



## Nutritional Status of HIV Subjects Attending an ART Centre in Bangalore

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### Abstract

*Nutritional status is an important determinant of HIV outcomes. The study was undertaken to assess the nutritional status of 500 HIV infected adults attending an ART centre in Bangalore. The nutritional status was assessed by anthropometric measurements (Height, Weight, Mid upper-arm circumference), dietary intake and biochemical parameters such as hemoglobin and CD4 count. BMI was calculated. Nutrient adequacy ratios were computed based on the data collected from 24hr dietary recall method. The results indicated that half of the sample had low CD4 cell count below 200 cells/cumm. The nutrient intake was < 60% of RDA in case of Energy, Protein, Riboflavin, Niacin, and Vitamin A. Nutrient adequacy pertaining to calcium and iron were 74.40% and 38.2% in males as against 66.30% and 32.20% in females respectively. Adequate dietary intake along with nutrient supplementation can play an important role in strengthening the immune system and delaying the progression of disease.*

**Keywords :** Nutritional status, HIV/AIDS, dietary intake, Anthropometry

### Introduction

Human Immunodeficiency virus and acquired immunodeficiency syndrome (HIV/AIDS) is an infectious disease that presents a global problem. HIV is a virus that attacks the immune system and destroys CD4+ T cells in the human body. These cells are part of the body's Immune system which fight infectious and various cancers [1],[2]. According to NACO (National AIDS control Organization) 2010 number of people living with HIV/AIDS in India is estimated at 23.9 Lakhs (19.3-30.4 lakhs) in 2009 [3]. The four high prevalence states of South India, Andhra Pradesh (5 lakhs), Maharashtra (4.2 lakhs), Karnataka (2.5 lakhs) and Tamil Nadu (1.5 lakhs) account for 55% of all the HIV infections in the country. Nutrition plays a vital role in the immune system of all people including people living with HIV.

Good nutrition strengthens the immune system, while HIV infections and poor nutrition have a cumulative effect in damaging it. PLHIV (People living with HIV) are more vulnerable to malnutrition than the general population and nutritional status is a good predictor of their mortality risk [4]. Because HIV and Nutrition are so strongly linked. Nutritional assistance is seen as important part of the response to HIV. This may take the form of Nutritional assessment, counseling or food provision. According to WHO, Screening for nutritional status and assessment of dietary intake should be included routinely in HIV treatment and care for adults and children [5]. The present study therefore aims at assessing the nutritional status of PLHIV.

## Material and Methods

The study was undertaken on 500 HIV subjects attending the outpatient clinic at an ART centre in Bangalore. The patients above 21 years of age, who were on ART treatment and willing to participate in the study, were included. Pregnant and lactating mothers, infants and children were excluded from the study.

Sociodemographic information and dietary intake was collected using a questionnaire and interviewing the patients in the local language. Anthropometric measurements like Height, Weight and Mid upper arm circumference were taken by standard procedures. Body mass index was calculated. Based on BMI the patients were compared with WHO standards and classified as underweight, overweight and normal. Information on dietary intake was collected by 24-hour recall method using standardized vessels, cups, spoons and glasses. The raw food equivalents of cooked foods were computed from the standardized cups.

The nutrients present in the food viz., calories, protein, fat, carbohydrates, B-complex vitamins, and vitamin A and C were computed using software called Annapurna VER-3. Nutrient adequacy ratio was calculated by the formula and compared with values given by Indian council of medical research (ICMR) <sup>[6]</sup>.

Nutrient adequacy ratio = Nutrient intake/RDA X 100.

The data was statistically analyzed using 't' test and chi-square test. Ethical approval was obtained from the Institutional Ethics Committee.

## Results

The age range of the sample was between 20-60 yrs. Majority of the subjects were in the age group of 31-40 yrs (47.6%). Hence most affected were people in the productive years. About 75 % of the populations were engaged in some sort of employment as against 25% who were not indulged in any type of occupation due to fatigue. The earnings were between Rs 3000-8000 per month in 60% of the population while 24% had monthly income less than Rs 3000. Statistically significant difference was found

between male and females with respect to education, occupation and income as shown in Table 1.

**Table 1.** Socio-Demographic Profile of HIV Subjects

	Male(N=260)	Female (N=240)	Total(N=500)	Chi-square
<b>Age group(years)</b>				
21-30	37 (14.2)	73 (30.4)	110 (22)	26.13***
31-40	124 (47.7)	114 (47.5)	238 (47.6)	
41-50	78 (30.0)	45 (18.8)	123 (24.6)	
50-60	21 (8.1)	8 (3.3)	29 (5.8)	
<b>Education</b>				
Illiterate	25 (9.6)	69(28.8)	94 (18.8)	32.81***
Primary	101 (38.8)	68(28.3)	169 (33.8)	
Secondary	99 (38.1)	85(35.4)	184 (36.8)	
Graduate	35 (13.5)	18(7.5)	53 (10.6)	
<b>Marital status</b>				
Single	44 (16.9)	5(2.1)	49 (9.8)	103.81**
Married	205 (78.9)	144(60.0)	349 (69.8)	
Widow	11 (4.2)	91(37.9)	102 (20.4)	
<b>Occupation</b>				
Unemployed	14 (5.4)	25 (10.4)	39 (7.8)	139.10**
Employed	246 (94.6)	121 (50.4)	367 (73.4)	
Housewife	0 (0.0)	94 (39.2)	94 (18.8)	
<b>Monthly Income(Rs)</b>				
< 3,000	35 (13.5)	85 (35.4)	120 (24)	44.71**
3,000-8,000	166 (63.8)	137 (57.1)	303 (60.6)	
> 8000	59 (22.7)	18 (7.5)	77 (15.4)	

\*\*\*Significant at 1% level df=3, 11.345;P<0.01 \*\* Significant at 1% level df=2, 9.210; P<0.01

The mean height of males was  $166.5 \pm 6.2$  while in females it was  $155.2 \pm 6.8$ , the mean weight in males was  $61.5 \pm 10.1$  and  $53.0 \pm 10.2$  in females. 15% of total populations were classified as underweight based on BMI. However the mid upper-arm circumference were less than the standard values in 94% of the population depicting low muscle mass the mean CD4 count was significantly higher in females where as hemoglobin was lower compared to males.

Classification indicates that 48% of the subjects had progressed to AIDS with their CD4 count < 200 cells/cumm, While about 40% had impaired immune system with CD4 count between 200-500 cells/cumm and only 11% of the subjects had CD4 count above 500 cells/cumm. There was significant difference between the genders pertaining to CD4 count as tested by chi square test.

**Table 2.** Anthropometric and Biochemical Parameters of HIV subjects.

<b>Anthropometric measurements</b>	<b>Male(N=260)</b> Mean±SD	<b>Female(N=240)</b> Mean±SD	<b>'t' value</b>
Height(cm)	166 ± 6.2	155.2 ± 6.8	13.39**
Weight(kg)	61.5 ± 10.1	53 ± 10.2	9.35**
Mid upper arm circumference(cm)	24.9 ± 2.9	23.9 ± 2.8	3.92**
Body mass index(kg/m <sup>2</sup> )	22.2 ± 3.6	22.0 ± 3.8	0.60 NS
Underweight	40 (15.4%)	39 (16.3%)	0.07 NS
Normal	166 (63.8%)	152 (63.3%)	
Overweight	54 (20.8%)	49 (20.4%)	
<b>Biochemical parameters</b>			
CD4 count(cells/cumm)	217±154.3	292.1± 223.3	
<200	143(55%)	101(42.1%)	18.61**
201-499	102(39.2%)	98(40.8%)	
>500	15(5.8%)	41(17.1%)	
Haemoglobin(%)	12.1± 2.2	10.5± 1.8	

\*\* Significant at 1 % level. NS- Non significant.

### Discussion

The study was carried out on out patients in an ART centre in Bangalore, Karnataka. The results of the study imply that majority of subjects were in the age group 31-40 years slightly older than what was reported by NACO [3]. The reason for this could be due to the fact that the older people have accepted their HIV status and thereby presented themselves for registration in clinics, while younger people may have been reluctant to register and hence the low prevalence state. The results of the study are in line with Nti *et al* who had reported that majority of the HIV subjects in Ghana were in the age group of 36-57years [7]. The nutrient adequacy of the subjects is presented in Table 3. Energy adequacy was less than 60% in both the genders. Which suggests that energy intake should be increased to help maintain body weight in HIV subjects which gives cause for concern. Adequate diet is vital for health and survival of all HIV infected persons as this reduces immune suppression. The results in the study are consistent with Onyango *et al* [8] that

there was low energy intake as well as most of the other nutrients among HIV subjects. Macallan *et al* [9] concluded that reduced energy intake rather than elevated energy expenditure is prime determinant in HIV associated weight loss. Both male and female reported a mean protein intake of 28g and 30.9 g respectively with less than 60% of the RDA.

The low protein intake in the study may be associated with their economic status. The results of the study differ from the findings of Danheuser *et al* [10] which report the energy and protein intake of HIV subjects met at least 67% of the RDA in Free State province of South Africa. However, most of them had low intake of vitamin A, C, D, iron and calcium. In the present study, the majority of the patients had an inadequate intake of micronutrients that was < 75% or lower than RDA. The study also established that the intake of calcium and iron in females was less than 70% of the RDA and vitamins such as Riboflavin and Niacin were less than 55% of the RDA. The female subjects had higher intake of all the nutrients compared to males except calcium

and iron where intake was higher in males as illustrated in Table 3. The intake of iron in males was 38% and in females 32% of the RDA. Calcium adequacy was 74.4% and 66.3% in males and females respectively. The reason may be due to low intake of calcium and iron rich foods and the extra demands during the menstrual cycle. The intake of B complex vitamins, thiamine, riboflavin

& niacin was less than 75% of RDA in both male & female. Whereas intake of vitamin C was adequate in both. Vitamin C has been found to affect the immune function in several ways. There is evidence that increase intake of vitamin C may help it reduce the risk of diseases with increased oxidative stress<sup>[11]</sup>.

**Table 3.** Adequacy of Nutrient intake among HIV subjects..

Nutrients	Gender	RDA	Nutrient adequacy(%)
Energy(K.cal)	Male	2320	46.7
	Female	1900	59.8
Protein(g)	Male	60	46.7
	Female	55	56.2
Carbohydrate(g) (60% Of energy)	Male	NA	45.97
	Female	NA	54.06
Fat(g) (20-30% Of Energy)	Male	25	54.06
	Female	20	65.65
Vitamin A(IU)	Male	600	31.85
	Female	600	21.85
Vitamin C(mg)	Male	40	100.25
	Female	40	101.45
Thiamine(mg)	Male	1.2	51.91
	Female	1.1	71.55
Riboflavin(mg)	Male	1.4	41.85
	Female	1.1	50.0
Niacin(mg)	Male	16	31.56
	Female	12	49.91
Calcium(mg)	Male	600	74.40
	Female	600	66.30
Iron(mg)	Male	17	38.2
	Female	21	32.2

Inadequate nutrition in people with HIV infection may result from many factors including nausea, vomiting that prevent adequate intake of nutrients, diarrheal infections that prevent absorption of nutrients & oral health candidacies in patients that interfere with chewing or tasting of food .The dietary intake of vitamin A in the study was lower than the RDA for a greater percent of patients. Tang *et al*<sup>[12]</sup> reported that 12 to 19% HIV positive subjects at various stages of HIV

infection shows vitamin A in adequacy that is more prevalent in woman than in men. Studies have shown that there is relationship of Vitamin A and immune function. Higher dietary intake of vitamin A may be related to metabolic demand during acute phase of HIV infection or an increased dietary intake, while the low intake could probably be associated with a rapid progression to AIDS<sup>[13]</sup>.

## Conclusion

Inadequate dietary intake could contribute to the severity of HIV infection and to depletion of CD4 T cell population in addition to oxidative stress that might arise from depletion of antioxidant molecules. Which enhances the progression of the HIV to AIDS, it is therefore recommended that adequate dietary intake and nutrient supplementation should be recommended in the treatment of HIV infection.

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