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Evaluation of nutrition education intervention on dietary intake of PLWHA in Uttarakhand, India

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Abstract
HIV/AIDS is a global pandemic and have a major impact on nutrition, food security, agricultural production and rural societies. The present investigation was carried out at ART centre of Susheela Tiwari Hospital, Haldwani, Uttarakhand, India. A manual was produced and pretested to impart nutrition education. The baseline information from all registered subjects was collected; dietary intake and nutritional need were assessed. The Nutrition education was imparted to experimental group and was followed every month for the period of six months and after six months dietary intake was assessed for both groups. The study revealed that majority of the subjects was in the age group18-60 years. A 10.92 per cent subjects were graduates. The per capitaincome per month of the subjects was Rs.2125±1512. The female subjects showed no significant difference between energy intakes at baseline and after six months by both groups. But experimental group showed a significant improvement (p<0.05) in protein intake after six months while no significant difference was found in control group. Among the male subjects no significant difference in energy and protein intake was found in both groups. Per cent energy intake of female subjects showed positive deviation of 6.73 and 3.45 per cent of RDA at baseline by sedentary and moderate subjects of experimental group, respectively. Protein intake increased only 3.37 per cent by experimental group. Per cent energy intake of male subjects showed a positive deviation of 2.56 and 5.78 per cent of RDA from baseline by sedentary and moderate subjects of experimental group. Protein intake increased by 7.96 per cent by experimental group. In experimental group 3.39 and 6.78 per cent subjects achieved > 100 per cent of RDA of energy at baseline and after six months, respectively. Whereas, 45.76 and 55.93 per cent subjects achieved 75-100 per cent of RDA of energy at baseline and after six months, respectively. Nutrition education showed to have insignificant difference in energy and protein intake of subjects except in the protein intake of female subjects of experimental group where significant (p<0.05) improvement was found. Effective management of the disease should include compulsory diet counselling, nutritional supplementation and financial assistance along with antiretroviral therapy.

Keywords: HIV, dietary intake, dietary adequacy, nutrition education

Introduction
HIV/AIDS is a global pandemic (Cohen *et al*., 2008) and approximately 35.3 million people worldwide are living with HIV/AIDS in 2012 (UNAIDS, 2012) [27]. Bollinger *et al*. (1999) [6] considered HIV /AIDS among few crises in history that have presented threat not only to human health but also world social and economic progress. FAO (2001) [12] also accounted that sufficient efforts are needed to address its social, economic and institutional consequences as increasingly the HIV/AIDS epidemic is having a major impact on nutrition, food security, agricultural production and rural societies in many countries. All dimensions of food security - availability, stability, access and use of food - are affected where the prevalence of HIV/AIDS is high.

India has the third largest number of people living with HIV/AIDS (NACO, 2011) [19] and is one of the largest and most populated countries in the world, with over one billion inhabitants have a prevalence rate of 0.3 percent which equates to around 2.4 million people living with HIV (UNAIDS, 2012) [27].

With the introduction of ART HIV/AIDS becoming a chronic disease and can be managed by combining nutritional education and healthy lifestyle practices such as moderate physical activity, avoiding alcohol abuse and smoking etc., will be a cost-effective strategy to improve

nutritional status on a long term (Anderson *et al*., 2011 and Nigatu *et al*., 2012) [21]. Dietary intake May be influenced positively by nutritional counselling, by raising awareness about needed quantities of food to meet increased demand and adequate dietary diversity (WHO, 2006) [28]. Nutritional counselling has been shown to increase intake and improve weight and fat mass and may also increase fat-free mass and lean body mass (De Luis *et al*., 2003, Rabeneck *et al*., 1998 and Schwenk *et al*., 1999) [25].

Since people living with HIV (PLWHA), who are well-nourished, are healthier, with a better ability to fight infections. Good nutrition also complements and ensures effective antiretroviral treatment. So the present study was carried out to see the impact of nutrition education on dietary intake of HIV positive patients at ART centre of Susheela Tiwari Hospital, Haldwani, Uttarakhand. RDA of protein at baseline and after six months, respectively.

Material and Methods

The present study was carried out at ART centre of Susheela Tiwari Hospital, Haldwani. The study was done in two phases. The baseline survey was conducted from August to September 2013 and after an interval of six months the survey was again conducted from February to April 2014 at ART centre of Susheela Tiwari Hospital, Haldwani. The sample size of 136 subjects was calculated according to Kish-Leslie (1965) [16] formula. The subjects were equally divided into experimental and control group, 58 subjects in each group. All adults, non-pregnant, non-lactating women and asymptomatic subjects attending ART centre were included for the study. Whereas pregnant and lactating women, symptomatic, unable to give consent for the study and who could not communicate in the study languages were excluded for the study. The subjects who were fulfilled the inclusion criteria during study period registered for the study. By the end of the study 26subjects dropped from the study and hence excluded from the study and the results have been reported on110 subjects, 51 in the control and 59 in the experimental group.

The study was approved by the advisory committee of Department of Foods and Nutrition, College of Home Science, GBPUA&T, Pantnagar, Uttarakhand. Permission was taken from the hospital administration of Susheela Tiwari Hospital, Haldwani to carry out the study. For ethical consideration the subjects were well explained the purpose of the study and their confidentiality in participant information sheet. A written consent was obtained from the subjects in participant information sheet for their willingness in participating in the study.

A pretested manual containing varied aspect of HIV infection, health, hygiene and nutrition was designed to impart nutrition education to experimental group. The baseline information from all registered subjects was collected, the nutritional status and nutritional need were assessed. The Nutrition education was imparted to experimental group through individual counselling with personalized diet chart. During counselling the manual was explained to the subject and handed over to them for their reference. The experimental group was followed every month for the period of six months.

Dietary intake

Dietary intake was collected using a 24 hour recall method. Data regarding the nature, quality and quantity of cooked food consumed in the last 24 hour were taken from the subjects. The raw equivalents were calculated by using nutritive value of Indian foods (Gopalan *et al*, 1989) [13].

Statistical Analysis

Data were cleaned, coded, entered and analyzed for Sample size, per cent, central tendency, dispersion and student t-test using the Microsoft Excel 2007.

Results

The investigation was done to assess the impact of nutrition education on dietary intake of HIV positive patients at ART centre, Susheela Tiwari Hospital, Haldwani, Uttarakhand, India. The per cent of male and female subjects were 47.27and 52.73, respectively. The per cent of the subjects in the age groups 18-30, 30-60 and above 60 years were41.82, 55.45 and 2.73, respectively. The literacy level of the subjects revealed that 77.28per cent of subjects were literate and 22.72 per cent of subjects were illiterate. Among literate only 10.92 percent were graduates and the majority of the subjects (66.36 per cent) had education up to intermediate. The religion wise distribution shows that 48.18 per cent of subjects were Hindus and 45.45 and 6.37 per cent were Muslim and Sikh respectively. Majority (56.36 per cent) of subjects were married and 9.09, 31.82 and2.73 per cent were unmarried, widow/widower and separated, respectively. A large per cent of subjects (80.90) were from nuclear family and only 19.1 percent of subjects were living in joint family. Majority (70.90 per cent) of subjects had small family size (0-4) while 19.09 and 10.01 per cent subjects had family size of 5-8 and above 8 members, respectively. A 62.7 per cent of subjects were engaged in sedentary activity and rest 37.3 per cent were moderate worker. Per cent of working subjects was 68.19 while nonworking subjects were 31.81 per cent. Among on working all were females and housewives. Among working subjects majority of subjects (30 per cent) had private job and 15.45, 11.81, 9.90, 1.81 and 1.81per cent subjects were farmers, labourer, self-employed, government job and retired respectively. The per capita income per month of the subjects was Rs. 2125±1512, ranged (300-7500). The study shows that the majority (52.73 per cent) were located in plain where as 39.09 and 8.18 per cent of subjects were located in hill and bhabhar region, respectively.

Dietary intake component of the nutritional assessment examines adequacy of the current diet for micronutrient as well as macronutrient composition, identifies factors affecting adequate intake, and identifies food intolerances that may affect intake and proper medication regimens (ADA, 1998) [1]. The goal of dietary assessment and subsequent education and counselling is to prevent loss of weight and lean body mass and to determine measures that may improve the overall health of a patient (Bingham *et al*., 1997; Sharma *et al*., 1998 and Morgan *et al*., 1978) [18].

Dietary intake of female subjects

Dietary intake of female subjects has been presented in Table 1. The mean energy intake of control group was 1592±477 kcal/day and 1433±530 kcal/day for sedentary activity at base line and after six months, respectively while for moderate activity the mean energy intake was 1862±337 kcal/day and 1779±213 kcal/day at baseline and after six months, respectively. The values for experimental group were 1547±391 kcal/day and 1688±407 kcal/day at baseline and after six months for sedentary activity while for moderate activity the mean energy was 1826±239 kcal/day and

1910±281 kcal/day, at baseline and after six months, respectively. Sachdeva *et al* (2011) [22] reported that energy intake of females HIV/AIDS patients was 1564.38 ± 322.1 kcal/ day.

The protein intake was 45.82±13.02 g/day and 44.65±11.17g/day at baseline and 42.90±13.73 g/day and 49±10.17 g/day after six months for control and experimental group, respectively.

No significant difference was found between energy intakes at baseline and after six months by both groups. But experimental group showed a significant improvement ($p<0.05$) in protein intake at six months while no significant difference was found in control group. A little improvement in dietary intake was observed in experimental group after diet counselling but lag behind to achieve desirable intake.

Table 1: Dietary intake of female subjects

	Control (n= 28)		t value	Experimental (n= 30)		t value
	Baseline	**6 months**		**Baseline**	**6 months**	
Energy (kcal/day)	1592±477	1433±531	1.96	1547±391	1688±407	0.85
Sedentary	(590-2391)	(365-2400)		(493-2069)	(280-2200)	
Moderate	1862±337	1779±213	0.98	1826±239	1910±281	2.10
	(1216-2691)	(1500-2085)		(1575-2313)	(1589-2486)	
Protein (gm/day)	45.82±13.02	42.90±13.73	1.52	44.65±11.17	49±10.17	2.53*
	(20-63.5)	(9-61)		(19 -61.5)	(10-63.5)	

Significant difference ($p< 0.05$) Values in box show mean ± SD (range)

Dietary intake of male subjects

Dietary intake of male subjects has been presented in Table 2. The mean energy intake of control group was 1905±509 kcal/day and 1917±321kcal/day for sedentary activity and 2044±498 kcal/day and 1727±574 kcal/day for moderate activity at baseline and after six months respectively. The corresponding values of energy for experimental group was 1910±425 kcal/day and 1976.5±344 kcal/day at baseline and 2042±410 kcal/day and 2208±337 kcal/day after six months, respectively. No significant difference was found in dietary intake of control and experimental group. Sachdeva *et al*. (2011) [22] reported that energy intake of males HIV/AIDS patients was 1783.68 ± 251.19 kcal/day.

The protein intake was 55.52±11.05 g/day and 53.8±11.12 g/day at baseline and 53.93±13.61 g/day and 57±11.39g/day after six months for control and experimental group respectively. No significant difference was found in protein intake of control and experimental group.

Table 2: Dietary intake of male subjects

	Control (n= 23)		t value	Experimental (n= 29)		t value
	Baseline	**6 months**		**Baseline**	**6 months**	
Energy (kcal/day) Sedentary	1905±509	1917±321	1.16	1910±425	1976.5±344	0.68
	(970-2657)	(1530-2560)		(1138-2617)	(1220-2600)	
Moderate	2044±498	1727±574	1.29	2042±410	2208±337	2.10
	(1266--2783)	(850--2876)		(1431-2893)	(1695-2715)	
Protein (gm/day)	55.52±11.05	53.8±11.12	0.70	53.93±13.61	57±11.39	1.42
	(34-80.5)	(39-79.5)		(29.5-88)	(35.5-80)	

Values in box shows mean ± SD (range)

Per cent dietary intake of RDA of female subjects

Per cent dietary intake of RDA of females subjects have been presented in Table 3. The per cent energy intake of RDA was 76.21 and 75.98 at baseline and 68.60 and 72.35 after six months by sedentary and moderate subjects of control group, respectively. The experimental group achieved 74.04 and 74.23 per cent energy of RDA at baseline and 80.77 and 77.68 per cent energy of RDA after six months RDA for sedentary and moderate subjects, respectively. Control group showed a negative deviation of 7.61 and 3.63 per cent from baseline by sedentary and moderate subjects, respectively while a positive deviation of 6.73 and 3.45 per cent of RDA was found at baseline by sedentary and moderate subjects of experimental group, respectively.

Protein intake was 35.29 and 32.82 per cent of RDA at baseline and 35.09 and 38.82 per cent of RDA after six months by control and experimental group respectively. Protein intake increased only 3.37 per cent by experimental group while decreased by 2.47 per cent by control group from baseline.

Bhowmik *et al*. (2012) [4] reported that per cent dietary intake of asymptomatic female HIV/AIDS patients were 64.25±19.46 and 69.23±26.08 for energy and protein respectively.

Table 3: Per cent dietary intake of RDA of female subjects

RDA for female	Control (n= 28)		Per cent deviation from baseline	Experimental (n= 30)		Per cent deviation from baseline
	Baseline	**6 month**		**Baseline**	**6 month**	
Energy Sedentary2090 kcal/day	76.21	68.60	-7.61	74.04	80.77	6.73
Moderate2460 kcal/day	75.98	72.35	-3.63	74.23	77.68	3.45
Protein80 gm/day	35.29	32.82	-2.47	35.09	38.82	3.37

Per cent dietary intake of RDA of male subjects

Per cent dietary intake of RDA of male subjects has been presented in Table 4. The per cent intake of energy of RDA was 74.65 and 68.10 at baseline and 70.91 and 65.44 after six

months by sedentary and moderate subjects of control group respectively. The experimental group achieved 74.84 and 68.02 per cent of energy of RDA at baseline and 77.4 and 73.58 per cent of energy of RDA after six months for sedentary and moderate subjects, respectively.

Table 4: Per cent dietary intake of RDA of male subjects

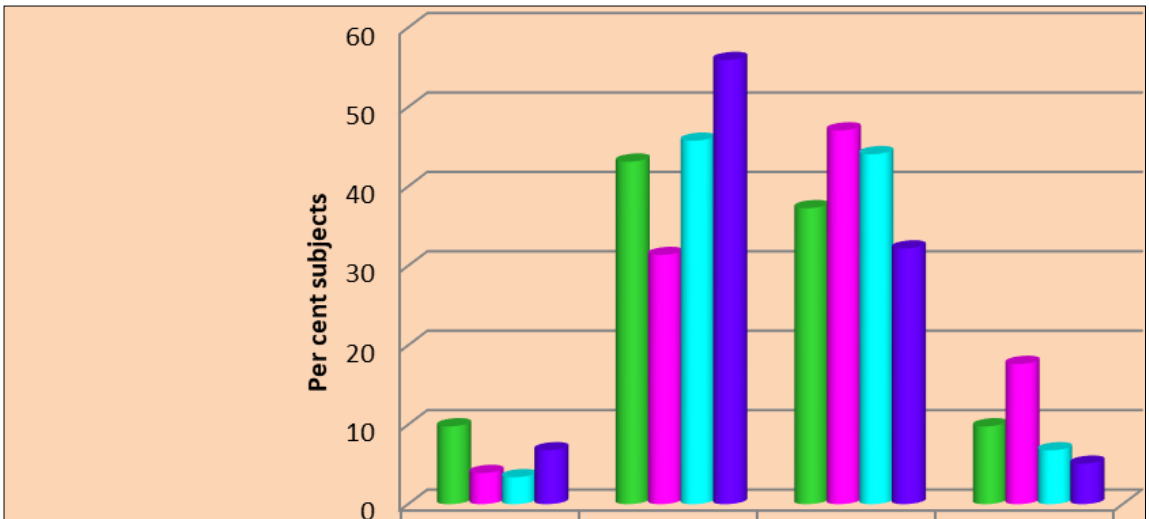
RDA for Male	Control (n= 23)		Per cent deviation from baseline	Experimental (n= 23)		Per cent deviation from baseline
	Baseline	6 month		Baseline	6 month	
Energy Sedentary 2552 kcal/day	74.65	70.91	-3.74	74.84	77.4	2.56
Moderate 3003 kcal/day	68.10	65.44	-2.66	68.02	73.58	5.78
Protein 100 gm/day	56.11	50.91	-5.2	52.67	60.63	7.96

Control group showed a negative deviation of 3.74 and 2.66 per cent from RDA at baseline by sedentary and moderate subjects, respectively while a positive deviation of 2.56 and 5.78 per cent of RDA was found from baseline by sedentary and moderate subjects of experimental group.

Protein intake was 56.11and 50.91 per cent of RDA at baseline and 52.67 and 60.63 per cent of RDA after six months by control and experimental group, respectively. Protein intake increased by 7.96 per cent by experimental group while decreased by 5.2 per cent by control group from baseline.

Adequacy of dietary intake

Distribution of subjects on the basis of per cent adequacy of energy and protein intake has been presented in Figure 1 and 2. In control group, 9.80 and 3.92 per cent subjects achieved >100 per cent of RDA of energy at baseline and after six months, respectively. A 43.13 and 31.37 per cent subjects achieved 75-100 per cent of RDA at baseline and after six months, respectively. Whereas, 37.27 and 47.06 per cent subjects achieved 50-75 per cent of RDA of energy at baseline and after six months, respectively (Figure 1).

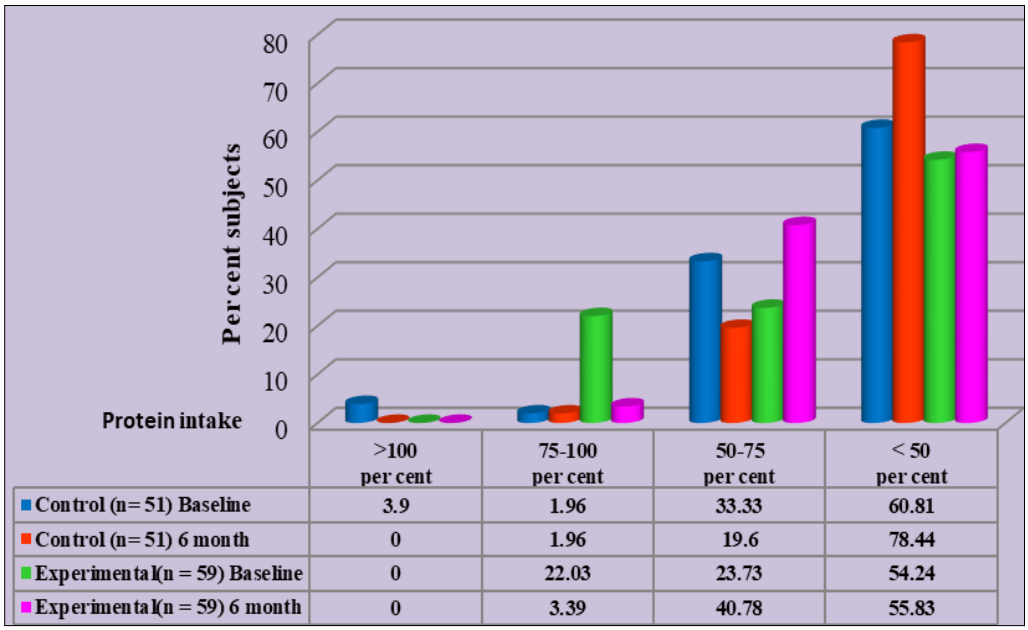


Energy intake	>100 per cent	75-100 per cent	50-75 per cent	< 50 per cent
Control (n= 51) Baseline	9.8	43.13	37.27	9.8
Control (n= 51) 6 month	3.92	31.37	47.06	17.65
Experimental(n= 59) Baseline	3.39	45.76	44.07	6.78
Experimental(n= 59) 6 month	6.78	55.93	32.2	5.09

Fig 1: Distribution of subjects on the basis of per cent adequacy of energy intake

A 5.80 and 17.65 per cent subjects achieved <50 per cent RDA of energy at baseline and after six months, respectively. In experimental group 3.39 and 6.78 per cent subjects achieved > 100 per cent of RDA of energy at baseline and after six months, respectively. Whereas, 45.76 and 55.93 per cent subjects achieved 75-100 per cent of RDA of energy at baseline and after six months, respectively. A 44.07 and 32.20 per cent subjects achieved 50-75 per cent of RDA of energy at baseline and after six months, respectively. While 6.78 and 5.09 per cent subjects achieved > 50 per cent of RDA of energy at baseline and after six months.

The adequacy of protein (Figure 2) intake shows that only 3.9 per cent of subjects of control group at baseline achieved >100 per cent of RDA of protein. A 1.96 per cent subjects achieved 75-100 per cent of RDA of protein each at baseline and after six months. A 33.33 and 19.6 per cent subjects achieved 50-75 per cent of RDA of protein at baseline and after six months, respectively. A 60.81 and 78.44 per cent subjects achieved < 50 per cent of RDA of protein at baseline and after six months, respectively. In experimental group 22.03 and 3.39 per cent subjects achieved 75-100 per cent of RDA of protein at baseline and after six months, respectively. Whereas 23.73 and 40.78 per cent subjects achieved 50-75 per cent of RDA of protein at baseline and after six months, respectively. A 54.24 and 55.83 per cent subjects achieved < 50 per cent of RDA of protein at baseline and after six months, respectively.



Protein intake	>100 per cent	75-100 per cent	50-75 per cent	< 50 per cent
Control (n= 51) Baseline	3.9	1.96	33.33	60.81
Control (n= 51) 6 month	0	1.96	19.6	78.44
Experimental(n = 59) Baseline	0	22.03	23.73	54.24
Experimental(n = 59) 6 month	0	3.39	40.78	55.83

Fig 2: Distribution of subjects on the basis of per cent adequacy of protein intake

The energy and protein intakes have been found to be grossly inadequate in the subjects whose energy requirements are typically adjusted upward of values for healthy adults by 10 % (FANTA and RCQHC 2003) [11] to meet the energy demand for increased metabolic rate, mal-absorption and metabolic aberrations observed in HIV-positive adults at different disease. Sachdeva *et al.* (2011) [22] reported a significant difference in the mean calories taken with the standard calories required (P<0.001) by people living with HIV/AIDS and considered that low socio-economic status and poor income can limit access to adequate dietary intake. Macallan*et al*. (1995) [10] concluded that reduced energy intake, rather than elevated energy expenditure, is the prime determinant of HIV-associated weight loss. Dworkin *et al.* (1990) assessed the potential role of dietary intake in the development and persistence of malnutrition in patients with HIV and AIDS and found that 88 per cent patients were ingesting less than 50 per cent of the RDA for at least one nutrient. Kim *et al.* (2001) [15] performed a cross-sectional study of 633 subjects in Boston and Rhode Island to determine the correlates of inadequate dietary intake among HIV-infected adults, and found that inadequate energy intake occurred in 38 per cent of this population.

Jones *et al.* (2003) [14] stated that in resource-limited environments, the effect of counselling may be limited by the availability of food and found that macronutrient supplementation would be the best approach. For supplementation Bakeine *et al*. (1997) [3] found corn and soy flour porridge effective where as other found ready to eat therapeutic feeds and food supplementation (Sadler *et al*., 2008; Sandig *et al*., 2004; Bowie *et al*., 2005 and Ndekha *et al*., 2005) [20].

Conclusion

The subjects of the present study belong to lowersocio-economical group with low education level and most of them are engaged in unskilled job. Nutrition education showed to have insignificant difference in energy and protein intake of subjects except in the protein intake of female subjects of experimental group where significant (p<0.05) improvement was found. Effective management of the disease should include compulsory diet counselling, nutritional supplementation and financial assistance along with antiretroviral therapy.

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