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Research Article

NUTRITIONAL STATUS OF PEOPLE LIVING WITH HIV/ACQUIRED IMMUNODEFICIENCY SYNDROME - A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: The objective of this study was to assess the nutritional status of people living with HIV and acquired immunodeficiency syndrome (PLHAs) on antiretroviral treatment (ART) and their knowledge with respect to role of nutrition in maintaining their health and to know the association of various factors with nutritional status and knowledge among PLHAs attending ART centers.

Methods: A cross-sectional study carried out at ART center of a tertiary care institution in Maharashtra. A total of 104 PLHAs who were started on ART for the 1st time and completed minimum 6 months of treatment and who gave consent were included in the study. Data were collected by personal interview technique after taking informed consent with the help of pre-tested, prevalidated questionnaire with predetermined scoring system along with anthropometric measurements and relevant investigations maintaining strict confidentiality. Those with <50% scores were marked as unsatisfactory and more than 50% as satisfactory. Data were entered into Excel Sheet and were analyzed with SPSS 17.1 software.

Results: In our study, 51.92% of the study participants were female, mean age was 38.5±9.6, 14.42% were illiterate, 32% had undergone primary education, and equally had secondary education. 16.35% were drivers and almost all were married (96.15%). Mean hemoglobin (Hb%) before and after ART was 10.45±2.13 and 10.64±2.16, while mean CD4 count before and after ART was 177.26±146.52 and 413.69±266.25, respectively, while post-ART mean body mass index (BMI) was 20.55±3.07. Majority (75%) were on ART for more than 12 months. Majority (65.38%) had unsatisfactory score with respect to overall knowledge regarding nutrition. 28.85% were underweight and 2.88% obese; while 17.31% were overweight and rest were normal. 46.15% were anemic. Statistical significant difference was noted among age, educational status, marital status, knowledge score, and anemia status with respect to BMI. Logistic regression with BMI as an outcome showed that age binary had some association. It means that there are 2.7 times odds of normal BMI in higher age group. Statistically significant difference was also noted in mean CD4 count before and after ART therapy. Regression analysis showed that CD4 count post-ART depends on pre-ART CD4 count, ART duration, and gender of the individual. With each unit increases in pre-ART CD4 and ART duration, there is increase of 0.44 and 4.5 units in after ART CD4. Post-ART CD4 count increased more among females compared to males in our study.

Conclusion: There exists a wide gap in PLHAs knowledge regarding nutritional aspects. The study also shows that good nutrition has good influence on CD4 count. PLHAs belonging to higher age 40 years, married, and educated, those who had better knowledge score and good Hb% had better nutrition. Therefore, there is an urgent need for nutritional interventions like frequent health educational sessions on nutrition to increase the knowledge of PLHAs can be emphasized during each follow-up visit at ART centers. There is a need to identify PLHAs with no or minimum nutritional support and provides nutritional supplementation, for which planning and policy section needs adequate research evidences from India.

Keywords: Nutrition, HIV/acquired immunodeficiency syndrome, Knowledge, CD4.

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INTRODUCTION

Wide-ranging serious health, economic, and social problems have been implicated by HIV/acquired immunodeficiency syndrome (AIDS) for people living with HIV/AIDS (PLHAs) worldwide.

Introduction of combination antiretroviral therapy (cART) which is referred to as highly active ART (HAART) in 1996 has dramatically changed the course of HIV infection. Under the national AIDS control program, free antiretroviral treatment (ART) began in 2004, given to all HIV patients with CD4 count <350 cells/ml. HAART sustainably suppresses viral replication, allowing recovery of the immune system. As a consequence, AIDS-associated mortality and morbidity declined after the widespread introduction of HAART [1]. For those who are motivated to take therapy antiretroviral therapy (ART) and who have access to lifelong treatment, AIDS-related illnesses are no longer the primary threat [2]. However, malnutrition remains a common problem for certain subgroups of HIV-infected population on HAART such as those diagnosed late in the course of the infection and those with failed or non-adherent antiretroviral regimens [3].

HAART interrupts the replication of HIV and results not only in clinical and immune function improvement but also rapid and significant weight gain provided that the diet contains adequate energy, protein, and micronutrients to enable nutritional recovery. On the other side, poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity [4]. Moreover, reduced body mass index (BMI) is still predictive of mortality even with antiretroviral treatment and highlights the value of appropriate nutritional monitoring and support in addition to antiretroviral medications. Furthermore, reduced food intake can reduce the efficacy of antiretroviral treatment regimens, as some drugs may not be properly absorbed or can cause significant side effects if not taken with adequate food. Adequate good quality food intake largely depends on the nutrition awareness level of PLHAs and socioeconomic factors. Results from studies among HIV-infected adults in Haiti, Kenya, Malawi, and Zambia have demonstrated significant positive effects of macronutrient supplementation and good diet on adherence to antiretroviral medication, weight gain, and CD4 counts [5-8]. Certainly, ART has become more readily available, but nutritional status and nutritional care have long been ignored among HIV/AIDS patients

despite the fact that malnutrition is frequently associated with the disease [9].

One of the important factors for impaired nutritional status is reduced food consumption both in terms of quantity or quality, and it may be a highly erosive "coping" strategy, as nutrient requirements rise following HIV infection. Literature available shows across the world AIDS-afflicted households do tend to incur high health-care expenditures and health-care costs specific to the person with AIDS, which accounted for almost 80% of the household health-care budget and an HIV/AIDS-related death significantly increased the probability of a household's falling below the poverty line [10].

Focus on improving nutrition status in HIV-infected patients is important because it optimizes existing immune system function, can help alleviate the burden of HIV-related complications, might reduce the overall cost of medical care, and improves the patient's quality of life [11]. Nutritional management is an essential but often neglected element in HIV care. Malnutrition not only worsens the HIV status and hastens progression to AIDS-related illnesses but also increases the chances of transmission to others particularly seen in parental to child transmission as shown in various studies [10]. Along with food insecurity, malnutrition may undermine adherence and response to ART, and exacerbate socioeconomic impacts of the virus. HIV infection itself weakens food security and compromises nutritional status by reducing work capacity and productivity, and jeopardizing household livelihoods [12]. As per the WHO also improved attention to diet and nutrition may enhance ART acceptability, adherence and effectiveness and directed countries to prepare for ART access through training on how to manage ARTs nutritional dimension [13].

Keeping in view the socioeconomic constraints particularly in resource limited settings like ours and much needed appropriate strategies for improving nutritional status; there is a need to carry out this study with the objective to assess the nutritional status of PLHAs on ART and their knowledge with respect to role of nutrition and their association with various factors if any..

METHODS

Study setting

This was a cross-sectional study carried out at ART center of a tertiary care institution in Maharashtra.

Inclusion criteria

a. PLHAs who were started on ART for the 1st time and completed minimum 6 months of treatment.
b. Those who gave consent for participating in the study.

Exclusion criteria

a. Those who were having opportunistic infections and treatment failure, treatment defaulter's cases.
b. Pregnant ladies.
c. Those who did not give consent for participating in the study.

Sampling

Sample size of 96 was calculated keeping the expected parameter (proportion of malnutrition and PLHAs with satisfactory knowledge) at 0.5 with acceptable deviation of 0.1 on either side of truth with 95% confidence interval. Sample was collected by means of systematic random sampling taking into consideration of number of PLHAs visiting per month to cover a sample of 104. Since all consented to be part of the study, they were included in the study.

Measurement tools

A questionnaire in local language was prepared consisting of baseline sociodemographic part, anthropometric part, certain investigations, and questions to assess the role of diet and important nutritional aspects which are important for PLHAs on ART. Accordingly, those who answered correct answers were given score 1 and wrong answers/nil answers as 0 were ever open-ended questions there marks were given as per the number of correct answers. The total score was calculated and those with <50% scores were marked as unsatisfactory and more than 50% as satisfactory. The questionnaire was pre-tested and prevalidated and data collected by personal interview technique after taking informed consent and confidentiality maintained by coding system.

Data analysis

Data were entered into Excel Sheet and were analyzed with SPSS 17.1 software.

Ethical considerations

The study was carried out after taking institutional ethical committee clearance, and informed consent was taken from the patients and confidentiality maintained.

Table 1: Sociodemographic variables of study participants

Variables	Frequency (%)	95% Conf. limits	
Age (years)			
<30	17 (16.35)	9.82	24.88
31–35	25 (24.04)	16.20	33.41
36–40	27 (25.96)	17.86	35.48
>40	35 (33.65)	24.68	43.58
Total	104 (100		
Sex			
Female	54 (51.92)	41.91	61.83
Male	50 (48.08)	38.17	58.09
Total	104 (100		
Education status			
Illiterate	15 (14.42)	8.30	22.67
Primary education	34 (32.69)	23.81	42.59
Secondary education	34 (32.69)	23.81	42.59
Intermediate	4 (3.85)	1.06	9.56
Graduate and above	17 (16.35)	9.82	24.88
Total	104 (100		
Occupation			
Driver	17 (16.35)	9.82	24.88
Farming	14 (13.46)	7.56	21.55
Service	4 (3.85)	1.06	9.56
Labor	24 (23.08)	15.38	32.36
Others	45 (43.27)	33.59	53.35
Residence			
Rural	35 (33.65)	24.68	43.58
Urban	69 (66.35)	56.42	75.32
Marital status			
Divorced	1 (0.96)	0.02	5.24
Married	100 (96.15)	90.44	98.94
Unmarried	3 (2.88)	0.60	8.20
Total	104 (100)		

Table 2: HIV positivity and art duration of study participants

Duration of HIV positivity (months)	Frequency (%)	95% CI	
<12	11 (10.58)	5.40	18.14
13–24	22 (21.15)	13.76	30.26
25–48	38 (36.54)	27.31	46.55
>48	33 (31.73)	22.95	41.58
Total	104 (100.00)		
Duration since ART started (months)			
<12	26 (25.00)	17.03	34.45
13–24	20 (19.23)	12.16	28.13
25–48	42 (40.38)	30.87	50.46
>48	16 (15.38)	9.06	23.78
Total	104 (100.00)		

ART: Antiretroviral treatment

Table 3: Knowledge score of study participants

Knowledge regarding Nutrition aspects	Frequency (%)	95% C.I	
Unsatisfactory score	73 (70.19)	60.43	78.77
Satisfactory score	31 (29.81)	21.23	39.57
Total	104 (100)		
Knowledge regarding general ways to stay healthy			
Unsatisfactory score	27 (25.96)	17.86	35.48
Satisfactory score	77 (74.04)	64.52	82.14
Total	104 (100)		
Overall knowledge score			
Unsatisfactory score	68 (65.38)	55.42	74.45
Satisfactory score	36 (34.62)	25.55	44.58
Total	104 (100)		

<50% scores were marked as unsatisfactory and more than 50% as satisfactory

Table 4: Nutritional status of study participants

BMI cat	Frequency (%)	95% CI	
Underweight	30 (28.85)	20.38	38.55
Normal	53 (50.96)	40.97	60.90
Overweight	18 (17.31)	10.59	25.97
Obesity	3 (2.88)	0.60	8.20
Total	104 (100.00)		
HB anemia cat			
Normal	56 (53.85)	43.80	63.67
Anemic			
Mild	11 (10.58)	5.40	18.14
Moderate	21 (20.19)	12.96	29.19
Severe	16 (15.38)	9.06	23.78
Total	48 (46.15)	36.33	56.20
Total	104 (100.00)		

CI: Confidence interval

Table 5: Association of BMI (underweight/normal) with related factors

Associated factors	Significance (p value)
Age	
Above/below 40	0.0057
Gender	
Male/female	0.4294
Residing area	
Urban/rural	0.4868
Educational status	
Primary/high school and above	0.0000
Working	
Driver/non-driver	0.3132
Marital status	
Yes/no	0.00001
Knowledge score	
Sat/Unsat	0.01083
ART duration	0.4557
Duration of HIV positivity	0.2085
Anemia	
Yes/no	0.0389

BMI: Body mass index

RESULTS

In our study, 51.92% of the study participants were female, mean age was 38.5±9.6, 14.42% were illiterate, 32% had undergone primary education, and equally had secondary education while 16.35% were graduate and above. 16.35% were drivers and only 3.85% were in government service, almost all were married (96.15%) as shown in Table 1.

Mean hemoglobin (Hb%) before and after ART was 10.45±2.13 and 10.64±2.16, while mean CD4 count before and after ART was 177.26±146.52 and 413.69±266.25, respectively, while mean after BMI was 20.55±3.07. 31% were HIV positive with <12 months duration while rest were 12 months. 25% were on ART since <12 months while rest were on ART for more than 12 months (Table 2). Majority (65.38%) had unsatisfactory score with respect to overall knowledge regarding nutrition (Table 3). 28.85% were underweight and 2.88% obese; while 17.31% were overweight and rest were normal. 46.15 % were anemic as per Table 4.

Statistical significant difference was noted among age, educational status, marital status, knowledge score, and anemia status with respect to BMI (Table 5). Logistic regression with BMI as an outcome showed that age binary had some association. It means that there are 2.7 times odds of normal BMI in higher age group.

Statistically significant difference was also noted in mean CD4 count before and after ART therapy (Table 6). Regression analysis showed that CD4 count post-ART depends on pre-ART CD4 count, ART duration, and gender of the individual. With each unit increases in pre-ART CD4 and ART duration, there is increase of 0.44 and 4.5 units in after ART CD4. Post-ART CD4 count increased more among females compared to males in our study.

DISCUSSION

Better nutritional status help PLHAs to remain healthy and strengthen the immune system, so as to have a significant impact in maintaining and improving clinical condition. Assessment of nutritional status in PLHAs is of paramount importance and will form basis to appropriately plan continuum of care for PLHAs and helps in monitoring efficacy of ART.

As per the study carried out by Sicotte *et al.* [14], on two West African cohorts, at baseline, low BMI was associated with low Hb levels and CD4 counts, while anemia was associated with low CD4 counts and more in females. While treatment contributed to early gains in BMI, Hb, and albumin in the first 6 months of treatment, initial improvements plateaued or subsided thereafter. Despite HAART, malnutrition persisted in both cohorts after 1 year, especially in those who were anemic, hypoalbuminemic or had a low BMI at baseline [14] which is similar to our study findings.

Anand and Puri[15], carried out a study among 400 PLHAs on ART in India, showed the mean BMI of the study sample was 19.73±3.55 kg/m^2 with around 40% having BMI <18.5 kg/m^2 while in our study 28.85% were underweight. The same study by Anand and Puri also showed that all anthropometric measurements were found to correlate positively and significantly with CD4 count ($p<0.05$). These findings are consistent with our study. Similarly, Sachdeva [16] in North India carried out a study among 100 PLHAs on ART and showed that the mean weight and BMI of the participants were 58.6±11.7 (range, 34–94) kg and 21.5±3.7 (range, 13.6–36.7) kg/m^2, respectively, which was more when compared our study (mean weight=51.31±9.39 with range from 28 to 75 and mean BMI=20.55±9.4 with range from 13.84 to 28.99).

While Thapa *et al.* [17] in Nepalese population showed that 19.93% of the PLHAs visiting the ART centers in Kathmandu valley were undernourished. Illiteracy, residence in care homes, CD4 cell count

Table 6: Association of CD4 counts before and after initiation of art

Variable	Observations	Mean	SE	SD	(95% Confidence interval)
CD4 count before ART	104	177.2692	14.36761	146.5214	148.7745–205.764
CD4 count after ART	104	413.6923	26.10875	266.2581	361.9118–465.4729

Paired t-test, Pr(|T|>|t|)=0.0000. SE: Standard error, SD: Standard deviation

<350 cells/mm^3, opportunistic infections, and illness at the WHO clinical stages III and IV were found to be significant predictors of undernutrition.

A study carried out by Hadgu *et al.* [18] in Ethiopia, the prevalence of undernutrition was 42.3% (95% confidence interval [CI]: 37.4%–47.3%). Of which 12% were severely undernourished and 10% and 20.3% belonged to moderate and mild undernutrition category, respectively. The prevalence of wasting was 75% (95% CI: 70.4%–79.2%). Severe wasting was observed in ~27% of respondents. In multivariate analysis, the same study also showed household food insecurity (adjusted odds ratio [AOR]=1.85; 95% CI 1.16, 2.86), inadequate dietary diversity (AOR=1.19; 95% CI 1.08, 1.75), anemia (AOR=1.67; 95% CI 1.05, 2.65), and absence of nutritional support (AOR=0.34, 95% CI 0.22, 0.54) were found to be independent predictors of undernutrition [18]. In comparison, our study showed only 28.85% undernutrition, and age, educational status, marital status, knowledge score, and anemia status had impact on BMI [Table 5].

As per our study with predetermined scoring system, although 74.04% had satisfactory score with respect to knowledge regarding general ways to say healthy, only 29.81% had satisfactory score with respect to knowledge regarding nutrition aspects with only 34.62% having overall satisfactory score. The overall knowledge score had statistically significant relation with BMI. All the above-quoted studies could not quantify the knowledge assessment among PLHAs.

Limitations

Our study being a cross-sectional in design does not allow us to generalize these results. Some important predictors such as household food insecurity, job insecurity, and data on nutrition intake were not considered in our study due to time constraints and feasibility in conducting interviews with huge number of patients attending ART center in a tertiary care hospital. Longitudinal follow-up/prospective design will give more information about predictors of malnutrition among PLHAs.

CONCLUSION

There exists a wide gap in PLHAs knowledge regarding nutritional aspects. The study also shows that good nutrition has good influence on CD4 count. PLHAs belonging to higher age 40 years, married, and educated, those who had better knowledge score and good Hb% had better nutrition. Therefore, there is an urgent need for nutritional interventions like frequent health educational sessions on nutrition to increase the knowledge of PLHAs can be emphasized during each follow-up visit at ART centers. There is a need to identify PLHAs with no or minimum nutritional support and provides nutritional supplementation, for which planning and policy section needs adequate research evidences from India.

AUTHOR'S CONTRIBUTION

Dr. RN Hiremath and Dr. Shailaja Patil were involved in planning, conducting, analysis, and manuscript preparation. Dr. AK Yadav was involved in methodological, analysis, and manuscript editing and corrections of the manuscript as per journal requirement.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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