Nutrition Intervention for Women Living with HIV

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Abstract

Since the start of the global HIV epidemic, in many regions, women have remained at a much higher risk of HIV infection than men. Young women and adolescent girls in particular, account for a disproportionate number of new HIV infections among young people living with HIV. HIV/AIDS is the leading cause of death among women of reproductive age. Nutritional status is an important determinant of HIV outcomes. In the present study, Hundred and seven (N=107) HIV positive women living in resource poor settings of Mumbai were selected through six NGO run-community care centers and one ART center using purposive sampling technique. The participants were followed up for a period of eleven months during which two types of nutrition interventions were received by them. They were Diet counseling (DC Group) Diet counseling and Supplementary Nutrition (DCSN Group).The impact of intervention on nutritional status was evaluated using anthropometrical, biochemical, clinical and dietary assessment methods. Both the groups showed improvement in all the parameters like macronutrient and micronutrient intake, anthropometric measurements. CD^4 count, an indicator of immunity status too showed an increase. However, the improvement was significant in the group that received supplementation as well as diet counseling. The DCSN group received the dual benefit hence the improvement was significant. The study recommends a strong need for diet and nutrition counseling along with provision of macro and micro nutrient dense locally prepared nutritious supplements to women living with HIV from poor families.

KEYWORDS-Women and HIV, nutritional status, intervention, supplementation, diet counseling, anthropometric parameters, dietary practices, CD4 count

Introduction

AIDS (Acquired Immune Deficiency Syndrome) is a fatal illness caused by a retrovirus known as Human Immuno deficiency Virus (HIV) which breaks down the body's immune system, leaving the victim to a host of life threatening opportunistic infections, neurological disorders, or unusual malignancies(Piwoz and Preble,2000). Out of the total number of adults living with HIV and AIDS in India 38 percent are women (AVERT.org, HIV statistics, 2011). The health of Incidence of AIDS is rising in women six times as fast as men. Maharashtra is one of the hard-hit states in India, as far as HIV and AIDS are concerned. HIV progressively weakens the immune system and results in malnutrition; in turn, malnutrition worsens the effect of HIV and contributes to more rapid progression to AIDS. The cellular effects of malnutrition on the immune system are similar to those of HIV and include reduction in CD4 T cell count.Nutrition and HIV are thus linked.

Nutrition support programs may need to address this by encouraging increases in food intakes. Recommendations have been made to integrate nutrition into the essential

package of care, treatment and support for people living with HIV/AIDS (Segal-Issacson et al, 2006). However, effective interventions to achieve this are still lacking. Planning and execution of such programs require baseline information on the nutritional status of the patients. But such information is sparsely available on Indian HIV/AIDS patients due to which there is a dearth of nutritional recommendations for PLHAs especially for women.

In the light of above rationale, the present study was undertaken to assess the impact of nutrition education and supplementation on the nutritional status of women with HIV/AIDS from resource poor setting. The data generated in this context would enable planning of dietary management strategies for the patients based on their current social, economic and family situation. These strategies could be used to strengthen the efforts of government and non government organizations towards the betterment of the focus group (patients of HIV/AIDS).

Methods

Sample Size, Characteristics & Sampling Technique

One hundred and seventy women (N=170) living with HIV/AIDS in the age group of 15-49 years, from resource poor settings were selected from 7 centers mentioned i.e. one ART center and six Community Care Centers run by NGOs situated in Mumbai and Thane using purposive sampling technique Informed written consent letters were obtained by all participants and the study was approved by an independent ethics committee.

Research Tools and Techniques

Anthropometric measurements, [Height, Weight ,Mid Upper Arm circumference (MUAC), Triceps skin fold thickness (SFT), Waist and Hip circumference, Ideal Body weight, Waist /Hip ratio, Body Mass Index, (BMI) Mid Upper Arm Muscle Circumference (MAMC) and Upper Arm Muscle Area (UAMA)]; biochemical test report for immunity status(CD4 count) ; Body composition parameters (Fat%, muscle mass%, water % and bone%);Nutrient intakes (Energy, protein, fat, carbohydrates, calcium, iron, zinc, vitamin A and vitamin C), and overall dietary patterns (no. of meals, menu, frequency, quantity and quality of different food items under different food groups) were assessed. Interview schedules were used to obtain relevant information from the participants.

Based on the data collected, plans were made for suitable nutrition intervention along with an action oriented individualistic diet. Two types of interventions used were:

Dietary Counseling

The strategy of nutrition counseling was based on behavior modification. A counseling guide was prepared by the researcher after an extensive review of literature published on dietary counseling for PLHA, past experience of the researcher as trainer in Nutrition for HIV/AIDS for HIV counselors and interactions with WLHAs during the pilot study. It was used for imparting diet counseling tips as per different conditions/symptoms/complications
that PLHA usually face. It was used during every visit. Participants were imparted nutrition education with help of pictures, food ingredients, photos, flipbook etc.

A. Supplementation-

Three types of High Energy High Protein supplements were prepared using locally available low cost ingredients.Nutrient content of

powders was calculated using Food Composition Tables (Gopalan et al, 2010) and were also analyzed using suitable techniques for accuracy. Supplement powders were freshly prepared before each follow-up visit and were distributed after testing for microbial safety. All participants were properly orientated towards storage and preparation of powders before consumption. A standard spoon of 15 grams capacity (1 Tablespoon) was given to all participants.67 participants (62.6%) received 2 kg of supplement powder each month in addition to diet counseling. (DCSN group).The mean calorie and protein content in 60 grams portion (the average amount consumed by each participant per day throughout 9-month period of food supplementation) of the supplement ranged between 232-241Kcal and 10.5 to 12.8grams protein respectively. The nutrient content of the recipes was kept similar as far as possible.

Study Design

Baseline data collection of 170 participants was followed by 11-month intervention period that was divided into 4 sub-phases or follow-ups.107 (62.9%) participants completed the study period (Table 1). During these phases, diet counseling and supplementation trials were carried out. All the participants were imparted nutrition education through diet counseling for a period of 2 months and then they were divided into two groups. The entire study including a pilot project was conducted from March 2010 to March 2012.

Table 1 Follow-up detail with type of intervention.

Follow-up No.	Period from baseline	Type of Intervention		No. of subjects according to type of intervention.	
		Diet counselling (D.C.)	Food Supplement (S.N)	Only diet Counseling (D.C.)	Diet counseling with supplementary nutrition (D.C.S.N.)
F1	2 months	√	X	N=107 (all)	----
F2	5months	√	√	N= 40	N= 67
F3	8months	√	√		
F4	11months	√	√	(37.4%)	(62.6%)

The participants were divided into two groups, control and experimental. The control group (n=40; 37.4%) received only diet counseling throughout the trial whereas all the others (n=67; 62.6%) received diet counseling along with food supplementation. These groups were referred to as DC and DCSN groups respectively**.** Among the participants who completed the study a large majority 79.4 %(n=85) were on ART, comprising 62.5 %(n=25) of DC and 89.6 %(n=60) of DCSN group respectively whereas 15(37.5%) from DC and 7(10.4%) from DCSN group respectively were not on ART. (Fig 1)

Discussion

Dietary patterns and food habits

Some of the observations regarding dietary modification made by the participants of the present study are discussed below.

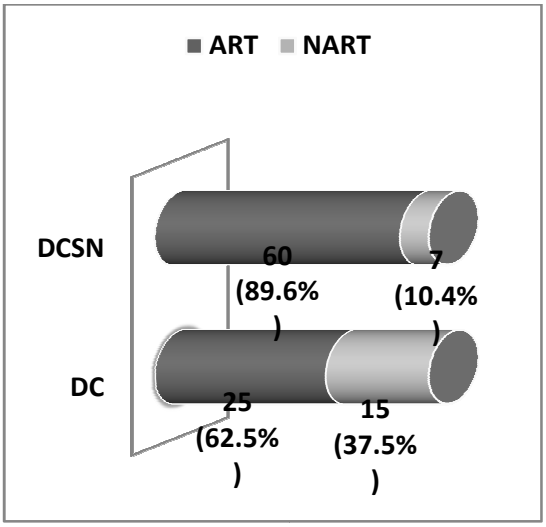

Fig. 1.Distribution of subjects –Type of intervention and ART/NART wise.

Major meals-

By end of first follow-up 16 (15%) participants reported introducing one more small meal in their diet in the form of breakfast or morning/evening snacks. By the end of intervention period (4th follow-up)this percentage increased to 44.9%(n=48) with significantly higher percentage belonging to NART group.(P=.038) (ART n=35,41.2%;NART n=13,59.1%).Those not on ART were motivated to improve their health status and thereby preventing themselves from depending on life-long antiretroviral therapy which is known to have several side effects. Type of intervention wise by end of 4th follow up19 participants among DC group (47.5%) and 29 participants (43.3%) from DCSN group made this kind of modification. However, there was no significant difference between the groups. Continuous ongoing counseling played a major role in these modifications.

Change in Menu

After the first follow up itself 28 (26.2%) subjects reported making changes in type of food consumed. A significantly higher number of participants belonged to ART group (n=26, 30.6%) in comparison with those not on ART (n=2, 9.1%). Participants on ART had more symptoms like indigestion, acidity, bloating, diarrhoea, nausea which affected their food intake. Certain suggestions given to them during follow-up meetings regarding modification of food helped them as reported by many participants. By end of 4th follow up the number that reported altering their menu as per diet counselling rose to 71 (66.4%) with 58(68.2%) and 13(59.1%) belonging to ART and NART groups respectively; 25(62.5%) and 46(68.7%) belonged to DC and DCSN group. No significant differences were observed among groups.

Modification in quantity of food

On the basis of their 24-hour recall and FFQ, participants were encouraged to increase quantity of available vegetables like spinach, fenugreek leaves, amaranth leaves , drumstick leaves, pumpkin; fruits like banana, guava, papaya, cereals like ragiandbajra, pulses and nuts, oilseeds and milk/curd/buttermilk/eggs/flesh foods to some extent. By 2nd follow-up 45 (42.1%) participants (37 on ART and 8 NART) reported an increase in the quantity of foods they consumed. Majority of them (84.1%) also made attempts to get maximum nutritional benefits simply by modifying the quantity of foods in their diet by end of the intervention period.

The frequency of consumption of almost all foods especially cereals, pulses, fruits and vegetables steadily increased by 4th follow-up for the majority of the participants. (66.3%). 30.6 percent of the participants on ART made significant changes by the 4th follow up in their diet compared to the baseline especially for the consumption of vegetables and fruits. (Pearson chi square P value =0.032). A

significant difference was also observed among DC and DCSN group in frequency of consumption of fruits, nuts and oilseeds consumption with frequency being higher for DCSN group probably due to higher motivational level among them.(P=0.04).

Dietary nutrient intakes

In the present study, intake of all nutrients increased in both the groups from baseline after intervention with higher intakes among participants belonging to DCSN group (Table 2). When compared with RDI (ICMR, 2010) actual intakes for all the nutrients were lower for the participants.

Table 2. Dietary nutrient intake of the participants (Mean, SD and Range)

Parameter	Baseline	FOLLOW-UPS			
		F1	F2	F3	F4
Energy (kcal)	1068±257 (278-1898)	1128±231 (345-1868)	1277±238 (757-1838)	1290±230 (726-1785)	1319±235 (753-1792)
Protein (gms)	31.8±6.7 (12.6-57.9)	33.0±6.3 (17.1-46.3)	37.1±6.3 (23.6-51.4)	36.6±6.1 (21.5-49.0)	37.8±5.1 (24.9-48.9)
Fat (gms)	19.6±5.9 (4.3-36.7)	19.1±5.2 (6.0-33.0)	21.5±4.1 (8.9-33.3)	22±4.5 (10.3-35.4)	21.5±4.0 (10.9-31.6)
CHO (gms)	191±54 (47-410)	205±49.4 (121-370)	234±52 (135-359)	236±50 (137-342)	244±52 (107-128)
Calcium (mgs)	196.4±119.5 (11-778)	175.9±69 (74-325)	219±75.1 (78.6-456.4)	230.8±93.3 (33.4-458)	240.1±83.6 (53.7-544.9)
Iron (mgs)	10.4±4.3 (3.4-22.4)	10.3±3.3 (3.4-22.3)	12.9±4.5 (4.6-24.9)	13.1±4.7 (4.6-26.8)	14.1±4.5 (5.5-30.7)
Zinc (mgs)	4.7±1.8 (1.8-12.4)	4.5±1.3 (2.6-10.4)	5.6±1.4 (2.6-12.6)	5.4±1.1 (2.9-8.3)	5.5±1.3 (2.4-9.9)
βcarotene(mgs)	678±808 (62-3784)	585±451 (78-2270)	679±433 (80-2564)	743±490 (120-3018)	736±394 (64-2369
Vit.C(mgs)	17.7±12.7 (1.6-71.1)	15.2±10.4 (1.6-71.1)	16.8±12.2 (4.2-91.6)	19.3±9.3 (3.3-56.7)	19.6±8.7 (4.7-69.8)

Table 3. Mean change in nutrient intake of the participants

Sr No	Nutrient	DC	DCSN	Sig(2- tailed)
1	Energy(Kcal)	+170.80	+298.92	P=0.001*
2	Protein(gms)	+4.05	+7.12	P=0.002*
3	Fat(gms)	+0.98	+2.44	P=.002*
4	Carbohydrates(gms)	+36.70	+62.11	P=0.003*
5	Calcium(mgs)	+31.33	+51.63	
6	Iron (mgs)	+3.02	+4.06	
7	Zinc(mgs)	+0.29	+1.05	P=0.014*
8	Vitamin A(mcg)	-1.26	+95.02	
9	Vitamin C(mg)	+1.44	+2.04	

*Significant.

Macronutrient consumption (Energy, Fat, Protein and Carbohydrates) was significantly higher among DCSN group possibly due to the consumption of supplement. Except zinc, there was no significant difference between the groups in the micronutrients intake. Consumption of zinc was significantlyhigher among DCSN group when compared with DC group (Table 3). The trace element zinc is essential for the immune system, and zincdeficiency affects multiple aspects of innate and adaptive immunity.

Anthropometrical assessment

All the anthropometric indices showed an improvement during intervention period. Anthropometric parameters increased for both the groups by the end of the study period but were significantly higher for DCSN group for weight, (at 3rd follow-up), especially arm anthropometry (MUAC, MAMC and UAMA), waist circumference and WHR**.** The supplement together with dietary counseling might have resulted in this positive difference. (Table 4). Average weight gain by end of the intervention period was 2.21kgs for DC group while for DCSN group it was 2.72kgs. (Fig 2).

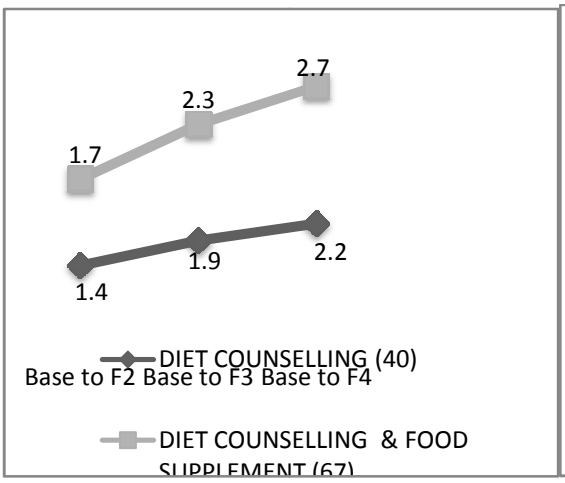

Fig. 2. Mean change in body weight during intervention trial.

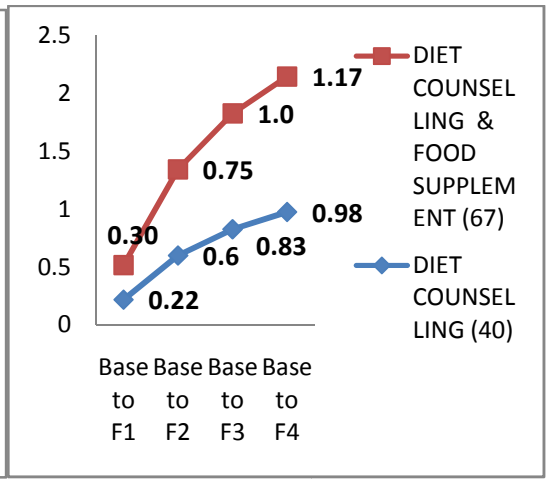

Fig. 3. Mean change in BMI of the participants during Intervention trial.

Prevention of weight loss could potentially have multiple benefits in terms of reducing mortality and morbidity, contributing to increased productivity and economic stability and perhaps improving response to ART. In a study, weight gain and weight maintenance was achieved in patients in the early stages (without secondary infection) who received a high energy ,high protein liquid foodsupplement daily along with nutrition counseling recommending a high protein diet and foods that minimize gastrointestinal complications. However, in participants who had already developed secondary infections, weight loss continued to occur despite supplements and nutrition counseling. (Stack et al, 1996).

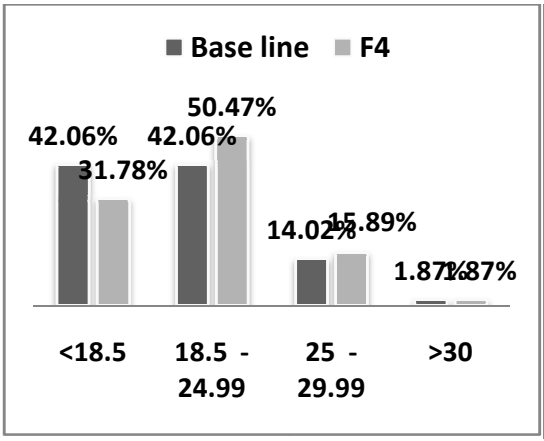

fig. 4.Classification of participants according to BMI from Baseline to final follow up (F4).

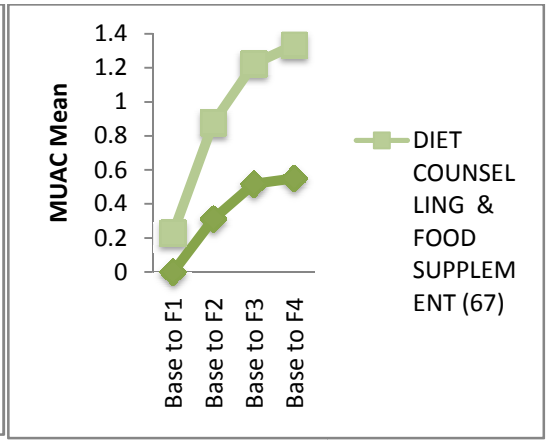

Fig. 5. Change in Mean MUAC (Baseline to F4)-Intervention wise.

Table 4. Anthropometric measurements at different follow-ups (Mean± SD and Range)

Parameter	Baseline	FOLLOW-UPS (F)			
		F1	F2	F3	F4
Weight (Kg)	45.9±9.7(30-74)	46.5±9.7(30-76.3)	47.5±9.7(31.5-76.0)	48.1±9.8(31.7-78.7)	48.5±10.0 (32.3-79)
Height (cm)	151.5±6.0(137-163)				
BMI	20±4.2 (13.2-30.8)	20.3±4.2 (13.6-31.8)	20.7±4.2 (13.7-31.8)	21.0±4.2 (13.4-32.9)	21.1±4.3 (13.1-33.7)
SFTmm	15.9±6.6 (4.0-32)	16.3±7.0(4.0-37.5)	16.5±7.1 (3.5-38.0)	16.6±7.1 (3.5-38.0)	16.7±7.2 (3.5-38)
MUAC cm	22.6±3.3 (17-32)	22.8±3.3 (16.5-32)	23.1±3.4 (16.5-32.5)	23.3±3.3 (17-32.5)	23.3±3.4 (17.0-33.0)
MAMC cm	17.6±2.0 (14.1-22.7)	17.7±1.9 (13.9-22.8)	17.9±1.9 (14.1-23.0)	18.1±2.0 (14.2-23.0)	18.1±1.9 (14.6-22.8)
UAMA cm	24.6±5.8 (15.4-40.4)	24.7±5.6 (14.9-41.0)	25.4±5.6 (15.3-41.7)	25.8±5.8 (15.6-41.6)	25.8±5.7 (16.4-41.0)
Waist cir cm	71.9±9.8 (56-98)	72.3±9.8 (56.5-98.0)	73.1±9.7 (57.0-98.0)	73.9±9.5 (57.5-97.0)	74.5±9.7 (56.5-97.0)
Hip cir cm	88.1±8.7 (73-117)	88.5±8.8 (73.0-117.0)	89.0±8.9 (73.0-118.0)	89.4±9.0 (73.0-119.0)	89.7±9.2 (73.5-120.0)
WHR cm	.82±.07 (.7-1.0)	.82±0.06 (0.7-0.96)	.82±0.06 (0.70-0.98)	.83±0.06 (0.71-0.99)	.83±0.06 (0.7-1.0)

When body mass index (BMI) of participants was compared pre and post Intervention trial it was observed that the number of severely malnourished HIV positive women (BMI, <18.5) reduced from 42.1% (n=45) to 31.8% (n=34) while number of participants belonging to 'normal category' increased from 42.1 %(n= 45) to 50.1% (n=54). Improvement in BMI was seen among both the groups with an increment being more prominent

among DCSN group. A large number of participants still had a low BMI It is, therefore, important to maintain a healthy body weight. In the present study participants were encouraged to undertake some form of exercise and maintain optimal nutrition intake to achieve a healthy weight and maintain lean body mass. In all the access centres yoga sessions were organized for the participants.

Table 5. Mean change in anthropometric parameters (Baseline to follow-up IV)

Sr No	Parameter	DC Grp (N=40)	DCSN Grp (N=67)	Sig(2- tailed)
1	Weight (Kg)	+2.21	+2.72	P=(0.049)(at F3)
2	BMI	+0.98	+1.17	
3	MUAC(cm)	+0.55	+0.78	P=0.037*
4	SFT(mm)	+1.04	+0.65	
5	MAMC	+0.22	+0.57	P=0.009*
6	UAMA	+0.69	+1.7	P=0.033*
7	Waist circum.(cm)	+2.05	+2.9	P=.019*
8	Hip Circum.(cm)	+1.56	+1.54	
9	Waist/Hip Ratio	+0.01	+0.02	P=.046*

*significant

Upper Arm Anthropometry

MUAC, SFT, MAMC and UAMA- All these parameters related to measurements of arm, Indicate muscle mass and fat reserves of body. Wasting and fat loss are two manifestations of malnutrition among PLHA. In the present study all these 4 parameters improved for both the groups after intervention.

Total body composition and other parameters

Studies on body composition have identified predominant loss of either muscle mass or fat mass during AIDS wasting(Klauke et al,2005).Body compositional changes observed in the present study, especially among participants on ART have been summarized below.

Body fat content increased from 24.0±6.7% at baseline to 25.3±7.0% at the end of the intervention period as a result of gain in weight. There was no significant difference between DCSN and DC group. (P=.234)

Muscle mass or body mass- There was a slight reduction in muscle mass from 34.5±3.0% at baseline to 34.1±3.1% at the end of F4.(Table 6). Muscle wasting is a feature of HIV related malnutrition. There was no significant difference between the groups. (Table 7).

Studies on body composition have identified predominant loss of either lean muscle mass or fat mass during HIV/AIDS related wasting. (Klauke et al, 2005)

Body water content-There was a slight reduction in body water content from 53.2±5.6% to 52.2±6.0 (Table 4.2.7) possibly due to increase in body weight. There was no significant difference in the mean values of change in body water content between the DE and DCSN groups. (P=.375)(Table 7)

Bone content. There was absolutely no change in bone mass which remained same from baseline (8.6±0.7%). (Table 6)Probably calcium supplementation with a regular

exercise regime may help HIV positive in increasing bone density.

Table 6.Body composition and other parameters at different phases of intervention (Mean± SD and Range).

Parameter	Baseline	FOLLOW-UPS			
		F1	F2	F3	F4
Fat%	24.0±6.7 (13.2-42.9)	24.2±6.7 (12.9-42.7)	24.8±6.8 (12.3-42.9)	24.9±7.0 (12.5-44.3)	25.3±7.0 (12.8-45.7)
Water%	53.2±5.6 (36.9-61.6)	52.8±5.7 (37.6-62.0)	52.6±5.8 (37.2-62.1)	52.6±5.8 (35.7-62.0)	52.2±6.0 (34.3-61.8)
Muscle mass%	34.5±3.0 (22.8-38.9)	34.4±3.0 (25.5-39.9)	34.2±3.0 (24.5-39.0)	34.2±3.1 (22.8-39.1)	34.1±3.1 (22.7-38.9)
Bone %	8.6±0.7 (6.8-10.0)	8.6±.7 (6.8-10)	8.6±.7 (6.8-10)	8.6±.7 (6.8-10)	8.6±.7 (6.8-10)
BMR kcal	1219±79 (1089-1447)	1224±79 (1089-1466)	1232±79 (1102-1463)	1236±80 (1103-1485)	1239±81 (1108-1488)
Energy reqd	2413±155 (2157-2865)	2423±156 (2157-2902)	2439±157 (2181-2897)	2448±158 (2184-2940)	2454±160 (2194-2945)

Table 7. Mean change in body composition and other parameters.

(Baseline to follow-up IV)

Sr No	Parameter	DC Grp (N=40)	DCSN Grp (N=67)
1.	Body H2O%	-0.96	-0.93
2.	Body fat%	+1.26	+1.33
3.	Body Mass%	-0.34	-0.43
4.	Bone %	No Change	No Change
5.	BMR	+23	+26
6.	Energy required	+151	+174

Fig 6. Change in mean CD4 ART and NART wise.

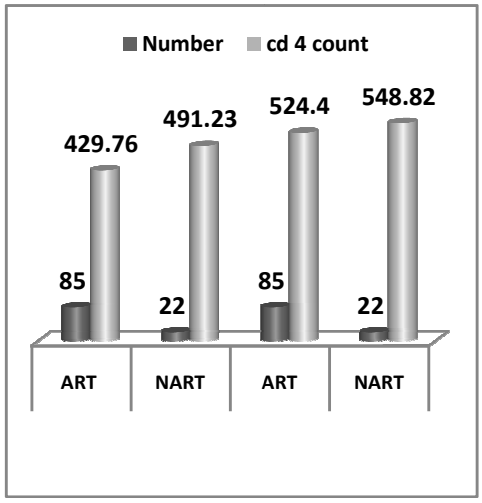

Table 8.Impact of Intervention on CD4 count(cells/µl) (DC and DCSN group)

CD4 Count	**Intervention**	**n**	**Mean±SD**
Prior to the study	Only diet counseling	40	463.5±184.6
	Diet counseling & food supplement	67	429.8±201.8
After 6 months	Only diet counseling	40	513.1±213.4
	Diet counseling & food supplement	67	539.2±212.0
After 11 months	Only diet counseling	40	49.6±170.6
	Diet counseling & food supplement	67	109.3±140.0

Immunity status

CD4 count is used as the major indicator of immune function in people with HIV infection. It is used to determine when to initiate ART and is the strongest predictor of disease progression. . (Dong and Imai, 2011). In India, it is generally monitored every six month. In the present study CD4 counts at the baseline and after six months of intervention were recorded. Impact of 2 types of interventions on CD4 count has been presented in Table 8. Participants who had the dual benefit of diet counseling and supplementation had shown significantly greater increase in their CD4count of (109 $\pm$ 140.02cells/µl) than those on diet counseling alone (49.62 $\pm$ 170.63; t=1.965, df=105, P= 0.026 1 tail).

Clinical signs and other symptoms.: - The observation of the participants for clinical signs indicated that more than one third (n=35, 37.5%) had clinical signs and symptoms for anemia like pale dull eyes, pale conjunctiva, pale skin and nails ,loss of hair and fatigue at the baseline. At the end of the study period 14 participants (12 from being DCSN group) reported being more energetic and showed improvement in the condition of skin, hair and nails. However, a sizeable number (n=43; 40.2%) continued to show clinical signs of iron deficiency anaemia which has been identified as predictors of faster disease progression and decreased survival. (Posener et al, 1993; Belperio and Rhew, 1985). Otherwise there was no significant improvement in clinical signs of nutritional deficiencies after the interventional study.

Summary and conclusion

The baseline data (N=170) showed that majority of participants had poor macro as well as micro nutrient intakes and subnormal body composition. The nutritional status of participants who completed the study (N=107) showed improvement in terms of their nutrient intakes and anthropometric measurements with the improvement being significant in DCSN group. Thus, the study indicated a strong need for nutrition education and provision of nutritious supplements to women from poor families living with HIV/AIDS and recommended that training in nutrition counseling should be compulsorily imparted to all counselors.

Change in CD4 values ART and NART wise- Fig 6 indicates increase in CD4 count for participants on ART as well as NART with a mean change being higher for participants on ART group (94.6Cells/µl)). However, there was no significant difference. In conclusion, it can be said that the nutrition interventions had a positive impact on the immunity status. Cantrell et al (2008) found improved adherence to ART among food – insecure patients provided macronutrients compared with that among patients who were not.

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