1)** | **Mean requirement of RDA/EAR for female** | **Female (N=39)** |
| **Protein** | | | | |
| <10 ene% | <52 | 31 | <41 | 9 |
| 10-15 ene  % | 52-79 | 30 | 41-62 | 14 |
| >15 ene% | >79 | 0 | >62 | 16 |
| **Carbohydrates** | | | | |
| <50 ene% | <290 | 45 | <228 | 5 |
| 50-55 ene  % | 316-347 | 11 | 228-249 | 13 |
| >55 ene% | >347 | 5 | >249 | 21 |
| **Total Fat** | | | | |
| <25 ene% | <58 | 34 | <46 | 8 |
| 25-30 ene  % | 58-70 | 22 | 46-55 | 12 |
| >30 ene% | >70 | 5 | >55 | 19 |

**Table 9**

**Proportion of energy intake from macronutrients (N=100)**

Table 9 represents the proportion of energy intake from macronutrients mean average requirements of Recommended Dietary Allowances (RDA) or Estimated Average Requirements (EAR) for macronutrients, specifically protein, carbohydrates, and total fat, categorized by energy percentage (% ene), for the participants. In terms of protein intake, more females fall into the >15% energy category compared to males, suggesting a potentially higher protein intake relative to total energy intake among females. For carbohydrates, more females fall into the >55% energy category compared to males, indicating a potentially higher carbohydrate intake relative to total energy intake among females. Total fat intake seems to be higher in females, not only 19 females which is approximately 50% of females from total females who consumed >30% energy, while only 5% of males exceeded the limit of >30% consumption in terms of total fat. Overall Proportion of energy intake from macronutrients was noted higher among females than men.

**DISCUSSION**

The current study aimed to assess the nutritional status and dietary diversity among HIV Positive adults living in South Delhi for which a sample of 100 participants of age groups were 20-35 years. The research provides valuable insights into the current Nutrition status among HIV positive adults, a good nutrition status can better improve and strengthen the immune system ultimately which will to lead to protect from developing co-morbidities because most of the patients with HIV disease become undernourished, malnourished, and die of infections other than HIV. Knowledge, attitudes, and practices towards a good nutritious and balanced diet can play a crucial role to live better as well as long life of HIV positive adults.

### Description of Socio-demographic Profile

The present study shows the nutrition status of HIV positive adults. The sample population is predominantly male (61%) compared to female (39%), male was 81% exposed and 19% female had, so and the study conducted by Pilcher *et al.* (2004) had also found acute primary infection in men, Hoenigl *et al*. (2016)

found HIV infections are still diagnosed in men above 25 years of age. The majority fall within the 31-35 age bracket, and Most participants were married (70%) whereas Matovu, *et al* (2013) found that between 55-93% of newly acquired HIV infections among adults occurred within discordant marital or cohabiting relationships, and Chauhan *et al* (2013) also said most of HIV positive adults have multiple sexual partners, Hiremath *et al.* (2018) found in the study 96% respondents were married, followed by unmarried (28%) and divorced (2%). A significant portion have attained education up to the high school level and above thus income levels vary, with a notable portion falling within the mid-range categories. while a majority are employed (62%), while a significant portion (38%) are unemployed in which mostly females were unemployed. The majority of respondents reside in urban areas (92%) as compared to rural areas (8%).

### Description of Nutrition status

The current study shows fewer females are underweight compared to males, whereas Gebru, *et al.* (2020), Wasihun, *et al* (2020), and Hiremath *et al.* (2018) also found HIV positive people were underweight. Similar proportions of males (22) and females (20) fall into the normal weight category whereas Naidoo, *et al.* (2018) found 55.9% (530/948) had normal BMI (≥18.50–24.90), and Kwiatkowska, *et al* (2013) also found most of HIV positive were normal BMI, Hiremath *et al*. (2018) had also found normal BMI in 46.15% respondents. While more males, (19) than females (4) are classified as overweight whereas Kwiatkowska, *et al* (2013) also found over weight HIV positives although study compare BMI between HIV positive and HIV negative adults and the number of obese individuals is comparable between males (15) and females (13). Whereas Khatri, *et al.* (2020) reported that most of the study participants were overweight/obese (39.1%), and similar findings were observed by Naidoo, *et al.* (2018). One more recent study conducted by Bantie *et al.* (2024). “Trend of body mass index changes among adults on ART” reported that HIV-positive adults on the TDF/3TC/DTG regimen experience considerable increases in mean BMI levels. Specifically, their BMI level increased from 20.28 kg/m2 to 23.05 kg/m2. It shows a linear increasing pattern in the BMI of HIV positive people due to ART TDF/3TC/DTG**.** WFP [(http://www.Wfp.org/)](http://www.Wfp.org/)) and WHO to take their good health and good nutrition status which will help to boost the immunity of PLHIV to reduce the viral load and increase the CD4 Count (Normal range 500-1500 cell/mm3), if left untreated, levels can drop below 200 cells/mm3, which is one indication for the diagnosis of AIDS, govt. of India also helps PLHIV to provide bus / travel fare for the treatment of AIDS or regularly seeking ART treatment (Koni, *et al*. 2022).

**CONCLUSION**

In conclusion, the study revealed diverse demographics and lifestyles among subjects with varied marital status, literacy levels, and nutrient intakes. Sedentary males had adequate nutrient intake, while heavily active male had poor nutrient intake. Interestingly, sedentary females' nutrient intake exceeded recommended levels. These findings underscore the importance of tailored nutritional recommendations based on activity levels and demographics to ensure optimal health. A good nutrition status can prevent developing from co-morbidities because most of the patients with AIDS disease become undernourished, malnourished, and die of infections other than HIV.

**RECOMMENDATION**

The World Health Organization (WHO) recommends that people living with HIV/AIDS eat a healthy diet and get enough nutrients to maintain a healthy weight.

* This includes eating a variety of foods from all food groups, and choosing foods that are low in fat, salt, and added sugar.

Eat a variety of fruits, vegetables, grains, proteins, and dairy and choose foods low in saturated fat, sodium (salt), and added sugars and maintain a healthy weight

* Consider macronutrient supplementation to meet additional energy needs

A healthy diet can improve clinical outcomes, quality of life, and survival and macronutrient supplementation can help meet additional energy needs

* Other considerations

Nutrition counseling can help patients with HIV infection maintain a healthy weight and aerobic exercise can play an important role in the care of adults living with HIV.

**Consent:**

As per international standards or university standards, Participants’ written consent has been collected and preserved by the author(s).

**Disclaimer (Artificial intelligence)**

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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