ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

NUTRITIONAL RECOVERY AMONG MODERATELY MALNOURISHED ADULTS LIVING WITH HIV IN CLINICAL NUTRITIONAL CARE IN ADDIS ABABA

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A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH.

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List of Acronyms/Abbreviations

ART – Anti retroviral therapy

ARV – Anti retroviral drug

AIDS – Acquired immunodeficiency syndrome

BMI - Body mass index

FBP – Food by prescription

HIV – Human immunodeficiency virus

MAM – Moderate acute malnutrition

RUSF – Ready to use supplementary food

RUTF – Ready to use therapeutic food

SAM – Severe acute malnutrition

NACS – Nutritional assessment and counseling service

NP – Nutritional program

OVC – Orphan and vulnerable children

OIs – Opportunistic infections

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Abstract

Background: Infection with HIV is one of the greatest challenges to global health. HIV infected person needs extra calorie than non-infected of the same age group. Malnutrition and HIV/AIDS exacerbate one another. PLWHIV are prone to develop malnutrition and malnourished PLWHIV have rapid disease progression and increase risk of mortality. National Clinical Nutritional Care Program provides therapeutic and supplementary food along with nutritional assessment and counseling to malnourished HIV positive individuals. However, to the investigators' best knowledge no published research that examined the recovery rate of moderately malnourished adults living with HIV on nutritional care program and its determinants.

Objective: This study aimed to evaluate the nutritional outcomes and associated factors among moderately malnourished adults living with HIV who were in the treatment care plan of nutritional care program.

Method: A retrospective before after study design (without a control group) was employed. For this purpose, we used medical records (FBP registration book) from 41 health facilities in Addis Ababa. Individuals' weight, height and clinical signs measured at baseline data and at the end of the 3 month follow up was analyzed and compared. In addition, we interviewed 15 health care providers' to get their insight about the program and understand the possible reasons for recovery/failure of the nutritional supplementation program.

Result: A total of 383 classified and treated as moderately malnourished clients data were reviewed from 41 health facilities (30 health centers and 11 hospitals). More than half of the study population, 223(58.2%) were females with a median age of 36.6 years. Overall the majority 284(74.2%) gained weight, while 13.8% lost their weight and 46(12%) discharged with the same weight of admission. The analysis showed there was significant improvement in the mean BMI score from $17.4kg/m^2$ during admission and to discharge at $18.2kg/m^2$ (P-value <0.01) With 133 (34.7%) getting out of malnutrition (reaching a BMI $\geq18.5kg/m^2$), of those who recovered from under-nutrition 67.6% were treated in health centers while 32.3% were treated in hospitals (with recovery rate of 33% & 39.1% in health center and hospital respectively). Sharing of the product within the household, selling and patient dislike of the product was explained as a main reason for failure.

Conclusion: There was significant change in weight but reaching the intended BMI still questionable only a minority of patients achieved stated programmatic goals. Further study should include duration of treatment, exit criteria and associated factor. The findings revealed clients who were admitted to nutritional care program in hospitals & with symptomatic disease were more likely to recover at discharge compared to their counterparts who were admitted to health center and without symptomatic disease. More in-depth study is recommended to understand the reasons and replicate the positive experience of hospitals in health centers. Product quality especially the taste takes a part in nutritional failure so further research is also needed to evaluate and design a better product which is preferred by adults.

1. Introduction

1.1 Background

Maintaining health is a challenge without normal nutritional status. Individuals may lack these because of a number of reasons like illness. Human immune deficiency virus (HIV) is one of the factors that lead individuals to face malnutrition. Malnutrition is characterized by deficient, excess, or unbalanced nutrient intake. It is a major contributor to increased morbidity and mortality, decreased functional quality of life, prolonged duration of mechanical ventilation, increased length of hospital stay, and higher health care costs. Malnutrition and HIV/AIDS exacerbate one another (1).

One way of managing an illness is through provision of additional treatment. The treatment might be specific drug, supplementary treatment, or regulation of food. In the case of HIV, in addition to its Anti-Retroviral Therapy (ART), people who live with the virus need diet regulation. In some situation, food can be considered as treatment. The whole body system and specifically the level of individual's immunity system are determined by the nutritional status. Better nutritional status resulting in improved immune function, reduced mortality, and prolonged survival. However, malnutrition that exists with the virus continues to hinder positive health outcomes and end with deterioration. It is known that HIV infection also worsens malnutrition(2).

The Ethiopia Food by Prescription program, implemented by Save the Children US (SC US), USAID/Ethiopia, and the Ethiopian Ministry of Health since 2010, provides therapeutic and supplementary food along with nutritional assessment and counseling to malnourished HIV positive individuals. Implementation began in 2010, initially in 58 health facilities, and has been scaled up in each subsequent program year. Under this element of the program, adult HIV positive patients with moderate acute malnutrition (MAM) are provided with two sachets of RUSF daily for a maximum of three months. Those with severe acute malnutrition (SAM) are provided RUTF with four sachets daily for a maximum of six months (3).

1.2 Statement of the problem

A significant proportion of people living with HIV/AIDS in sub Saharan Africa are simultaneously affected by nutritional deficiencies. Cross-national population-based data suggest that the prevalence of mild and moderate malnutrition among adults living with HIV/AIDS is 15.4% and 10.3% respectively, in sub-Saharan Africa (4).

The prevalence of the overall malnutrition is 60.9% with mild and 22% moderate malnutrition as reported study done in the University of Gonder and 12.3% in Dilla University referral Hospital (27, 30).

People living with HIV (PLHIV) are prone to develop malnutrition and malnourished PLHIV have rapid disease progression and increased risk of mortality. Nutritional support with early initiation of ART have significant role to break this vicious circle of HIV and nutrition. In this regard several studies are focused on assessing recovery rate and benefit of nutritional support (3,5). But to the researcher knowledge there are no published studies specific in terms of stage of malnutrition (moderate). So, the aim of this study is to assess recovery rate and its associated factors among moderately malnutrition adults living with HIV/AIDS in clinical nutritional care program.

1.3 Rationale and significance of the study

About 70% of clients treated in food by prescription program are moderately malnourished. Addis Ababa is a region which reports a low recovery rate according to FBP (food by prescription program). A nationwide impact evaluation shows only 11.3% recovery including severely malnourished clients however little is known about its impact specific to moderate malnutrition.

Therefore the findings of this study will help for program improvement and provide baseline information for local planners and decision maker. It gives suggestion to stakeholders to evaluate their nutrition support based on this research finding. In addition it will fill the knowledge gap regarding moderate malnutrition recovery and related factors. This study will serve as preliminary study for further studies in the context of Ethiopia.

2. Literature review

2.1 Nutrition overview

Good nutrition is indispensable component of healthy life and access to healthy diet and optimum nutrition are important to good health. All moderate to severe illnesses cause a loss of body protein, mainly from skeletal muscle, and a fall in body weight. Among people living with HIV/AIDS, nutritional support is increasingly recognized as a critical part of the essential package of care, especially for patients in sub-Saharan Africa(2,3). As HIV becomes a chronic disease sufficient quantity, quality, nutritious and energy dense food is important to HIV infected patients(6).

According to World Health Organization, malnutrition is the cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions. If the required nutrients are not available in a correct proportion, we can say there is malnutrition. It is possible to be obese and to present malnutrition. Mostly individuals with malnutrition present low body weight (7). Underlying malnutrition continues to impede positive health outcomes, and HIV infection in turn worsens malnutrition. Programs delivering inputs that include nutrition assessment, counseling, therapeutic nutrition rehabilitation, and livelihood support to HIV positive adults and children are being scaled up globally (3).

Appropriate nutrition is important for maintaining health and healing. Critically ill patients are at high risk for malnutrition-related complications. Malnutrition has consequences that include increased morbidity and mortality, decreased functional quality of life, prolonged duration of mechanical ventilation, and increased length of hospital stay, all which contribute to higher health care costs. In hospitalized patients, malnutrition is a common problem affecting both adult and pediatric populations. 15–60% of hospitalized patients are developing malnutrition. Nutritional therapy in this setting requires maintenance of adequate calorie and protein intake to prevent muscle wasting and avoid overfeeding and complications associated with nutritional care (8).

2.2 HIV and Malnutrition

People living with HIV are prone to malnutrition for various reasons. Based on baseline assessments and regular reports the prevalence of moderate and severe malnutrition in PLHIV in Ethiopia is very high. Malnutrition affects HIV disease progression and treatment outcome. The risk of dying within three months of a start ARV is five times higher in patients with Severe Malnutrition and the risk for those with Moderate Malnutrition is three times(9).

Medicinal drugs can cause a nutrient deficiency by reducing appetite, inducing nausea or vomiting, by interfering with the intestinal uptake of specific nutrients or by preventing the proper action of essential nutrients at the tissues. Such actions can lead to serious deficiencies of vitamins and minerals. Patients on drugs known to have such effects must be closely monitored so that deficiencies can be corrected, especially if the drugs are taken for long periods(2).

 Nutrition and HIV work in a vicious cycle. The weakening of the immune system as a result of HIV can lead to malnutrition, and malnutrition weakens the immune system of HIV positive people, contributing to rapid progression to AIDS(8). Malnutrition in people living with HIV (PLHIV) persists as a major challenge to achieve the interventions that aimed at improving their quality of life, productivity and survival. At its advent, HIV was commonly referred to as ―slim disease,‖ underlining the presence of severe wasting. In addition, the rates of malnutrition among PLHIV appear to be relatively higher among clients residing in regions with poorer food security. The overarching goal of nutritional interventions is to prevent malnutrition and restore good nutritional status of malnourished PLHIV with a view to maintain their productivity and immune function capacities. These interventions also aim to improve adherence to treatment and potentially prolong the pre-ART stage. HIV infection is characterized by a long progressive decline in health, with periodic acute episodes of opportunistic infections (OIs) during advanced stages. Malnutrition resulting from weight loss has been associated with progressive functional impairment and reduced immune competence. HIV infection is accompanied by progressive nutrition alterations and other pathological changes. The risk of mortality and complications associated with malnutrition among PLHIV may be reduced if malnutrition is corrected and adequate nutrient intake is guaranteed(10).

2.3 Treatment out come

Reducing or eliminating malnutrition has the potential to significantly slow progression of disease, decrease its severity, and improve longevity. Early identification and treatment of under nutrition found to be cost effective. Additionally, patients who recovered through the addition of supplementary food experienced long-lasting positive effects on their health and nutrition status (3).

A study by Tufts University on the Impact and Cost-Effectiveness of Prescribed food in Ethiopia showed that there is good recovery for those clients who adhere to the support. Overall 84.33 %(1279/1517) of participants has increased BMI (in both sever & moderate cases). The intervention group gained on average 1.1 BMI points during treatment and of those who recovered in the intervention group, the median (IQR) of weight and BMI gain were 3.4 (2.1–4.2) g/kg/day and 4.5 (4.2–5.6) kg/m2 respectively for SAM patients (n=13), and 1.2(0.8–2.0) g/kg/day and 1.6 (1.1–2.4) kg/m2respectively for MAM patients (n=207)(3).

A study done in Tanzania also shows that Poor nutritional status at ART initiation and decreased nutritional status in the first 3 months of ART were strong independent predictors of mortality. The role of nutritional interventions as adjunct therapies to ART merits further investigation.(11)

A qualitative study conducted in Hawassa Referral Hospital suggest that the nutritional care and support services for people living with HIV are not well coordinated; focus mainly on monthly supplementation of antiretroviral drugs and occasional handouts of food. The need for provision of health education on antiretroviral drugs and nutrition, and placing emphasis on strategies aimed at improving the nutritional status of peoples living with HIV is underlined. Strengthening the initiatives of some organizations regarding sustainable income-generating activities was also recommended (31).

Other study conducted in Butajira hospital, southern Ethiopia also reported about the negative effect of nutritional support. There was also a significant negative association between RUTF with malnutrition. In this study individuals who were not taking RUTF were 82% times less likely to be malnourished than those who were taking RUTF (26).

However in most of the studies reviewed, effectiveness of nutritional program was assessed and shows positive outcome of nutritional support and there was significant weight gain, change in BMI and recovery. But quality of records in implementation sites, absence of control group and intention to treat were reported as a limitation (3,6,8,10,12,13). Concomitant and early initiation of food support (RUTF) with ART increases recovery and slows progression of HIV over time (3,14). A qualitative study in Kenya shows RUTF was intended to treat malnutrition in children so inappropriateness of the taste has contribute for low compliance of RUTF in adult HIV clients but it lacks correlation of results with client clinical information(15).

Ethiopia has the highest rates of malnutrition in Sub-Saharan Africa. The prevalence of malnutrition imposes significant impact on different sector of Ethiopia (16). The National response to the HIV epidemic has registered great achievements. HIV incidence is reduced to 0.03% and annual death is estimated to be around 41,000 (17).

2.4 Food by prescription program

The food by prescription program was established based on the understanding that a comprehensive set of nutrition interventions improves the outcomes of care, treatment and support of PLHIV. Thus, the FBP program's objective was to provide energy and nutrient-dense food products along with nutrition assessment, counseling and clean, safe water to PLHIV who were malnourished or at risk of malnutrition. Besides nutritional outcomes, other impacts such as increased uptake of antiretroviral (ARV) drugs, greater adherence to ARV drugs, lower rates of LTF and reduction of stigma were expected. The program was designed to reduce malnutrition among the most vulnerable groups, pregnant or postpartum mothers and malnourished adult PLHIV (16)

Ethiopian Food by Prescription program was funded by USAID, with Save the Children US as a technical implementing partner. Through the Ethiopian Federal Ministry of Health, the program targets a combined package of nutrition assessment, counseling, and support (NACS) to malnourished adults with HIV as well as orphans and vulnerable children (OVC). In addition, the program seeks to link participants to economic strengthening opportunities following their graduation from the program. Implementation began in 2010, initially in 58 health facilities, and has been scaled up in each subsequent program year. Program supports both adults and children's. Under this element of the program, adult HIV positive clients with moderate acute malnutrition (MAM) are provided with two sachets of RUSF (previously it was treated with RUTF) daily for a maximum of three months. Those with severe acute malnutrition (SAM) are provided with four sachets of RUTF daily for a maximum of six months(3).

The program is aligned with the national protocol for treatment of HIV, and used outcomes for individual participants at the time of program exit.

In food by prescription program clients are treated according to the protocol, the maximum stay is six month for severe cases and three for moderate cases. Client will discharge whatever the outcome after maximum stay. The client will discharge with one the following outcomes:

1. Graduated/Recovered —Participant reached a BMI of ≥18.5kg/m^2 for two consecutive visits with in three or six months, depending on nutritional status at baseline (MAM or SAM, respectively).

2. Non-response/Unrecovered —Participant did not reach a BMI of ≥18.5kg/m2 for two consecutive visits within three (MAM) or six (SAM) months.

3. Default —Participant did not reach a BMI of 18.5kg/m2 and dropped out of the program before the end of three (MAM) or six (SAM) months.

4. Died —Participant died during course of program participation, and death was documented by clinic staff in the register book.

5. Transferred out—Participant transferred out of the program at the clinic where they first enrolled (9).

2.5 Conceptual frame work
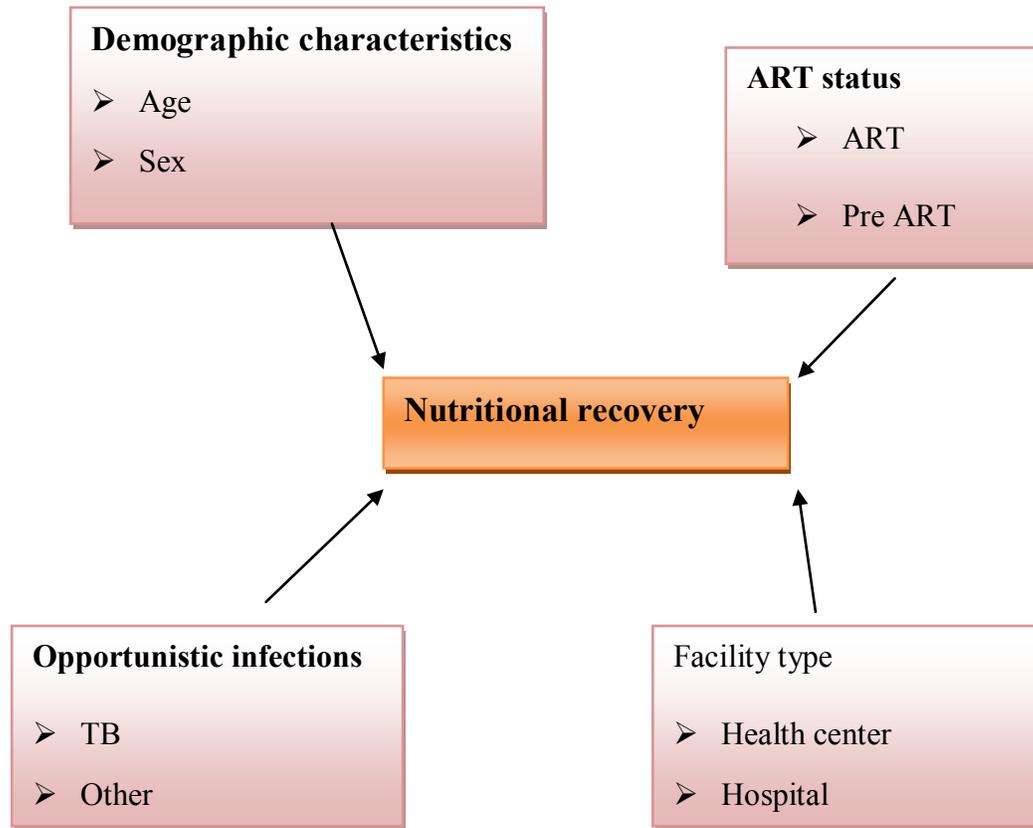
Figure 1: Conceptual frame work factors associated with nutritional recovery

3. Objectives

3.1 General objective

➢ To evaluate the nutritional outcomes of moderately malnourished adults living with HIV/AIDS admitted to nutritional care program in Addis Ababa.

3.2 Specific objectives

➢ To determine the rate of nutritional recovery of patients who were admitted in moderate malnutrition treatment.

➢ To identify factors associated with nutritional recovery of moderately malnourished Adults living with HIV in clinical nutritional care.

4. Methods and Materials

4.1 Study area

This study was conducted in Addis Ababa City Administration, which is the capital city of Ethiopia. The city comprises of 10 sub-cities and 116 districts with an area of 540 sq. km. According to 2007 population census, the city has 3,384,569 population. Addis Ababa is one of the regions where food by prescription program is implemented. Currently, 70 health facilities of which 16 hospitals (11 governmental, 4 private and 1 NGO) and 54 health centers (4 NGO and 50 governmental) have been providing the service.

4.2 Study design

A before after (pre-post) study design without a control group is a type of study design requires baseline data of the study participants' before the intervention took place (pre), and the same data after the intervention took place (post). This study design enables to look at one group of individuals who receive the intervention. The before after design allows us to make inferences on the effect of nutritional intervention by looking at the difference in the pre-intervention and post-intervention results(18). The base line data during admission to nutritional care and final outcome of program beneficiaries was analyzed and compared retrospectively. However, interpreting the pre and post intervention difference should be done with caution since it is difficult to be sure that the differences are causally related to the intervention.

For this purpose, service providers was interviewed to substantiate the findings and also to investigate important factors that affect the outcome (nutritional recovery).

4.3 Program description and study population

Food by Prescription provides food and nutritional support to malnourished HIV positive individuals in the form of therapeutic and supplementary food at health facility levels. An energy dense lipid based with high vitamin and minerals food was used to treat sever and moderate acute malnutrition. Namely, ready to use therapeutic food (RUTF) or plumpy nut and supplementary food (RUSF) or plumpy sup.

Based on the national guideline for nutritional care and support, nutritional assessment and counseling was given for all PLHIV who have visit in each health facility. An adult who's BMI < 18.5 kg/m^2 and having symptomatic disease regardless of BMI were enrolled in nutritional program (food by prescription). A BMI <18.5 kg/m^2 and ≥ 16kg/m^2 were classified as moderately malnourished and treated with RUSF. A BMI < 16 kg/m2 classified as severely malnourished and treated with RUTF. The maximum stay in the program for moderately malnourished clients was three months and it is six month for severe cases whether they were recovered or not. They were expected to reach a BMI of ≥ 18.5 kg/m2 (recovered) within the follow up period which is based on the experience in other countries.

The study populations were moderately malnourished adult living with HIV who were enrolled and followed for three months of treatment in nutritional care plan and treated with RUSF in all health facilities. Sample populations were randomly selected from moderately malnourished adult living with HIV and had a minimum of three visits.

4.4 Inclusion and exclusion criteria

Adult moderately malnourished clients who were admitted in nutritional care program & discharged after three months follow up visits were included. Clients who lost follow up and defaulted from the program during the study period, age below 18 years old and severely malnourished are excluded.

4.5 Sample size

4.5.1   Sample size determination

Sample size was calculated using single proportion estimate

$$No = \frac{Z^2 P(1-P)}{W^2}$$

P is the proportion of patients recovered of moderate malnutrition after 3 months stay in nutritional treatment. A value of 0.5 is used for P as there are no separate estimates for moderate cases.

95% confidence level is required and the degree of accuracy required (margin of error, w) is 0.5

$$No = \frac{1.96^2 0.5(1-0.5)}{0.5^2} = 384 \text{ clients record}$$

4.5.2   Sampling procedure

During the study period a total of 70 health facilities were implementing the food by prescription program. Of which 13 newly initiated were excluded and 57 were included in the study. The total sample size was proportionally distributed based on number of case load in nutritional program. A sample size proportion less than one or case load <55clients excluded (16 health facilities) and redistribution of sample size was done for 41 health facilities. Then, moderately malnutrition clients who had three months follow up in the treatment care plan were selected based on the sample proportion. Each client records were extracted in systematic random sampling by using the food by prescription registration book as a sample frame in each health facility.

For qualitative data health workers (service providers) working in ART from randomly selected health facilities until saturation.

4. **Data collection procedures**

The study used food by prescription registration book in each selected health facilities in Addis Ababa as a main data source. The data was gathered by reviewing the health facilities registration book which was designed and implemented for the specific program. Key informants working in ART clinic were interviewed from randomly selected health facility till saturation.

4.7 Variables

Dependent variables – Body mass index (BMI)

Independent – Age, sex, ART status, Sign of symptomatic disease and facility type.

4.8 Operational definitions

Adult – Age above 18 years old

Recovery – A malnourished client reaching BMI of greater or equal to 18.5kg/m^2 after three or six months of stay, based on nutritional status (moderate or severe respectively).

Moderate malnutrition – Clients with a BMI of 16-18.49kg/m^2 or have symptomatic disease regardless of BMI.

Defaulter – Client who lost for more than three consecutive month of visit from the nutritional care program.

Lost follow – Client who lost for one or two months of visit from nutritional program.

Discharged – Moderately malnourished clients complete three months follow up in nutritional care.

4.9 Data analysis

Data extracted from registration book of patients registered in food by prescription program were checked for completeness and relevance by the principal investigator. Data was cleaned coded manually and entered to EPI-INFO version 3.5 Statistical software. Data was then exported and analyzed using SPSS version 16.0. Descriptive statistical method was used to generate frequencies for categorical variables and to summarize and presented frequencies of demographic characteristics of the study participants. Bivariate and multivariate regression analysis was done to check crude and independent effect of variables by using odds ratio with 95% confidence interval. Paired sample t-test was used to compare the mean difference. Linear and multivariate linear regression was done to determine overall variation by controlling other factors. Qualitative data was analyzed using open code version 3.6B1 software.

4.10 Data quality management

To ensure data quality, data collectors were trained on how to extract the data from the registration book and how to fill in the structured data collection sheet. During the data collection period, the principal investigator serves as supervisor to make sure no missed values and helping them on daily basis. The checking was focus on each and every record, for its completeness and relevance.

4.11 Ethical consideration

The study was conducted after getting permission from the ethical clearance committee of Addis Ababa University Medical Faculty through Department of public Health. Formal letter from the university and supporting letter from Addis Ababa health biro for ten sub-cities was collected. Each sub-city writes a supporting letter for the selected health facilities. Then based on permission from the program owner and selected health facilities the researcher was explain the objective of the study and use records from FBP program registration books. In addition, oral consent from service providers as collected prior to the interview. Data was kept confidential and anonymous, and only used for study purpose.

5. Results

5.1 Demographic and nutritional characteristics of study population

Table 1 shows the demographic and nutritional characteristics of study population. The data were collected from 41 health facilities of which 11 were hospitals and 30 were health centers. When we see the total admission out of the total admission in this program, implementing period, 7406 (37.8%) had a minimum three months follow up and the rest were defaulted from the program.

Based on the inclusion criteria, 383 cases were classified as moderately malnourished and treated as clients. Their records were reviewed using systematic random selection. From the total cases, 160(41.8%) were males and 223 (58.2%) were females. The minimum and maximum age was 19 and 75 years respectively and the mean age was 36.6 years. About forty two percent (41.8%) of all the cases were within the age range of 30-39 years. During admission, the majority of the study populations (62.9%) were within the weight ranges of 40-49.9 kg. The minimum and maximum heights were 1.41 and 1.85 meter respectively. The mean BIM during admission was 17.4 kg/m^2 with the maximum and minimum value of 24kg/m^2 and 16 kg/m^2 and the standard deviation was 1.01. Based on the nutritional protocol, clients with sign of symptomatic disease during admission were classified as malnourished regardless of their BMI. In this study, 44 clients have sign of symptomatic disease, out of this 21 clients were included as moderately malnourished (BMI >18.49 kg/m^2) and the rest (362 clients) had a BMI of 16 kg/m^2 to 18.49 kg/m^2 which is within the moderate malnourished state.

Table 1: Demographic and nutritional characteristics of the study population Addis Ababa, 2015

Characteristics	Frequency	Percentage
Sex		
Female	223	58.2
Male	160	41.8
Age category		
19-29 years	92	24
30-39 years	160	41.8
40-49 years	90	23.5
>=50 years	41	10.7
Weight during admission		
30-39.9kg	44	11.5
40-49.9kg	241	62.9
>=50kg	98	25.6
BMI during admission		
16kg/m2-18.49kg/m2	362	94.5
>18.49kg/m2	21	5.5

5.2 Clients characteristic in relation to sign of symptomatic disease

Having sign of symptomatic disease is one the criteria to categorize clients' nutritional status regardless of their BMI. Table 2 shows the clients characteristics in relation to sign of symptomatic diseases, In this study population, 44 (11.5%) of them had symptomatic disease of which 28 clients had only tuberculosis (TB), 14 clients had other disease and 2 clients have both TB and other diseases. The majority of the clients i.e. 88.5% (n = 339) of the study populations had no symptomatic disease (Table 2).

Table 2: Client's characteristic in relation to sign of symptomatic disease Addis Ababa, 2015.

Sign of symptomatic disease	Frequency	Percentage
TB only	28	7.3
Other diseases	14	3.7
TB plus other diseases	2	0.5
Total with sign of symptomatic disease	44	11.5
Without any sign of symptomatic disease	339	88.5
Total	383	100

5.3 Clients' characteristics in relation to ART status and facility category, Addis Ababa 2015

Of the total study population majority of them 327 (85.4%) were on ART and 56 (14.6%) were on pre-ART. When we see the distribution of clients by type of health facilities i.e. health center versus hospitals. Majority of the clients (71.3%) were from health centers whereas only 28.7% were from hospitals. (Table3).

Table 3: Clients characteristic in relation to ART status and facility category Addis Ababa, 2015

Characteristics	Frequency	Percentage
ART status		
On ART	327	85.4
Pre ART	56	14.6
Facility Category		
Health center	273	71.3
Hospital	110	28.7

5.5 BMI Gains and Nutrition Status after one month treatment in relation to Demographic characteristics

Table 4 shows the BMI and nutritional status after one month of treatment in relation to demographic characteristic of the clients. Generally, after one month of treatment clients showed progressive BMI change. Ninety two clients (24%) become in a normal rang, some of them became severe 9(2%) and other are still in moderate category 282 (74%). From the total 383 clients after one month of treatment 257(67%) have positive BMI change, 81(21.3%) does not show any BMI change and the rest 45(11.7%) have decreased their BMI. Of this age group 40-49 years have shown good progress (72%) when we compared with other age groups.

Clients on ART showed good progress than on pre-ART and the data showed that females on ART have good progress than males and the reverse is true in pre ART cases. When we compare with hospital clients in the health center had progress and clients with the sign of symptomatic disease also showed improved BMI than without symptomatic disease. The mean BMI change during the second visit was 0.467 kg/m^2 with minimum -2.7 kg/m^2 & maximum 4.96 kg/m^2.

Table 4: **BMI and nutritional status after one month of treatment in relation to demographic characteristic in Addis Ababa, 2015**

Characteristics	BMI change first to second			Total	P- value
	No BMI change(%)	BMI decreased (%)	BMI increased (%)		
Sex					
Female	51(13)	20(5)	152(40)	223	0.1
Male	30(8)	25(7)	105(27)	160	
Age category					
19-29 years	21(6)	13(3)	58(15)	92	
30-39 years	35(9)	16(4)	109(28)	160	
40-49 years	15(4)	10(3)	65(17)	90	0.7
>=50 years	10(3)	6(2)	25(7)	41	
ART status					
On ART	71(19)	36(9)	220(57)	327	0.5
Pre-ART	10(3)	9(2)	37(10)	56	
Facility category					
Health center	49(13)	37(10)	187(49)	273	0.02
Hospital	32(8)	8(2)	70(18)	110	
Sign of symptomatic disease					
Yes	7(2)	7(2)	30(8)	44	
No	74(19)	38(10)	227(59)	339	0.5
Total	81(21)	45(12)	257(67)	383	

5.6 BMI gains and nutrition status after two months of treatment in relation to demographic characteristics

The results revealed that there is individual weight gain and progress in BMI (Table 5, Fig.1). Two hundred thirty five (61.6%) are still in moderate malnutrition, 133 (34.5%) are recovered and clients in severely malnourished category increased by 6 from the second visit which accounts a total of 15 clients (3.9%) moved down to the severely categorized group. The 15 severely malnourished clients had a sex distribution of 11 male and 4 female. Eleven of the 15 severely malnourished clients (8 male and 3 female) get the service at health center level and 13 of the 15 clients did not have any sign of symptomatic disease. Of 223 females (57.5%) showed progress in BMI when compared with males. Age groups of above 30-39 years shows good progress compared with other age groups, which is different from the first one. When we see from ART status fifty seven percent of clients on Pre-ART have progress in BMI than on ART. Same with the second visit clients with sign of symptomatic disease had good improvement in BMI in comparison with non- symptomatic. One hundred fifty one clients from health center and 63 from hospital showed increments in their BMI.

Table 5: **BMI and nutritional status after two months of treatment in relation to demographic characteristic and clinical factor in Addis Ababa, 2015**

| Characteristics	BMI change second to third			Total	P- value
	No BMI change (%)	BMI decreased (%)	BMI Increased (%)		
Sex					
Female	60(16)	35(9)	86(23)	223	0.4
Male	41(11)	33(9)	128(33)	160	
Age category					
19-29 years	25(7)	20(52)	47(12)	92	
30-39 years	42(11)	24(6)	94(25)	160	0.8
40-49 years	24(63)	17(4)	49(13)	90	
>=50 years	10(26)	7(2)	24(6)	41	
ART status					
On ART	88(23)	57(15)	182(48)	327	0.8
Pre-ART	13(3)	11(3)	32(8)	56	
Facility category					
Health center	71(19)	51(13)	151(39)	273	0.7
Hospital	30(8)	17(4)	63(16)	110	
Sign of symptomatic disease					
Yes	14(4)	5(1)	25(7)	44	0.4
No	87(23)	63(16)	189(49)	339	
Total	101	68	214	383	
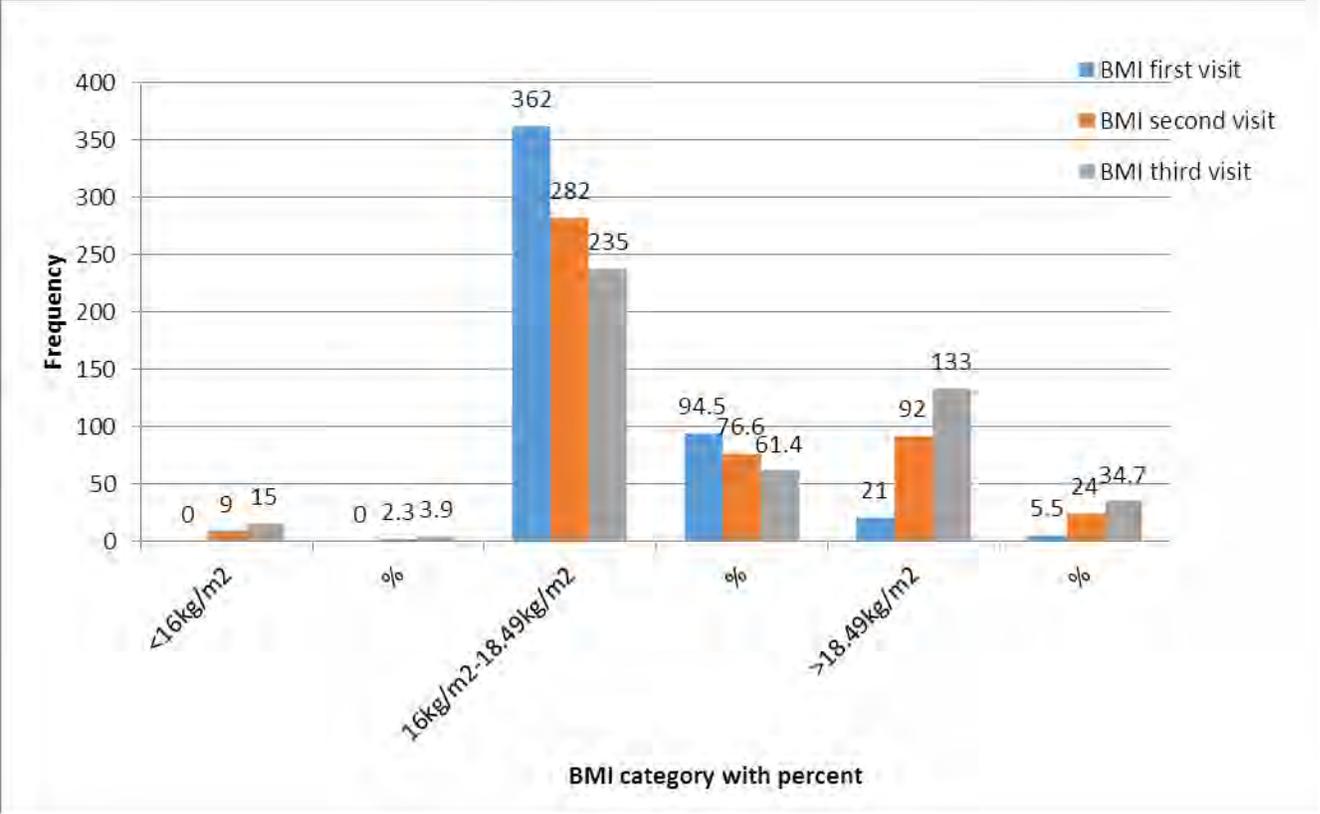
Figure 2: **BMI change during the three visit, Addis Ababa2015**

5.7 Final treatment outcome (recovery)

From the total 383 clients, 133 (34.7%)   had not malnutrition, the mean BMI during discharge was 18.2 kg/m^2 with a minimum 13.5 kg/m^2 and maximum value of 26.4 kg/m^2. The mean BMI difference between first and third visit was 0.8kg/m^2.

Of the total cured clients (67.6%) were treated in health center (recovery rate 33%) and 32.3% were from hospital (recovery rate of 39.1%). From the age category, 30-39 years are recovered well in compared to the other age categories. When we compare weight during admission and discharge 53(13.8%) loses their weight, 46(12%) discharged with the same weight of admission and the rest 284(74.2%) gains weight. The minimum and maximum weight gain was -18 kg and 15 kg respectively with the mean 1.92 kg.

When we see in relation to sign of symptomatic disease, clients with symptomatic disease were recovered better than without the symptomatic one (68.2% and 30.4% respectively) and within these symptomatic clients with TB plus other have better recovery than who had only one type of the disease. In contrast to this, a male client with 23 years of age, on ART and whose BMI was in normal range of nutritional status enrolled to the program due to TB was finally discharged with severe malnutrition. Females have better recovery than males in the final outcome. Clients taking ART also shows recovery rate, which is better than pre ART.   The mean weight gain during nutritional supplement was 3.2 gram/day. Table 6 shows the treatment outcome with demographic characteristics and clinical factors.

Table 6: Treatment outcome in relation to demographic characteristics and clinical factors

| Characteristics		BMI category		
		<18.49kg/m2 N (%)	>18.49kg/m2 N (%)	Recovery in %
Type of health facility	Health center	183 (47.7)	90(23.5)	33
	Hospital	67 17.5)	43(11.2)	39.1
Sex	Female	143(37.2)	80(20.9)	35.9
	Male	107(27.9)	53(13.8)	33.1
Age category	19-29years	68(17.8)	24(6.3)	26.1
	30-39years	95(24.8)	65(17)	40.6
	40-49years	57(14.9)	33(8.6)	36.7
	>=50years	30(7.8)	11(20.9)	26.8
ART status	On ART	210(54.8)	117(30.5)	35.8
	Pre ART	40(10.4)	16(4.2)	28.6
Sign of symptomatic disease	Yes	14(3.7)	30(7.8)	68.2
	No	236(61.6)	103(26.9)	30.4
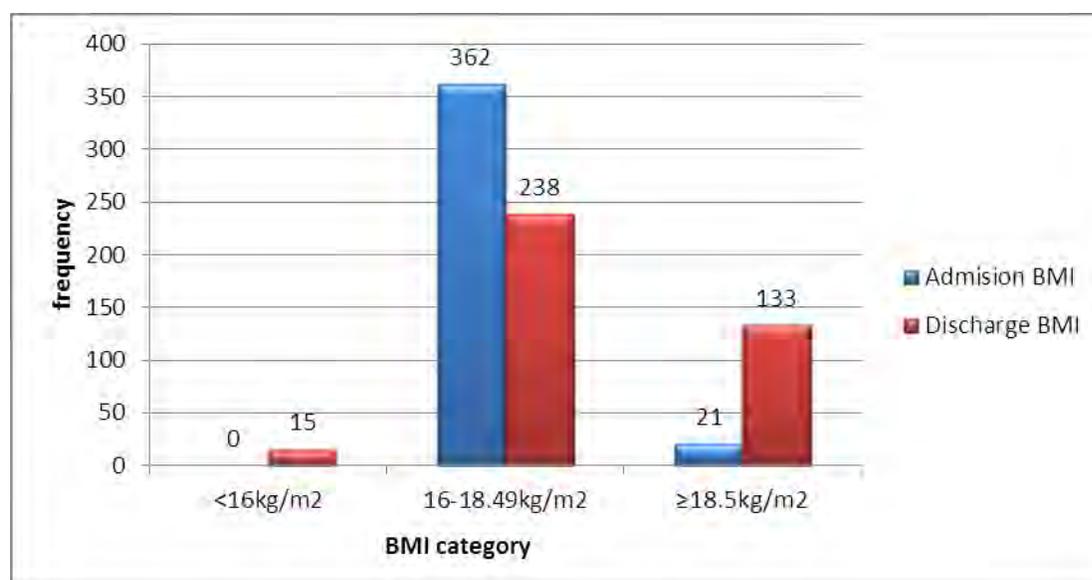
Figure 3: BMI category during Admission and discharge Addis Ababa 2015

5.8 Factors associated with nutritional outcome

In bivariate and multivariate logistic regression analysis, sign of symptomatic disease has significance association with nutritional recovery. Clients with symptomatic disease are 4.74(2.4-9.5 CI) times more likely to recover when compared with non-symptomatic one with a p-value of < 0.01. Age, sex, facility type and ART status do not show any significance with nutritional recovery in logistic regression analysis (Table 9).

Key informants interview were conducted with health professionals who were available in health facility during the visit and providing the nutritional support program. The interview focused on food by prescription program implementation and factors associated with client's failure to meet the program criteria during exit (i.e. reaching a BMI of ≥ 18.5 kg/m^2). The key informants were 5 male and 10 female and 14 of them were nurses and 1 medical doctor. The average experience related to the food by prescription program was 2 years. They explain about the program importance in developing immunity, giving physical strengthening, increase CD4 and decrease HIV disease progression. The service providers mentioned some of the factors they thought as a reason for poor recovery rate from different perspective. From the product perspective dislike, gastric upset, fasting, diarrhea, anorexia, test intolerance and feeling of tiredness, from clients/families perception misunderstanding about the product, fear of stigma, misuse especially in high family size of low income and use it as a regular meal were listed as the problem.

From service provider's perspective negligency and poor tracing mechanism and from program implementers and management body stock out, not assigning responsible and well trained person in ART, lack of recognition and supportive supervision takes a great contribution in the program failure. Sever sickness, hospitalization and inconvenience are also listed as other factors.

Improving quality of the product, continuous supportive supervision, involvement of management body and strengthening income generating activities (ES) were some of the recommendations stated by service providers for further improve the nutritional support program.

The paired t-test and linear regression shows nutritional support program has statistical significance with BMI change (Table 7 and 8).

The T-test shows that nutritional support helps clients increasing their BMI from 17.4kg/m2 at baseline to 18.2kg/m2 during discharge, with a difference of 0.8kg/m2. When we see the T-value the difference is statistically significant, different from zero.

Even though the before after comparison is for the same clients, there are other factors and characteristics of study participants which affects the nutritional recovery. To address some of these factors linear and multivariate linear regression analysis was done by adjusting other factors and characteristics of study population.

Both simple linear and multivariate linear regression analysis shows equivalent result with a simple before after difference in BMI change (0.8kg/m2).

Table 7: BMI change before after intervention (comparison of means) Addis Ababa, 2015

BMI change	Before	After	Difference	t- stat.	p-value
1st to 2nd visit	17.4 kg/m^2	17.9 kg/m^2	0.5 kg/m^2	11.8	<0.01
2nd to 3rd visit	17.9 kg/m^2	18.2 kg/m^2	0.3 kg/m^2	17.1	<0.01
1st to 3rd visit	17.4 kg/m^2	18.2 kg/m^2	0.8 kg/m^2	13.3	<0.01

Table 8: **BMI change before after intervention (regression analysis) **Addis Ababa, 2015**

BMI change	Linear regression	Multivariate linear regression
1st to 2nd visit	0.5 kg/m^2 (<0.01)*	0.5 kg/m^2 (<0.01)*
2nd to 3rd visit	0.3 kg/m^2 (<0.01)*	0.3 kg/m^2 (0.002)*
1st to 3rd visit	0.8 kg/m^2 (<0.001)*	0.8 kg/m^2 (<0.001)*

( ) p-value

*   Significance

** After controlling predefined factors (age, sex, symptomatic disease, facility type and ART status).

Table 9: Logistic regression analysis of factors associated with nutritional outcome of PLHIV in Addis Ababa, 2015

Variables	Recovery		COR (95 % CI)	AOR(95%CI)	P-value
	Yes n (%)	No n (%)			
Total	133(34.7)	250(65.3)			
Type of health facilities					
Health center	90(33)	183(67)	0.76(.48-1.21)	0.84(.52-1.36)	0.84
Hospital (r)	43(39.1)	67(60.9)	1.00		
Sex					
Male	53(33.1)	107(66.9)	0.88(.57-1.35)	084(.53-1.33)	0.47
Female(r)	80(35.9)	143(64.1)	1.00	1.00	
Age category					
19-29years	24(26.1)	68(73.9)	0.96(.41-2.21)	1.07(.45-2.5)	0.86
30-39years	65(40.6)	95(59.4)	1.86(.87-3.98)	1.83(.83-4.03)	0.13
40-49years	33(36.7)	57(63.3)	1.57(.7-3.56)	1.66(.71-3.85)	0.23
>=50years(r)	11(26.8)	30(73.2)	1.00	1.00	
ART status					
On ART	117(35.8)	210(64.2)	1.39(.74-2.59)	1.48(1.75-2.9)	0.25
Pre ART(r)	16(28.6)	40(71.4)	1.00	1.00	
Sign of symptomatic disease					
Yes	30(68.2)	14(31.8)	4.91(2.49-9.64)	4.74(2.38-9.45)	<0.01*
No (r)	103(30.4)	236(69.6)	1.00	1.00	

(r)- Reference group

*- Significant

6 Discussion

Nutritional support program for HIV patients is believed to be effective for developing immunity, giving physical strengthening, increase CD4 and decrease HIV disease progression (19). The findings of this study of nutritional recovery among moderately malnourished adults living with HIV, nutritional support for malnourished adults living with HIV had considerable benefit in improving their BMI and weight. As the clients regularly taking the treatment, their weight is progressively changing and the people who, were found in each weight category gradually bounce to the next group at each visit. As far as there is change in the weight of the clients, it is obvious to see a change in the BMI of the clients as well. However, few of them are achieving stated programmatic goal of reaching a BMI of ≥ 18.5 kg/m^2.

This study revealed that only 34.7% are reaching the program discharging criteria (BMI of $\geq$18.5 kg/m^2). Despite there was a difference in discharging criteria and inclusion of severe cases, other studies (8,14) reports high recovery rate. A study conducted in sub-Saharan Africa reports 47.7% (14) and 84% in Zambia FBP pilot project evaluation report(8). Another study conducted in Kenya reports 13.1%, which is lower than our finding.

When outcome is assessed in relation to ART status, in contrary with other study done in Kenya which reports (10), this study revealed that ART and pre ART have different recovery rate. Clients on ART have high rate of attaining the intended BMI than on Pre ART. This might be due to ART adherence counseling.

A longitudinal study done in sub-Saharan Africa revealed that men had an odds of failure 1.5 times higher than women and a higher risk of nutritional failure (14) and another study in Ethiopia reports females were 1.5 times more likely to recover than males (3),which supports our finding that female clients have better recovery rate than males. In contrast, other study conducted in Kenya found men had a higher rate of achieving intended BMI than women (20).

Both the studies shows enrolment to nutritional program with lower BMI and advanced HIV progression had a positive relation with recovery (3, 20), which may relate and support the result of this study that ART clients had a higher recovery rate than pre ART. Other study found that patients who initiated ART while receiving nutrition treatment had lower risk of nutritional program failure than those already on ART (14).

Even though there are several differences between hospitals and health centers such as clients enrolled and treated in hospitals are more malnourished and there is a high case load, recovery rate comparatively higher in hospitals than health centers unlike other study found that high non response rate in hospitals(3) this might be due to the reason that there is comprehensive care in hospital.

After receiving a nutritional treatment average total weight gain was 1.9 kg (3.2gm/day), which is lower than other studies done in sub-Saharan Africa and Kenya, 8 kg and 2 kg respectively (15,20). There was a positive difference between the mean BMI of admission and discharge, which is 17.4 kg/m^2 and 18.19k g/m^2 respectively. The mean BMI difference between the first and third visit was 0.8 kg/m^2. This result is almost similar (BMI = 0.77 kg/m^2) with the other study conducted in Ethiopia (3).

Symptomatic clients had the greatest gains in weight and BMI, given that they had the most opportunity for improvement than non -symptomatic, however exceptionally a client admitted to the nutritional program with a BMI category of >18.49 kg/m^2 with symptomatic disease drop back to severely malnourished with a BMI < 16 kg/m^2. Diagnosed TB at nutritional program admission or during follow up and presence of other opportunistic infections were unrelated to the risk of nutritional program failure as reported in the study conducted in sub- Saharan African (14).

However, in this study having symptomatic disease related with good nutritional recovery compared with non-symptomatic diseases. This might be feeling presser to take the prescribed dose due to their illness. Bivariate and multivariate logistic regression analysis also shows having sign of symptomatic disease had greater out come in nutritional recovery when it is compared with who doesn't have the symptoms.

A study in Kenya report that younger age is significantly related with a greater rate of achieving the program exit criteria (20). In contrary, this study shows age group 30-39 years and above have higher rate of recovery than the young ages.

Many patients exited before achieving target outcomes. Some potential reasons for exiting was reported in other food by prescription program studies include health workers and participants being unclear of the protocol (clients discharged after gaining some weight or after certain duration of time) as reported by Ireton-Jones and Delegge (21). Sharing of the product within the household (with children, in particular), selling, patient dislike of the product, and the burden of transportation costs were also reported in other studies (3), which corresponds with our finding in key informants interview.

In addition, treating the product as a primary food source rather than as a supplement, due to limited availability of other household resources, inadequate supply of supplement distributed to participants relative to the monthly amount required in the program protocol and the presence of other illness or infection are stated as the main factor for treatment failure.

The product was primarily developed to treat acute malnutrition in HIV infected children, adult patients complained to take full prescribed dose due to the taste. It might not be the right nutritional supplement for adults.

As observed from the data even though clients have three follow-up visits, they are staying two months till third visit effect of last dose (3rd) was not considered; they are discharged during third visit as recovered or non-responder. This may be the main reason that most of the clients are approaching the exit criteria (BMI) but reported as non-responder (not recovered).

When we see the total admission to food by prescription program in our case 7406 (37.8%) had a minimum three months follow up and the rest 12183(62.2%) are defaulted from the program within the program implementation period. This shows defaulter rate is also very high same as non- responder (not recovered) in the program. In general, it can be concluded that food by prescription program is helping the HIV patients to improve their BMI, nevertheless, there are several setback that needs to be improved to implement the program more effectively.

7 Strength and limitation of the study

7.1 Strength

The study included most of food by prescription program implementing health facilities in Addis Ababa where majority of clients were treated. This makes the result representative.

7.2 Limitations

The study was limited by design, being retrospective, and before and after without control group. The study relies on previously collected data and all necessary information was not documented in the registration book including dose and type of product.

8. Conclusion

Nutritional support for malnourished adults living with HIV had significant effect in weight and BMI change in majority of cases. However reaching the intended BMI is questionable. This study reports 34.7% recovery rate for moderately malnourished adult living with HIV, which is lower than other similar studies.

The finding of this study revealed that female clients have better recovery rate than males. In this study having symptomatic disease, being on ART and follow up in hospital shows greater recovery rate. There were significant number of defaulters and non- responders and this finding helps to work on appropriate nutritional counseling and follow-up and researching the factors.

The major reasons revealed for the failure of the program or low recovery rate were 1) health workers and participants being unclear of the protocol (clients discharged after gaining some weight or after certain duration of time), 2) sharing of the product within the household (with children, in particular), 3) selling, and patient dislike of the product.

9. Recommendations

Generally, it was found weight and BMI gain among food by prescription program beneficiaries, only 34.7% of participants met stated program goals. Further, in-depth studies with intervention and control groups are required in evaluating the effect of nutrition supplementation on clinical outcomes for adults living with HIV (specific to moderate malnutrition) and investigate the factors.

Integration of food by prescription program with the existing HIV care service by filling the training gap with implementation of good tracing mechanism, improving products quality to make suitable for adults and intensive supportive supervision will improve the program quality. Persistent monitoring and evaluation of the program is also crucial to improve nutritional recovery rate.

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Annex I   Sample distribution per facility Addis Ababa 2015

S.no.	Name of health facility	No. of MAM clients enrolled in FBP	sample size	Remark
1	kazanchis HC	347	12	
2	Meshualka HC	268	9	
3	Kirkos HC	424	14	
4	T/Haymanot HC	204	7	
5	Beltshachew HC	325	11	
6	Lideta HC	494	17	
7	Addis ketema HC	211	7	
8	A/ketema woreda7 HC	214	7	
9	Akaki HC	208	7	
10	Kality HC	358	12	
11	Saris HC	262	9	
12	Entoto no.1 HC	221	7	
13	kotebe HC	750	25	
14	Yeka HC	296	10	
15	NSL woreda 3 HC	330	11	
16	NSL woreda 6 HC	99	3	
17	NSL woreda 9 HC	575	19	
18	kolfe woreda 9 HC	164	6	
19	Kolfe HC	262	9	
20	Shiromeda HC	362	12	
21	Selam HC	195	7	
22	Hidase HC	55	2	
23	Arada HC	301	10	
24	Gulele HC	242	8	
25	Kebena HC	107	4	
26	Bole 17 HC	271	9	
27	Bole 17/20 HC	319	11	
28	Dilfire HC	108	4	
29	Black lion HO	144	5	
30	St.Paulos HO	379	13	
31	Zewditu HO	335	11	
32	Alert HO	256	9	
33	Gandi HO	193	6	

S.no.	Name of health facility	No.of MAM clients enrolled in FBP	sample size	Remark
34	Yekatit 12 HO	513	17	
35	St.Peter HO	486	16	
36	Amanuel Ho	113	4	
37	Zembaba HO	90	3	
38	Minilk Ho	557	19	
39	Rasdesta Ho	239	8	
40	Missionary of charity HC	55	2	
41	Worldwide orphan HC	94	3	
Total		11846	388	

Note: HC - health centers

HO - hospitals

NSL – Nifasilk lafto

Annex II Key informant interview guide line for service providers

Interviewer name

Respondent code   Sex   Profession

Educational level   Name of health facility

Experience related to the program

1. Do you know about the nutritional intervention program?

2. If yes for Q1, what objective and goals of the program?

3. In your opinion, do you think that this program is effective in achieving its mission objectives?

4. If the answer is yes for Q3, how do you measure the effectiveness of the program?

5. In your opinion, do you think that food by prescription is helping clients?

6. What factors did the clients mentioned for their overall failure?

7. What do you say about the appropriateness of dose and duration of the support?

8. What do you recommend to improve food by prescription in the future?

Annex III Data collection tool

Name of Health Facility_____ Name of Data Collector_____   Date _____

S. no	Background					Finding on admission First visit						Second visit				Third visit				Fourth visit (optional)			
	Age	Sex	ART status	PLW	Date of admission	Weight	Height	BMI	MUAC	Edema	sign of SD	Date	Weight	Edema	Sign of SD	Date	Weight	Edema	Sign of SD	Date	Weight	Sign of SD	edema
1																							
2																							
3																							
4																							
5																							
6																							

Note: ART status -1-0n ART,2 -pre,3 –NA   PLW- 1-pregnant,2-lactating,3-NA, sign of SD-0-none,1-TB,2-other,3-TB & other, Edema-yes or no