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Original Article

Community Section

Quality of Life and Nutritional Status of People Living with HIV/AIDS (PLHA's) in Western Maharashtra-A Prospective Cohort Study

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ABSTRACT

Introduction: Decades ago HIV/AIDS epidemic was considered as unprecedented human catastrophe. With Anti-Retroviral Therapy (ART) services easily available and accessible to everyone, HIV/AIDS has become a chronically manageable illness wherein Nutritional status and Quality of Life (QOL) play a key role in long-term impact of ART on People Living with HIV/AIDs (PLHA's). Therefore, a study is needed to better understand the factors affecting them.

Aim: To assess the psychological component of QOL of PLHAs and their association with nutritional status, health satisfaction and socioeconomic factors at the end of one year and to recommend measures to improve the QOL based upon the findings of the study.

Materials and Methods: A prospective cohort study was carried out across two ART centres in western Maharashtra. PLHAs who were lately placed on ART and consented to participate were included in the study and followed up for one year. A total of 10 PLHAs were lost to follow-up and finally 249 were included in the analysis. Data were collected by means of pre-validated, pre-tested questionnaire with relevant investigations and anthropometric measurements.

Results: With respect to nutritional status, 107 (43%) were having under-nutrition at the baseline and 84 (33.7%) at the end of one year in spite of free ART. Anaemia was found among 179 (71.9%) participants at baseline and 159 (63.9%) at the end of one year. Low albumin was seen among 39 (15.7%) participants at the baseline and similar number of them were at the end of one year. Dietary intake was inadequate among 178 (71.5%) participants. Forty (16.1%) participants had excellent QOL, 82 (32.9%) still had poor QOL in spite of free ART being given for one year. There was no significant difference in the health status before and after one year of ART among 180 (72.3%) participants.

Female sex deteriorated income status, deteriorated BMI status, deteriorated anaemic status, deteriorated CD4 count, after health status less than five, diet inadequacy were significantly associated with poor QOL. On multiple logistic regression model, female sex was 2.4 times (p=0.014) and deteriorated BMI/undernutrition was 3.6 times (p<0.001) more associated with poor QOL and were statistically significant.

Conclusion: Immediate measures need to be directed to improve nutritional status in PLHA's by giving nutritional support (food security), job security, income security along with free ART in order to have excellent QOL as compared to providing free ART alone.

Keywords: Anti-retroviral therapy, Food security, Job security, Malnutrition

INTRODUCTION

As per National AIDS Control Organisation (NACO) 2017 Annual report, the total number of PLHAs in India has been estimated at 21.17 lacs (17.11-26.49) in 2015, and 9.97 lakhs are already placed on ART untill September 2017 [1]. With the changing landscape of HIV/AIDS and ongoing research, the initiation of ART had undergone regular revisions with ART being started at CD4 count of 350, then 500 and finally with the latest WHO 2016 and NACO 2017 guidelines, ART is started to all PLHAs irrespective of CD4 count, clinical stages, age or population [2].

HIV primarily target CD4 lymphocytes. Low CD4 counts increase the risk of Opportunistic Infections (OIs) and in turn increases the morbidity and mortality associated with HIV due to immune suppression. Morbidity and mortality rates increase as per clinical stages with the minimum at clinical Stage 1 and maximum through clinical Stage II, III and final IV with an increased rate of OIs. ART increases CD4 counts, reduce risk and improve survival of HIV infected people [3].

With ART services easily available and accessible to everyone, HIV/AIDS has now become a chronically manageable illness from an epidemic which was once considered an unprecedented human catastrophe decades ago. If ART is started at the right time, the immune system can be restored by means of effective viral suppression thereby, halting the progression and reducing the chances of OIs and thus enhancing both QOL and survival rate of PLHAs [4].

QOL achieved by PLHAs after initiation of treatment indicates how well the disease is managed over a period of time. QOL is, therefore, one of the most important healthcare indicators and is defined by WHO as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" [5]. QOL is a broader concept wherein various factors including socioeconomic factors, nutritional status, ART, CD4 count, perception of well-being, physical and psychological health, social relations and their relationship with the environment play an important role in maintaining an excellent QOL. Thus, various factors which contribute to QOL of PLHAs after initiation of ART need to be studied [5].

Nutritional Status Impact on QOL

The vicious cycle of malnutrition and HIV is well known. Poor nutritional status leads to an impaired immune system, which in turn increases the vulnerability to opportunistic infections leading to worsening of malnutrition, thereby ultimately affecting QOL. Good nutrition also has a good influence on CD4 count [6]. In a first-ever study carried out by Carvalho BD et al., in Europe, who investigated the association between QOL and nutritional status showed that

PLHAs on ART with low energy intake, undernutrition and increased waist circumference had poor QOL. Even socioeconomic factors such as age, gender, education level and current health problems also predicted QOL significantly (p<0.05) [7].

ART Impact on QOL

ART introduction has made tremendous impact on survival in PLHAs over the years. Oguntibeju OO, carried out the review of studies to see the relationship between ART and QOL of people living with HIV and AIDS that showed a strong positive association between improved with ART baring few studies which reported negatively [8].

Impact of Psychosocial Factors on QOL

Psychological and spiritual well-being measured by depression, hope, stress and anxiety among PLHAs has a huge impact on HIV symptoms and QOL as documented by various studies [9,10]. In view of HIV/AIDS now being a chronically manageable disease and Nutritional status, QOL being vital indicators for long-term impact of ART on PLHAs, the authors conducted a prospective cohort study with the objective to assess the psychological component of QOL of PLHAs and their association with nutritional status, health satisfaction and socioeconomic factors at the end of one year and to recommend measures to improve the QOL based upon the findings of the study.

MATERIALS AND METHODS

Study Setting

A prospective cohort study was carried out across two ART centres in western Maharashtra in October 2016, after taking permission from the BLDEA's University, Shri BM Patil Medical College Bijapur, Karnataka, India. PLHAs who were newly put on ART and consented to participate, formed a cohort and were followed up for one year. Data was collected by the researcher by means of personal interview at the start of ART and then after a duration of one year. PLHAs who were not on ART and those having opportunistic infections especially gastro-intestinal infections, clinically diagnosed "HIV wasting syndrome" and patients with co-morbid diseases including known diabetes mellitus, thyroid disease, malignancy, and co-infections, clinical stage III and IV were excluded which would act as confounding factors. Pregnant females were also excluded.

The sample size was calculated based on the 80% excellent QOL as per Ghana study [11], with precision of 5% and 95% Confidence Interval, worked out to be 246, plus 5% to cater for loss to follow-up, a sample size of 259 was taken and systematic sampling technique was used to collect the sample size from two ART centres based on the number of PLHAs newly initiated on ART.

Measurement Tools

Data were collected by means of a questionnaire consisting of the socio-demographic profile, clinical data, anthropometric measurements, and laboratory investigations, psychological aspects of WHOQOL-BREF [12] protocol which was pre-validated, pre-tested and approved. Additionally, to estimate PLHAs perception of state of health before and after one year of treatment, a scale wherein best imaginable health state marked as 100 and worst imaginable health state marked as 0 was used, with more than 50 points change before and after one year of start of ART was considered significant [13].

Laboratory investigations were carried out at the respective institutions as per NACO guidelines and anthropometric measurements were carried out by means of International Standards for Anthropometric Assessment (ISAA) [14]. Nutritional status of PLHAs was calculated based on the BMI categories with respect to Asians (BMI <18.5: Underweight, BMI 18.5-22.9: Normal, BMI 23-24.9: At risk (Overweight), BMI >25: Obese) With respect to dietary status, authors asked about weekly intake of fruits, green leafy vegetables, milk, eggs and monthly intake of chicken, fish and categorised the data by means of scoring system into adequate and inadequate diet. PLHAs having fruits, green leafy vegetables, milk, egg on less than three days per week gave a score of "0" for each item while eating on more than three days per week gave a score of "1" for each item. Similarly, PLHAs eating chicken and fish at least once per month gave a score of "1" while not eating at all or eating occasionally given score of "0". The total score of less than three marked as having "inadequate diet" and more than 3 marked as having "adequate diet". For e.g., a person eats fruits, green veg on four days (1+1=2) per week and milk, egg –two days per week (0+0=0), chicken, fish once per month (1+1=2 score), so now total score=2+0+2=4, since the total score is more than three, he has adequate diet. The basic principal is that PLHAs should have fruits, green vegs, milk, eggs at least on alternate days (more than three days per week) and chicken, fish at least a month so as to get good nutrition.

Each item in the QOL psychological domain had a five-point Likert's-type scale that best represented their opinion, based on their life over the previous two weeks. On the scale, one (1) indicated low and negative perceptions, whilst five (5) indicated high and positive perceptions, which denoted better QOL. Negatively worded items were reverse scored, and all scores were checked for appropriate range {between (1) and (5)}. Total QOL score was calculated by dividing the total of individual scores obtained in psychological domain divided by the total attainable score and then multiplied by 100 so that the percentage obtained would range from 0 to 100%. Individuals with <60% scores, 60-79%, ≥80% scores were graded as poor, good and excellent QOL respectively [11].

Ethical Considerations

The study was approved by Institutional Ethics Committee (Reg No 95/2014-15) and data was collected by means of informed consent and strict confidentiality was maintained throughout the study by means of coding system.

STATISTICAL ANALYSIS

Data were entered in Excel Sheet and analysed by means of STATA version 13/IC. Univariate and multivariate logistic regression analysis was carried out with poor QOL as exposure variable and age, sex, education, after one year change in job, income, CD4 count, BMI, Haemoglobin (Hb), albumin, perception of health status and dietary diversity were input variables to know the association. Non-parametric correlation was used to check for linearity among variables.

RESULTS

A total of 10 PLHAs were lost to follow-up and finally, 249 were included in the analysis. The mean age of the respondents was 43.00±10.97 years, majority 130 (52.2%) belonged to 36-50 years, both sex and both urban/rural areas had equal representation, 111 (44.6%) were educated up to second class and 51 (20.5%) were illiterate. No income was seen among 73 (29.3%) of participants while majority 82 (32.9%) had income less than 5000 per month. Unemployment was seen in 73 (29.3%) of participants and 94 (37.8%) were doing heavy work which included construction labour/agriculture labour. The demographic details are given in [Table/Fig-1].

When analysed with respect to various factors associated with nutritional status [Table/Fig-2], majority 227 (91.2%) were started on ART at the time of detection itself when the clinical condition was poor due to low CD4 count. Participants who had HIV positive children were 8 (3.2%) while 82 (32.9%) had their spouse positive. Almost all (90.4%) disclosed their HIV status in their home so that home care is not affected while only 0.4% disclosed their status outside fearing stigma and differentiation while interestingly 1.2% had not disclosed their status even to their spouses which were alarming.

One of the important factors affecting the nutritional aspects is dietary intake. Authors asked about weekly/monthly intake of fruits,

Age cat	Frequency	Percent
18-25 years	8	3.2%
26-35 years	55	22.1%
36-50 years	130	52.2%
50-60 years	37	14.9%
>60 years	19	7.6%
Sex	**Frequency**	**Percent**
Female	124	49.8%
Male	125	50.2%
Education	**Frequency**	**Percent**
Illiterate	51	20.5%
Primary	49	19.7%
Secondary	111	44.6%
College and above	38	15.3%
Income	**Frequency**	**Percent**
Zero	73	29.3%
<5000	82	32.9%
5001-10000	58	23.3%
10001-15000	18	7.2%
15001-20000	4	1.6%
>20000	14	5.6%
Occupation	**Frequency**	**Percent**
Heavy (Construction/agriculture)	94	37.8%
Salaried	24	9.6%
Business	24	9.6%
Unemployed	73	29.3%
Driver	16	6.4%
Others	18	7.2%
Living area	**Frequency**	**Percent**
Rural	143	57.4%
Urban	106	42.6%
Religion		
Hindu	242	97.2%
Muslim	7	2.8%
Marital status		
Married	168	67.5%
Separated	13	5.2%
Single	14	5.6%
Widow	54	21.7%
Type of family		
Joint	54	21.7%
Nuclear	195	78.3%
Total	249	100.0%

[Table/Fig-1]: Baseline characteristics of the study participants.

ART initiation	Frequency	Percent
At the time of detection	227	91.2%
<2 years of detection	3	1.2%
2-5 years of detection	11	4.4%
>5 years of detection	8	3.2%
PLHAs children HIV status (If any)	**Frequency**	**Percent**
Not applicable (No child less than 10 yrs)	239	96.0%
Negative	2	0.8%
Positive	8	3.2%
Spouse HIV status	**Frequency**	**Percent**
Not applicable (Single)	84	33.7%
Negative	83	33.3%
Positive	82	32.9%
Dietary intake*	**Frequency**	**Percent**
Inadequate	178	71.5%
Adequate	71	28.5%
Total	**249**	**100.0%**
Disclosure status		
Disclosure in home-yes	225	90.4%
Disclosure outside-yes	1	0.4%
Disclosure with spouse	**Frequency**	**Percent**
Not applicable (Single)	81	32.6%
No	3	1.2%
Yes	165	66.2%

[Table/Fig-2]: Factors associated with Nutritional status.
*Considering intake of fruits, green leafy vegetables, milk, eggs at least on 50% days in week and chicken, fish at least once a month

Variables	BMI Cat base Asians		BMI Cat after Asians	
	Frequency	Percent	Frequency	Percent
Underweight (BMI <18.5)	107	43.0%	84	33.7%
Normal (BMI 18.5-22.9)	73	29.3%	84	33.7%
At risk (Overweight), BMI 23-24.9	28	11.2%	34	13.7%
Obese (BMI >25)	41	16.5%	47	18.9%
Total	249	100.0%	249	100.0%

[Table/Fig-3]: Baseline and after one year Nutritional status of the study participants.

Variables	Baseline Hb		After one year Hb	
	Frequency	Percent	Frequency	Percent
Anaemia	179	71.9%	159	63.9%
Normal	70	28.1%	90	36.1%
Total	249	100.0%	249	100.0%
	Baseline albumin		After one year albumin	
Low albumin	39	15.7%	38	15.3%
Normal	210	84.3%	211	84.7%
Total	249	100.0%	249	100.0%

[Table/Fig-4]: Anaemia and low albumin status during one year.

green leafy vegetables, milk, chicken, eggs, fish and categorised the data by means of the scoring system. Authors found that majority 178 (71.5%) were taking inadequate diet considering the intake of fruits, green leafy vegetables, milk, eggs at least on 50% days in week and chicken, fish at least once a week [Table/Fig-2].

With respect to nutritional status, 107 (43%) were underweight at the baseline and 84 (33.7%) at the end of one-year in spite of free ART for one year. Interestingly, 47 (18.9%) were also obese at the end of one year indicating the positive effect of ART on the nutritional status of PLHAs [Table/Fig-3]. Anaemia was seen among 179 (71.9%) of participants at baseline while 159 (63.9%) at the end of one year and low albumin was seen among 39 (15.7%) at the baseline while the similar number of them were having low albumin at the end of the year [Table/Fig-4].

QOL based on the psychological component of WHO QOL questionnaire was excellent among 40 (16.1 %) and 82 (32.9%) still had poor QOL in spite of being given free ART for one year [Table/Fig-5]. When asked about the difference in the health status before and after ART for one year, 180 (72.3%) said there was no significant change compared to previous health status as determined by health satisfaction scale.

On univariate and multivariate logistic regression analysis, Female sex deteriorated/decreased/no income, deteriorated BMI/undernutrition, deteriorated Hb/Anaemic, after health status perception less than five, diet inadequacy were significantly associated with poor QOL. Female sex was 2.5 times (p=0.001),

QOL category	Frequency	Percent
Excellent	40	16.1%
Good	127	51.0%
Poor	82	32.9%
Total	249	100.0%
Before-after health status (difference)	**Frequency**	**Percent**
Less than 50	180	72.3%
More than 50	69	27.7%
Total	249	100.0%

[Table/Fig-5]: QOL and Health status (difference) after one year.

deteriorated BMI/undernutrition was 3.4 times (p<0.001) more associated with poor QOL and statistically significant. Authors also carried out gender-wise multiple regression model, which showed females of deteriorated BMI (p<0.009), deteriorated CD4 count (<0.001) and males with inadequate diet (0.003), deteriorated BMI (p<0.006) are statistically significantly associated with poor QOL compared to others [Table/Fig-6].

DISCUSSION

The viscous cycle of HIV and malnutrition is very well known. Various HIV-related factors and socio-demographic factors determine the nutritional status of PLHAs including the differences in their dietary pattern, their understanding on the disease processes, opportunistic infections, patient clinical stage, CD4 counts and ART adherence. The complex web of HIV, undernutrition, food insecurity, job security, income security and health status need to be understood and accordingly, measures need to be taken [15]. Moreover, better nutritional status and excellent QOL are need of the hour for every PLHAs. Monitoring nutritional status and QOL also helps us to visualise the effect of freely supplied ART on PLHAs. The present prospective study was aimed at these issues of nutritional status and QOL and various factors which affected QOL in-spite of free

Variable	No. of respondents (249)	All respondents						Female respondents			Male respondents		
		Univariate logistic regression			Multiple logistic regression			Multiple logistic regression			Multiple logistic regression		
		OR	p-value	95% CI	OR	p-value	95% CI	OR	p-value	95% CI	OR	p-value	95% CI
Gender													
Female	124	2.5	0.001	1.4-4.3	2.4	0.014	1.1-4.8						
Male (ref)*	125												
Age													
<45 yrs (ref)*	148												
>45 yrs	101	1.2	0.4	0.7-2.1									
Education													
Illiterate/primary	100	1.4	0.3	0.8-2.3									
Above secondary (ref)*	149												
Job change[&]													
Change/New/no job (ref)*	27												
Same job	222	1.8	0.2	0.7-4.7									
Income change													
Deteriorated/decrease/no income	110	2.6	0.001	1.5-4.4	1.7	0.3	0.8-3.3	1.2	0.7	0.5-2.9	3.7	0.03	1.2-11.9
Improved/Same (ref)*	139												
BMI change													
Deteriorated/undernutrtion	115	3.4	<0.001	1.9-5.8	3.6	<0.001	1.9-6.7	3	0.009	1.6-7.7	4.3	0.006	1.5-12.4
Improved/Same Normal (ref)*	134												
Hb change													
Deteriorated/Anaemic	160	1.8	0.04	1.02-3.3	1.8	0.06	0.9-3.6	1.7	0.2	0.8-4	2.5	0.1	0.8-7.4
Improved/Normal (ref)*	89												
Albumin change													
Deteriorated/Anaemic	35	1.07	0.8	0.5-2.2									
Improved/Normal (ref)*	214												
CD4 change[$]													
Deteriorated	183												
Improved/Same (ref)*	66	3.63	0.001	1.7-7.5	5.4	<0.001	2.4-12.4	6.3	<0.001	2.4-16.6	2.9	0.2	0.7-12.8
Dietary diversity													
Inadequate diet	178												
Adequate diet (ref)*	71	2	0.03	1.07-3.8	3.1	0.003	1.4-6.5	1.7	0.3	0.7-4.4	8.8	0.003	2.1-36.9
Health effect change													
Deteriorated/No change	180												
Significant change (ref)*	69	2.13	0.02	1.1-4.1	2.3	0.025	1.1-4.8	1.7	0.3	0.7-4.2	4.9	0.03	1.2-20.8

[Table/Fig-6]: Univariate and multivariate analysis of various variables with Poor QOL.
(ref)*: It is the reference, a baseline category against which odds ratios are calculated
p<0.05 statistically significant (underlined)
[&]Job change: Categorises the PLHAs who have changed, acquired New job, didn't have any job or continuing the same job as compared to baseline (before 12 months)
[$]CD4 change: Categorises the PLHAs who have deteriorated, improved or same CD4 counts as compared to baseline (before 12 months)

ART has been given for one year. The findings show the relationship between the changing variables before and after one year of ART with that of QOL.

In the present study, although there was a decrease in undernutrition rate from 43% (Baseline) to 33.7% (After one year), but still it was on the higher side. Same was true with anaemia status (71.9%- baseline and 63.9% at the end of one year). However, albumin status was the same as that of baseline (i.e., 15.7%) and inadequate diet was consumed by 71.5%. QOL (only psychological domain) was poor in 39.1% of the respondents while in a cross-sectional study carried out in eastern India by Anand D et al., the QOL profile of subjects indicates a moderate score in all domains of QOL with overall poor QOL [16]. There was not much difference in the QOL domain scores between males and females in this study while the present study showed females were significantly associated with poor QOL. Anand D et al., also showed that for the entire sample (males and females), BMI correlated positively and significantly with psychological domain ($p<0.05$) while in the present study participants with deteriorated BMI/undernutrition during one-year follow-up, were significantly associated with poor QOL ($p<0.001$). The study also showed as the CD4 count increased the QOL scores also increased similar to the present study. Similarly, Thapa R et al., also found out that BMI was significantly correlated with three domains of QOL (psychological, social and environmental) [15]. A study carried out by Borah DJ et al., in North-East India showed after 18 months of ART, there was a significant improvement of QOL. Initiation of ART, good adherence and continuing for a longer period, educational status, higher CD4 counts positively co-related with QOL [17]. In another study on PLHAs on second-line treatment, QOL was better when compared to those on first-line ART due to a better quality of care and access for them in the institution set-up [18].

Osei-Yeboah J et al., in a cross-sectional study carried out at Ghana, 79.75% and 8.86% presented with excellent and good overall QOL, respectively, whilst only 11.39% had their life negatively affected by HIV/AIDS as compared to the present study where 32.9% were having poor QOL which was quite high probably due to worsening or persistence of still high rate of undernutrition in-spite of taking ART for one year [11]. Their study also showed that patients' occupation and perception of health were associated with overall poor QOL which was similar to the present study wherein before and after perception of health status after one year of ART was significantly associated with poor QOL ($p=0.02$). Osei-Yeboah J et al., also observed that, with the exception of one, all the patients who had attained tertiary level education at the time of the study presented with excellent QOL, while the present authors could not find any statistically significant association with education and QOL. Their study also showed that the male participants presented with a poorer psychological QOL compared to the present study where female gender was having statistically significant association with poor QOL ($p=0.001$) probably because of reflection of a patriarchal society, where female gender inequality is high leading to much higher stigma and discrimination and abuse of a female living with HIV/AIDS. Female contributors also include unemployed, lower educational status, financial dependency and social bindings. Similar findings were also noticed by Manhas C showing female gender being more affected with poor QOL whereas a study by Folasire OF et al., did not find any significant difference in QOL scores between males and females living with HIV/AIDS in Nigeria [19,20].

Carvalho1 BD et al., in a cross-sectional study in Lisbon, Europe also showed findings similar to the present study where respondents with lower QOL scores were associated with inadequate energy intakes ($p<0.05$); even age, gender, education also predicted QOL significantly [7]. Surprisingly, only one patient was underweight out of the 51 studied. Haemoglobin (Hb) level was significantly correlated to psychological QOL (0.4, $p=0.027$) while the remaining biochemical biomarkers measured did not correlate significantly with QOL which were similar to the present study wherein deteriorated Hb status was significantly associated with Poor QOL ($p=0.04$).

Opportunistic infections, advanced stage of disease as in WHO Clinical Stage III and IV are also known to cause malnutrition independently and thus, affecting QOL. As per Thapa R et al., in a study carried out in Nepal, illiteracy, residents in care homes, CD4 cells count <350 cells/mm^3, OIs, and illness at WHO clinical stages III and IV were found to be significant predictors of undernutrition with 20% of PLHAs being undernourished [15]. The present study ruled out OIs and WHO clinical stages III and IV before the patients were selected to see the role of other factors on nutritional status as discussed.

Regarding CD4 count, with the decreasing count and increased chances of OIs, chances of getting malnutrition also increase and vice versa. In Thapa R et al., cross-sectional study, PLHAs with more than 350 cells/mm^3 were more well-nourished than PLHAs with ≤350 cells/mm^3 and recommended for longitudinal study which can better explain the relationship between CD4 count and nutritional status [15]. The present study is longitudinal in nature, showed the PLHAs with deteriorated CD4 counts are 3.63 times more vulnerable to under-nutrition then compared to increased CD4 after one year of ART ($p=0.001$).

LIMITATION

The study was carried out at two ART centres in a single place So, findings cannot be generalised. The nutritional status was not determined by 24 hours recall method nor food frequency method. So, the exact dietary intake was not calculated. Data on the only psychological component of WHO QOL was taken rather than all components of WHO QOL which would have given us elaborate QOL of PLHAs. Authors could not assess the food insecurity scale to quantify the food insecurity and its association with nutritional status and QOL among study participants. With respect to dietary status, the scoring system which categorised the data into the adequate and inadequate diet was developed specifically for the present study and needs to be validated by other researchers also.

CONCLUSION

QOL along with good nutritional status is the most important outcome for any long-term manageable disease. The present study showed PLHAs in the female gender, deteriorated income status, undernutrition status, anaemic status, CD4 counts, diet inadequacy during the course of one year, was significantly associated with poor QOL. So immediate measures need to be directed to improve nutritional status by giving nutritional support (food security), job security, income security along with free ART in order to have excellent QOL as compared to providing free ART alone.

The present study gives the baseline data, based on which further studies may be carried out to see the cost-effectiveness of nutritional support program implementation at the national level and select the appropriate nutritional technology.

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