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Nutritional Recovery and Associated Factors Among Adult Hivclients on Therapeutic Feeding Program at South Achefer Woreda Health Facilitiesnorth West Ethiopia

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BAHIRDAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCE
SCHOOL OF PUBLIC HEALTH
DEPARTMENT OF NUTRITION AND DIETETICS
NUTRITIONAL RECOVERY AND ASSOCIATED FACTORS AMONG
ADULT HIVCLIENTS ON THERAPEUTIC FEEDING PROGRAM AT
SOUTH ACHEFER WOREDA HEALTH FACILITIES NORTH WEST
ETHIOPIA

BY:DESSALEGN MIHIRET(Bsc in public health)

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FULL TITLE OF RESEARCH PROJECT	NUTRITIONAL RECOVERY AND ASSOCIATED FACTORS AMONG ADULT HIV CLIENTS ON THERAPEUTIC FEEDING PROGRAM AT SOUTH ACHEFER HEALTH FACILITIES
TOTAL BUDGET	27,538 BIRR
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STUDY AREA	SOUTH ACHEFER HEALTH FACILITIES

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Acronyms And Abrevations

ARV	Anti-Retro Viral
AIDS	Acquired Immunodeficiency Syndrome
BMI	Body Mass Index
CD4	Cluster Differentiation 4
FAO	Food and Agriculture Organization
FBP	Food By Prescription
FMOH	Federal Ministry of Health
HAART	Highly Active Anti-retroviral Therapy
HIV	Human Immune deficiency Virus
MAM	Moderate Acute Malnutrition
NASC	Nutritional Assessment, Counseling, and Support
PEPFAR	President's Emergency Plan for AIDS Relief
PLWH	People Living With HIV
RUTF	Ready to Use Therapeutic Food
RUSF	Ready to use Supplementary Food
SAM	Sever Acute Malnutrition
SPSS	Statistical Package for Social Science
USAIDS	United States Agency for International Development
WFP	World Food Program
WHO	World Health Organization
DSD	Differentiated Service Delivery

Table of Contents

Acknowledgment	ii
Acronyms And Abrevations	iii
Abstract	viii
1. Introduction.....	1
1.1Background	1
1.2 Statement Of The Problem.....	2
1.3 Significance Of The Study	4
2. Literature Review.....	5
2.1. Nutritional Recovery	5
2.2. Factors associated with nutritional recovery.....	7
2.3 Conceptual Framework	11
3. Study Objective.....	12
3.1General Objective.....	12
3.2Specific Objectives.....	12
4. Methods And Materials.....	12
4.1Study Design And Period.....	12
4.2Study Area And Settings	12
4.3Source Population	13
4.4Study Population	13
4.5 Inclusion And Exclusion Criteria.....	13
4.5.1 Inclusion Criteria	13
4.5.2 Exclusion Criteria.....	13
4.6 Sample Size Determination.....	13
4.7 Sampling procedures	15
4.8 Data Collection Tools and procedures	17
4.9 Variables Of The Study.....	17
4.9.1 Dependent/Outcome Variables.....	17

4.9.2 Independent Variables/Study Variables	17
4.10 Standard Definitions.....	17
4.11 Data Management And Analysis.....	19
4.12 Data Quality Assurance.....	19
4.13 Ethical Clearance.....	19
5. Results.....	20
5.1 Socio-Demographic Characteristics	20
5.2 Nutritional And Hiv Related Characteristics	21
5.3 Nutritional Recovery	24
5.4 Factors Associated with Nutritional Recovery.....	25
6. Discussion	27
7. Strength and Limitation Of The Study.....	30
7.1 Strength	30
7.2 Limitation	30
8. Conclusions.....	31
9. Recommendations.....	32
10. References.....	33
11. Annexes.....	37
Annex1. Data extraction format/check list.....	37
Annex2. English Version Data extraction format/check list	38
Declaration	41

List of tables

Table 1 Sample size determination of the second objective for a study conducted on nutritional recovery and associated factors among adult HIV patients at south Achefer woreda, 2022.	14
Table 2 Sociodemographic characteristics of adult HIV clients enrolled in food by prescription program in south achefer district, West Gojjam Zone, Amhara region Ethiopia, 2022.	20
Table 3 Nutritional and HIV related characteristics of adult HIV clients enrolled in food by prescription program in south achefer district, West Gojjam Zone, Amhara region Ethiopia, 2022.....	21
Table 4 Bivariable and multivariable analysis of predictors of adult HIV clients enrolled in food by prescription program in south achefer district, West Gojjam Zone, Amhara region Ethiopia 2022.....	25

List of figures

Figure1:conceptual framework of nutritional recovery of ready to use food therapy and its predictor among adult HIV/AIDS clients South Achefer Amahara regon Ethopa, 2022. 11

Figure 2 Schematic presentation showing sampling procedures in South Achefer Woreda, Northwest Ethiopia, 2022. 16

Figure 3 Nutritional recovery of ready to use food therapy among adult HIV clients enrolled in food by prescription program in south achefer district, West Gojjam Zone, Amhara region Ethiopia, 2022. 24

Abstract

Background: -Treatment of malnutrition is essential in addition to antiretroviral treatment for clients who are malnourished. To address the problem of malnutrition, the Ethiopian Ministry of Health implemented a therapeutic feeding program but HIV clients receiving the therapeutic food package, still suffer with low recovery. Although the factors contributing to the low recovery were reported, some crucial factors such as viral load status, disclosure status, distance to health institutions, differentiated service delivery and comorbidity with chronic illness were overlooked in earlier investigations.

Objective: - To assess the nutritional recovery and associated factors among adult HIV clients on therapeutic feeding program at South Achefer health facilities North West Ethiopia, 2022.

Methods: -An institution-based cross-sectional study was conducted from May 25 to June 22, 2022 among adult HIV clients on ready to use therapeutic food enrolled from February 2011-January 2021. The data were gathered from 411 patient records, which was chosen using a simple random sampling method to select the record of each patient from the therapeutic feeding registration logbook from each clinic based on their unique identification number, and then their charts were reviewed. Binary logistic regression analysis was done for independent variables with an outcome variable. Variables with significant associations for nutritional recovery of ready to use food therapy were identified based on AOR with a 95% CI and p-value < 0.05.

Results: - In this study, the recovery was 46.5% (95% CI: (41.8-51.1)). Baseline nutritional status at enrollment SAM (AOR=2.20 (95% CI, (1.368-3.577)), not involved differentiated service delivery (AOR =0.551 (95% CI, (0.310-0.982)) and poor adherence to ART (AOR=2.31 (95% CI, (1.441-8.455)) were predictors of recovery rate in adult HIV patients enrolled in the food by prescription program.

Conclusion and Recommendation: - The recovery of this study was low when compared to the sphere standard. Severity of malnutrition, clients involved in differentiated service delivery and poor adherence to ART were the predictors of low recovery rate.

Enhance quality of life and minimize nutritional impact by promptly treating infections and managing symptoms that affect nutrient intake and it is also preferable to modify the monthly appointments for prescribing ARV drugs for malnourished clients.

1. Introduction

1.1 Background

Acquired immune deficiency syndrome(AIDS) is a disease caused by a retrovirus, the human immunodeficiency virus (HIV), which attacks and impairs body's natural defense system against disease and infection. Malnutrition is defined as “the cellular imbalance between supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions(1).

The effect of HIV on nutrition begins early in the course of the disease, even before an individual may be aware that he or she is infected with the virus. Asymptomatic HIV positive individuals require 10% more energy, and symptomatic HIV-positive individuals require 20%- 30% more energy than HIV-negative individuals of the same age, sex, and physical activity level. Nutrition and HIV are strongly related to each other since any immune impairment as a result of HIV leads to malnutrition, and malnutrition leads to immune impairment, worsens the effect of HIV, and contributes to more rapid progression to AIDS.(2)

Treatment of malnutrition is essential in addition to antiretroviral treatment for patients who are malnourished(3). The current WHO recommendations for the nutrient requirements of people living with HIV call for increases in energy over the intake levels recommended for healthy non-HIV-infected individuals of the same age, sex, and level of physical activity(4).

Nutritional interventions have been successful in the management of HIV, and many patients enrolled into such programs have markedly improved both their body weight and general health status(5, 6).

HIV infected adults who present with malnutrition at participating health facilities are prescribed food rations according to their nutritional status. The rations are prescribed during monthly appointments together with client's ART medication, and are distributed directly from clinic pharmacies. Clients are monitored closely by health facility staff who are collecting both anthropometric and disease progression data during monthly appointments(7).

According to the sphere standard the discharged individuals from the food by prscription progamme must be free from medical complications. In addition, they should have regained their

appetite and have achieved and maintained appropriate weight gain without nutrition-related edema (for example, for two consecutive weighings with BMI >18.5Kg/m²(8).

1.2 Statement Of The Problem

HIV infection progressively destroys the immune system, leading to recurrent opportunistic infections, debilitation, and death. Poor nutritional status is one of the major complications of HIV and a significant factor in full-blown AIDS. HIV can cause or worsen undernutrition by causing reduced food intake, increased energy requirements, and poor nutrient absorption. Undernutrition in turn further weakens the immune system, increasing vulnerability to infection and worsening the disease's impact(9).

Malnutrition has been associated with progressive functional impairment, reduced immune competence and exacerbate the effects of HIV by increasing susceptibility to AIDS-related illnesses which leads to decreased rate of cure from opportunistic infections.(10)

Due to the increasing incident of HIV among different segments of the population which is 1.88 incidence ratio(11), the needs for nutritional care and helping them to be well nourished become more important. This in turn makes the need to give nutritional assessment and nutritional care top priority in the program(12).

The presence of opportunistic diseases such as oral candidiasis and diarrhea are related to increased susceptibility to malnutrition and poor recovery from malnutrition(13).

Even if ready to use food therapy was launched and given for malnutrition HIV clients in Ethiopia; still suffers with low (42%) nutritional recovery.

The previous studies conducted were in towns and urban health institutions of Ethiopia which might have better access of facilities (Addis Ababa, Gondar, Mekelle and Bahir Dar)(14, 15).

The donors and the government pay little attention to this program. This could be owing to a lack of knowledge about RUFT nutritional recovery in the research area.

The negative effects of malnutrition are often preventable and are usually not easily reversed. Nutrition-related alterations can occur early in HIV infection; thus, nutrition intervention should begin soon after diagnosis.

There is a discrepancy between studies conducted in Sub-Saharan Africa and Kenya on the risk and recovery of male clients. As a result, this study will provide additional information about whether or not sex is an apridictor.

The study conducted in mekele revealed that those who did not attend any formal education decreased the probability of recovery from under-nutrition. However, a study conducted at Gondar University Hospital in Ethiopia revealed that education is not significantly associated with nutritional recovery. So that this study will give additional information about educational status as apridictor or not.

To the best of my knowledge, some crucial factors such as viral load status, disclosure status, distance to health institutions differentiated service delivery and comorbidity with chronic illness were overlooked in earlier investigations. As a result, this study will provide more information about those factors.

1.3 Significance Of The Study

The result of this study is important on identification of the factors of nutritional recovery among adult ART clients.

The study provide a base line data for ART clinic staffs, donors who are supporting the food by prescription (FBP) program in giving information about treatment responses and its factors associated with the nutritional recovery of FBP among HIV positive adult individuals based on the evidences generated from the study and that will helps in improving quality of life of HIV infected people.

Thus, understanding nutritional recovery of ready-to-use food therapy and associated factors among HIV patients is critical for improving service delivery and for clearly illustrating the problem of nutritional recovery of RUFT related with nutritional intervention programs.

At this time there is also less attention on this program by the donors and the government. So adding this study provide additional information on nutritional recovery of ready to use food therapy and associated factors with nutritional intervention programs.

knowing nutritional recovery of ready to use food therapy and associated factors among HIV patients is important to improve the service delivery process and also help to clearly picture the problem of nutritional recovery of ready to use food therapy and its factors associated with nutritional intervention outcome. And also, may be used by health program planners, organizations working on food by prescription program and researchers who are interested to conduct research in this area may use it as a reference.

2. Literature Review

2.1. Nutritional Recovery

Nutritional rehabilitation was required for 15% of HIV patients in Sub-Saharan Africa(13). Nutrition therapy combined with an early start of ART may improve the chances of nutritional recovery in HIV patients who are severely malnourished(13).

A cross-sectional study conducted in Tanzania found that 3.0 percent of RUTF recipients were underweight and 2.8 percent were wasting, compared to 12.4 percent and 16.5 percent of non-RUTF recipients. As a result, providing RUTF for at least four months was associated with a low proportion of undernutrition(16).

A study which was conducted in Kenya and Uganda showed that among malnourished Adult HIV/AIDS clients 47.4% of clients' body mass index improved from the total number of clients treated by ready to use food therapy and 48.0% patients failed nutrition therapy (17).

A study conducted in sub Saharan African shows that 34.7% recovery rate from malnutrition among HIV infected individuals (18).

Another study conducted in Sub-Saharan Africa stated that patients who took ready to use food therapy were a 13% weight increase as compared to a control group who took food supplementation containing corn–soya blend with a 10 % increase(6).

A study done in South Africa shows that nutritional supplementation taken concurrently with ART for 6 months resulted in an increase in BMI (19).

Ethiopia is also one of the countries hit hardest by the HIV epidemic alongside malnutrition(20).The prevalence of under-nutrition among HIV patients receiving ART in Ethiopia ranges from 12.3 to 46.8%(21, 22).

Nutritional support with RUTF may be more effective when given to patients at an earlier stage of malnutrition(13). According to a study on the effects and cost effectiveness of FBP on malnutrition recovery in Ethiopia, it is critical to closely monitor HIV patients' nutritional status and treat malnutrition at an early stage to achieve optimal malnutrition recovery(23).

A study conducted in Ethiopia stated that 32.6% achieved BMI ≥ 18.5 at least once during treatment in the FBP group, compared to 18.8% in the comparison group. A study conducted in Ethiopia on impacts of FBP showed that recovery rate was 42%, and non-response rate was 58%(23).

A study conducted in Ethiopia showed that the recovery rate was 42% which is below the sphere standard (recovery rate $>75\%$), study conducted in Mekele hospital showed that recovery rate was 62.4%, study conducted in Gonder university hospital showed that recovery rate was 24% and also study conducted in Amhara region showed that recovery rate was 41% (15, 23, 24).

A mixed quantitative and qualitative study done in Tigray region stated that 55.3% were recovered from malnutrition, 19% did not complete the program, and 21% completed the program but failed to recover from malnutrition (25).

A cross sectional study conducted in Gondar University Hospital reveal that 24% were recovered (graduated) from malnutrition, 25.6% of patients were non-responders (didn't recover) according to the FBP exit criteria, 48.8% were defaulted from the FBP program and 1.7% were died during the intervention period. The overall failure rate including non-responders, defaulter and death were 76 %(24).

A cross sectional study done in Gonder University Hospital about retention and treatment outcomes of an under-nutrition program for HIV patients (children and adults) involving Ready-to-use Therapeutic Food showed that 44.2% recovered after 4-6 months of follow-up and the overall defaulted cases were found to be 24.8% and not responded cases comprise 18.6%(14).

Food supplementation improved weight gain and BMI in all studies. Food and nutrition security plays an important role in improving drug adherence, preventing opportunistic infections and early mortality, and improving overall quality of life for HIV patients(26).

2.2. Factors associated with nutritional recovery

Socio Demographic Factors

A study conducted in Sub-Saharan Africa showed that being male sex were found to be significant predictors for poor nutritional treatment outcome(13).

Major socio-economic factors associated with malnutrition were being female and unemployed. Patients with opportunistic infections, low adherence to HAART, and stage of HIV had a higher risk of malnutrition(27).

A study conducted in Ethiopia showed that being female was more likely to recover from malnutrition after ready to use food therapy than men(23).

A study conducted in Ethiopia on impacts of food by prescription showed that being female was associated with increased chance of recovery(7).

And also case control study done in Bahir Dar showed that being male sex were found to be significant predictors for poor nutritional treatment outcome(28).

A retrospective study done in Mekele hospital showed that being male sex and illiterate patient were found to be significant predictors for poor nutritional treatment outcome(15).

In contrast to this a cross sectional study conducted in Gondar University Hospital revealed that males were higher to recover than females(24).

A Retrospective Study conducted in Amhara National Regional State revealed that male patients were more likely to achieve normal BMI status compared with females(17).

A study conducted at mekelle shows that rural residence and can't read and write educational status were the barriers for nutritional recovery for patients on the therapeutic feeding program. In addition to that under-nutrition was more prevalent among older adolescents and young adults (29).

A study conducted at Gondar University Hospital in Ethiopia revealed that education is not significantly associated with nutritional recovery(30).

An HIV-positive person living in a food-insecure household would not consume an adequate diet that included nutrients necessary for maintaining a functional immune system and preventing opportunistic infections. (31). This situation usually leads to a rapid onset of AIDS, which causes a decrease in productivity due to illness and death. HIV-affected households are thus more likely to experience income losses, which in turn exacerbates food insecurity and low ART adherence (32).

In less developed countries, many PLWHA lack access to sufficient quantities of nutritious foods, which poses additional challenges to the success of antiretroviral therapy. The combined impacts of food insecurity and HIV place further strain on already limited household resources as affected family members struggle to meet household food needs (33, 34).

Malnutrition and food insecurity have been associated with progressive functional impairment, reduced immune competence, increased mortality and poor clinical outcomes and exacerbates the effects of HIV by increasing susceptibility to AIDS-related illnesses which leads to decreased rate of cure from opportunistic infections (5, 35). Evidence indicated that even relatively small losses in weight (5%) are associated with decreased survival rate (5).

ARV Treatment and Adherence Status

The level of adherence is highly affected by the level of commitment of ART service providers in providing drug adherence counselling services. Antiretroviral therapy (ART) was thought to be a solution to HIV-associated undernutrition. It is well established that most of clinically undernourished people living with HIV who start ART will improve or stabilize their weight. ART and pre-ART have different recovery rate, Clients on ART have high rate of attaining the intended BMI than on pre- ART(36).

A study done in Mangochi Health District of Malawi about Effective Therapeutic Feeding with Chickpea Sesame Based Ready-to-Use Therapeutic Food (CS-RUTF) in Wasted Adults with Confirmed or Suspected AIDS stated that being on HAART and adhering to the number of visits were associated with increased chances of nutritional status improvement while the occurrence of episodes of acute diarrhea, and complaint of poor appetite during supplementation negatively affect nutritional improvement(37).

Poor ART adherence level decrease the probability of nutritional recovery. This could be described by the fact that poor ART adherence reduces immunity (CD4) and increases the occurrence of opportunistic infection. Food-based interventions can play a supportive role in overall weight gain and improving ART adherence(38).

Other retrospective study conducted in Kenya showed that higher nutritional status at base line and compared to patients receiving HAART, patients who did not qualify for and therefore did not receive HAART during the study period had an increased rate of attaining BMI > 20(35).

Baseline Nutritional Status

A low BMI at the start of ART was an independent predictor of early mortality (ie, in the first 90 day of therapy) in several analyses from sub-Saharan Africa. In Zambia, patients who started ART with a BMI ,16.0 had 2-fold higher mortality when compared with those above this BMI threshold(39).

A study conducted in Ethiopia stated that recent commencement of ART, being moderately rather than severely malnourished, having a CD4 count higher than 200 cells/microliter, and coming from a food insecure household increased chance of recovery from malnutrition(23).

The negative effects of malnutrition are often preventable and are usually not easily reversed. Nutrition-related alterations can occur early in HIV infection; thus, nutrition intervention should begin soon after diagnosis(40).

A Retrospective Study conducted in Amhara National Regional State revealed that those patients who adhered to RUTF treatment were more likely to achieve normal BMI compared to those who did not adhered to the RUTF treatment, those patients who were moderately malnourished were more likely to achieve the desired BMI compared with those who were severely malnourished at the time of enrolment and those patients who adhered to Antiretroviral treatment (ART) were more likely to regain the desired BMI compared to those who did not adhered (17).

A cross sectional study conducted in Gondar University Hospital reveal that patients who were moderately malnourished at base line were more likely for recovery as compared with those who were severely malnourished at entry(14). .

Presence Of Opportunistic Infections

A cross sectional study conducted in Gondar University Hospital reveal that patients who had opportunistic infections like diarrhea, mouth ulcer/oral thrush, pneumonia, meningitis, and CNS toxoplasmosis were less likely to recover from malnutrition as compared to those who had no opportunistic infections at entry(14).

A study conducted in finoteselam shows that poor ART adherence reduces immunity (CD4) and increases the occurrence of opportunistic infection(38).

WHO Clinical Stage And CD4 Count

In Ethiopia 21,000 new HIV/AIDS cases and 13,000 death were recorded in 2020. From 90% target for suppressed viral load, Ethiopia reaches 450,000 (72%) which is far from the target, which food and nutrition insecurity are prevailing(11).

Participants who had a CD4 count below 100 were more likely not to respond to therapeutic food than participants who had a CD4 count above 350. Furthermore, patients who failed to have regular follow up, WHO clinical stage three, hemoglobin level below 10mg/dl were also associated with increased risk of no recovery from malnutrition (14).

A study conducted in Ethiopia on impacts of FBP showed that recovery rate was 42%, and non-response rate was 58%. Along with this, factors associated with increased chance of recovery from malnutrition included having a CD4 count higher than 200cells/micro liter(23)

Those patients with the illness at WHO clinical stage II were approximately three times more likely to be undernourished than WHO clinical stage I ART patients(41).

In general all studies on impacts of FBP showed that recovery rate was 42%, and non-response rate was 58%. Along with this, factors associated with increased chance of recovery from malnutrition included being female, recent commencement of ART, being moderately rather than severely malnourished, having a CD4 count higher than 200cells/micro liter, and coming from a food insecure house hold. Food and nutrition security plays on improving drug adherence, prevents acquiring of opportunistic infections and early mortality and improving overall quality of life for HIV patients.

2.3 Conceptual Framework

The conceptual framework was developed after reviewing different literatures with proposed to study nutritional recovery of ready to use food therapy and its predictors among adult HIV/AIDS clients. This study was conceptualizes outcome of ready to use food therapy as the result of the interaction of different factors, which have direct and indirect relation to outcome of ready to use food therapy.(7-9, 25-35)

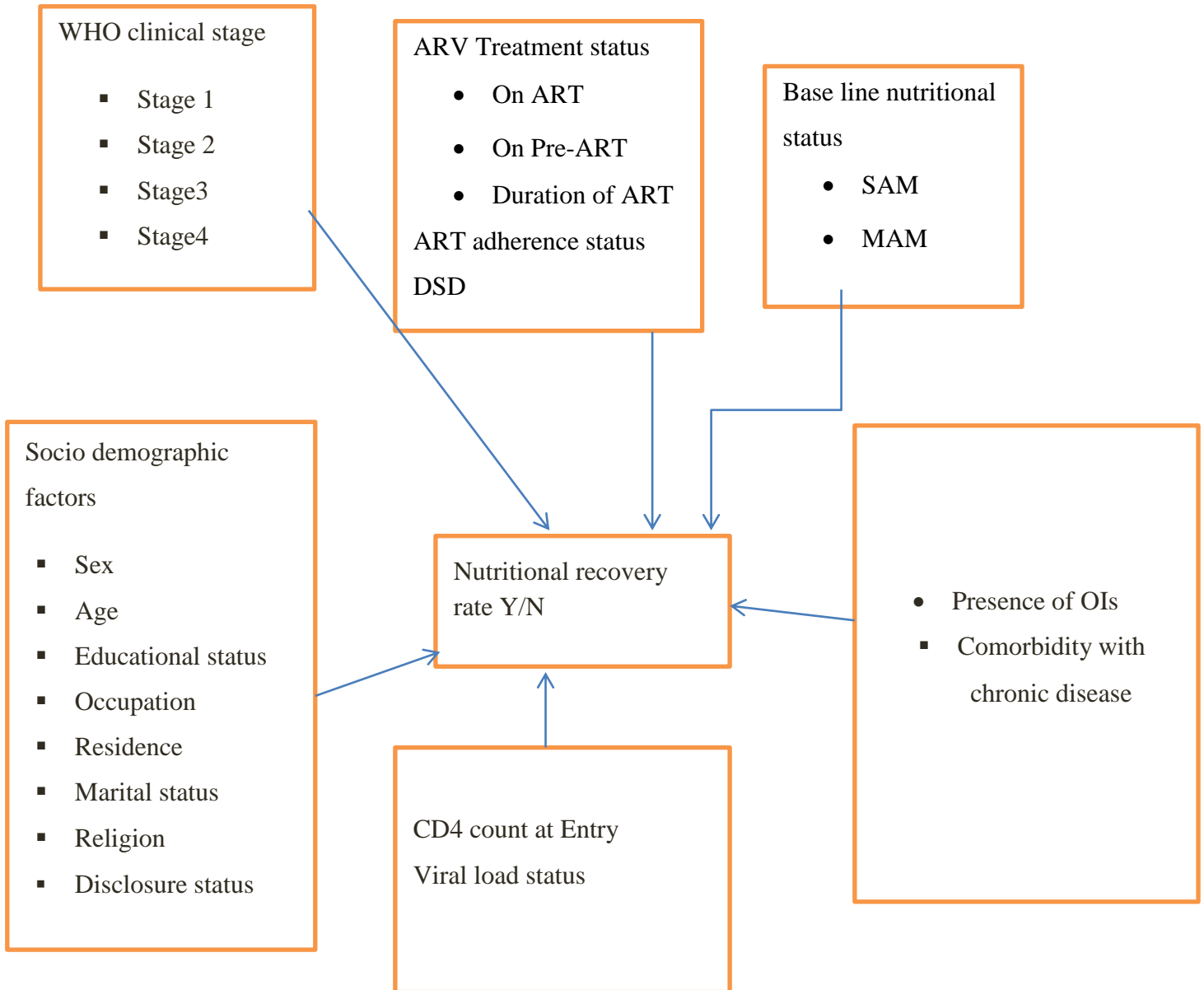


Figure 1: conceptual framework of nutritional recovery of ready to use food therapy and its predictor among adult HIV/AIDS clients South Achefer Amahara region Ethopa, 2022.

3. Study Objective

3.1 General Objective

To determine nutritional recovery and associated factors among adult HIV clients enrolled in a therapeutic feeding program in South Achefer Woreda, West Gojjam Zone, Amhara Region, Northwest Ethiopia 2022.

3.2 Specific Objectives

To determine nutritional recovery among adult HIV/AIDS clients enrolled in therapeutic feeding program in South Achefer Woreda, West Gojjam Zone, Amhara Region, Northwest Ethiopia 2022.

To identify associated factors of nutritional recovery among adult HIV/AIDS clients enrolled in therapeutic feeding program in South Achefer Woreda, West Gojjam Zone, Amhara Region, Northwest Ethiopia 2022.

4. Methods And Materials

4.1 Study Design And Period

Institutional based cross-sectional study was conducted in south achefer woreda health facilities from May 25 to June 22, 2022.

4.2 Study Area And Settings

The study was conducted in south achefer woreda which is located in Northwest Ethiopia and it is 491 km far from Addis Ababa, the capital city of Ethiopia, and 60 km away from Bahir Dar, the capital city of the Amhara regional state. There are 170,032 population in the catchment from which 82,056 were male and 87,976 were females. From the total population 87,430 were estimated in the age group of 15-59 years.

There were 8 health centers, 1 primary hospital and 11 private clinics in the study area of which 2 health centers and the primary hospitals were ART sites.

The food by prescription nutritional treatment program was started since 2011 in Durbete and lalibela health center. Those Health facilities serves about 1270 people living with HIV and 846 clients were enrolled in therapeutic feeding program.

4.3 Source Population

All adult (≥ 18 years) HIV infected people who were following care and treatment in south acheferworeda health facilities.

4.4 Study Population

All adult HIV clients who were malnourished and enrolled in a therapeutic feeding program between February 2011 and January 2021 in south achefer woreda health facilities and had recorded nutritional treatment outcomes.

4.5 Inclusion And Exclusion Criteria

4.5.1 Inclusion Criteria

Adult HIV positive individuals age greater than ≥ 18 years, who have nutritional intervention and registered in the food by prescription registration book with documented nutritional treatment outcomes from February 2011 and January 2021.

4.5.2 Exclusion Criteria

Those who were transferred out to other health facility without completing the treatment and those clients with incomplete patient records, those who are registered more than one time by malnutrition, Pregnant women and patients with body swelling (edematous patients) were excluded from the study because BMI measurement was not accurate for these groups of the population.

4.6 Sample Size Determination

The sample size was calculated by two different ways; by nutritional recovery rate and by its predictors based on this, the maximum sample size was taken.

For estimating the recovery rate, a single population proportion formula was used to calculate the sample size by considering the following statistical assumptions:

$$n = (z_{\alpha/2})^2(p)(1 - p)/d^2$$

Where, n = sample size; d = tolerable marginal error; P = the proportion of nutritional recovery rate from previous study performed at Ethiopia (0.42)(23). Hence, with 95% confidence level (Z = 1.96) and 5% precision. Finally, after adding 10% for incompleteness of data, the required sample size for determining the recovery rate was 411.

For the second objective, the sample size determination for predictors of treatment recovery rate from nutritional program was calculated using double population proportion formula by using Epi Info version 7 statically programs by considering 95%CI, power 80%,1:1 ratio for exposed to non-exposed group. Accordingly, the maximum sample size based on the above two formulae after considering 10% incompleteness were 411 and 308. For better estimate of parameters, the maximum sample size of 411 was used.

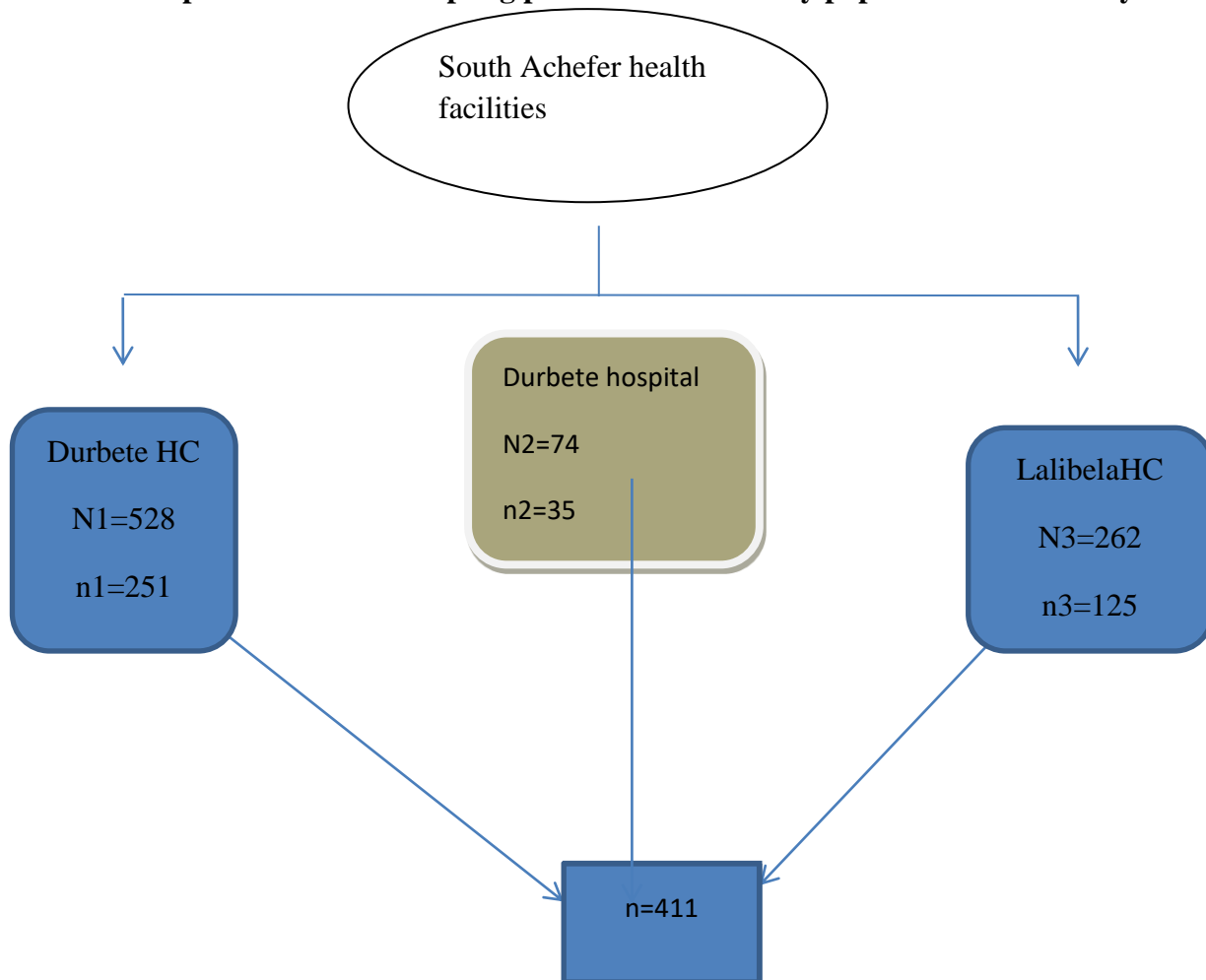
Table 1 Sample size determination of the second objective for a study conducted on nutritional recovery and associated factors among adult HIV patients at south Achefer woreda, 2022.

Explanatory variables		Ratio(une xposed: exposed)	BMI improved		AOR	sampl e size	After 10% non respons e	Reference
			No	Yes				
Sex	Male	1:1	77 (47.0)	87(53.0)		280	308	(29)
	Female		119(33)	241(67.0)	2.157			
ART adherence status	Good	1:1	151 (35%)	133 (30.9%)	2.14	280	308	(24)
	Poor		105 (24.4%)	42 (9.7%)				
Nutritiona l status at admission	MAM	1:1	179(41.5 %)	169(39.2 %)	6.7	96	106	(24)
	SAM		77(17.9%)	6(1.4%)				

4.7 Sampling procedures

Records of 864 HIV infected adult patients on the food by prescription program, which were collected through retrospective review in the following therapeutic feeding units in South Achefer District: Durbete Primary Hospital= 74, Health Center =528 and Lalibela Health Center=262. Simple random sampling was used to select the record of each patient from the therapeutic feeding registration logbook from each clinics based on their unique identification number, and then their charts were reviewed. As the study was conducted through a review of records, no consent was asked from the patient. The confidentiality and privacy of the patient records were ensured by avoiding names and identification numbers from the extraction form and codes were used instead.

Schematic presentation of sampling procedure from study population in the studyarea



Note:

N = total malnourished HIV clients, n = sample malnourished HIV clients registered on FBP register

$$N = N1 + N2 + N3$$

$$n = n1 + n2 + n3$$

Figure 2 Schematic presentation showing sampling procedures in South Achefer Woreda, Northwest Ethiopia, 2022.

4.8 Data Collection Tools and procedures

Data was collected by document review using structured checklist that was adapted from the Ethiopia Federal Ministry of Health food by prescription program registration book, patient chart, and follow-up form. A one day practical training was given for data collectors on the objectives of the study, how to review registration logbooks and the patient's chart, and to maintain the confidentiality of the data. The patient chart, food by prescription registration book, and HIV follow-up card (which contains CD4 count result, viral load result, weight, height, BMI, opportunistic infections, and other pertinent findings) was the source of data. The checklist includes socio-demographic data, clinical and laboratory data, ART-related data, and follow-up data. The data was collected by three clinical nurse professionals who were not working on ART clinic at the time of data collection. Two runners were used for bringing cards from the card room and one data clerk was used to get information from smart care computer program. The principal investigator and the supervisors were closely monitor the whole data collection process on a daily basis.

4.9 Variables Of The Study

4.9.1 Dependent/Outcome Variables

Recovered or not recovered

4.9.2 Independent Variables/Study Variables

The independent variables are age, sex, religion, educational status, occupation, residence, ARV regimen, duration of ART, ART level of adherence, WHO clinical stage, opportunistic infection (OI), CD4 count, viral load number, disclosure status, Differentiated service delivery and functional status.

4.10 Standard Definitions

Recovered:- Patients reached a BMI of $\geq 18.5\text{kg/m}^2$ for two consecutive visits within 3 months for MAM and within 6 months for SAM(42).

Not recovered:- Participants who did not reach a BMI of 18.5kg/m^2 for two consecutive visits within 3 months for MAM and within 6 months for SAM(42).

Moderate acute malnutrition (MAM) is defined as BMI 16.5 kg/m^2 – 18.49 kg/m^2 (42).

Severe acute malnutrition (SAM) is defined as $BMI < 16.5 \text{ kg/m}^2$ (42).

Normal nutrition is $BMI \geq 18.5 \text{ kg/m}^2$ to $< 24 \text{ kg/m}^2$ (42).

Overweight is $BMI \geq 25 \text{ kg/m}^2$ to $< 30 \text{ kg/m}^2$.

Ready to Use Food (RUF) includes both RUTF and RUSF, which are nutrient dense food packed in sachets.

Intake of RUF/day: To meet their additional daily energy requirements, patients received four sachets of RUTF (2000 kcal; Plumpy' nut) per day if they were classified as SAM and two sachets of RUSF if they were classified as MAM, and/or exhibiting significant weight loss or demonstrating signs or symptoms of a disease. Patients had a monthly nutritional follow-up before renewal of their RUF prescription(42).

Duration of therapy: Severely malnourished adults stay in nutritional programs for a minimum of four months and a maximum of six months, being supplemented with RUTF for the first two to three months and continuing with RUSF for the next two to three months. Those admitted to the nutritional program with a classification of MAM, exhibiting signs or symptoms of a disease, or who lost 5% of their body weight remain in the program two to three months taking RUSF.

Baseline clinical data means record at the time of malnutrition diagnosis(42).

The level of ART adherence was classified based on the percentage of ARV drugs taken (Good ART adherence defined as 95% or greater of doses taken as prescribed, fair adherence defined as 85–94% of doses taken as prescribed, and poor adherence defined as less than 85% of doses taken as prescribed)(43).

Differentiated service delivery is a person centered approach to HIV service delivery. Moving away from a one size fits all model, DSD tailors HIV services to diverse groups of people living with HIV while maintaining the principle of the public health approach(44).

4.11 Data Management And Analysis

Data was entered in to Epi-Data version 3.1 statistical software and then exported to SPSS version 25 for analysis. Before analysis data cleaning(cheking missing value) coding and recoding was done.

Descriptive statistics were used to describe demographic and clinical characteristics of patients. Binary logistic regression analysis was done for independent variables with an outcome variable to select candidate variables for multivariable analysis. Variables with a p value < 0.25 in bivariable analysis was included into a multivariable logistic regression analysis to identify the independent predictors of nutritional recovery of ready to use food therapy. Then variables with significant associations for nutritional recovery of ready to use food therapy among HIV clients was identified based on the adjusted odd ratio (AOR) with a 95% CI and p-value < 0.05.

4.12 Data Quality Assurance

Data was collected using three trained health professionals and regular follow-up were carried out during data collection period by principal investigator. During the data collection process the filled checklist were checked for their completeness, consistency and accuracy by the principal investigators and supervisor every day during data collection period. The collected data was cleaned before the analysis.

4.13 Ethical Clearance

Ethical clearance was obtained from the Ethical Review Committee of Bahirdar University, Amhara public health institute, south achefer woreda health office and permission was taken from administrations of the Durbete hospital, Durbete and lalibela health center after verifying about the study. The information were collected from the food by prescription register and patient medical card was used only for the research purpose and kept confidential. No patient identifying information was recorded to maintain the anonymity of the information.

5. Results

5.1 Socio-Demographic Characteristics

There were 411 participants document reviewed of whom 69.8% of them were females and the overall mean (SD) age of patents was 33.28 (\pm 8.685) years. More than half of participants were lived in urban area (56.9%) and 45.2% of them were married. The mean distances from health facility were 11.73 km which was far from their got. The majority of participants were attained no education (47.7%) while 30.4% had attained primary education.

Table 2 Sociodemographic characteristics of adult HIV clients enrolled in food by prescription program in south achefer district, West Gojjam Zone, Amhara region Ethiopia, 2022.

Variables		Frequency	Percent
Age	18-29	145	35.3
	30-39	178	43.3
	40-49	65	15.8
	\geq 50	23	5.6
Sex	Female	287	69.8
	Male	124	30.2
Marital status	Married&cohabitated	186	45.2
	Never married	57	13.9
	Divorced	115	28.0
	Widowed	26	6.3
Educational status	Separated	27	6.6
	No education	196	47.7
	Primary	125	30.4
	Secondary	66	16.1
Occupation	Tertiary	24	5.8
	Employed	52	12.7
	House wife	164	39.9
	Farmer	140	34.1
	Merchant	42	10.2

	Daily laborer&student	13	3.1
Religion	Orthodox	382	92.9
	Muslim	19	4.6
	Protestant	10	2.4
Residence	Urban	234	56.9
	Rural	177	43.1
Distance	<5 km	208	50.6
	>5km	203	49.4

5.2 Nutritional And Hiv Related Characteristics

At base line, 97 (23.6%) were on Sever Acute Malnutrition (BMI of <16kg/m²), 314 (76.4%) were on Moderate Acute Malnutrition (BMI of 16-18.4kg/m²). From the reviewd documents 107(26%) of them had opportunistic infections. Majority of them350(90.8%) had suppressed viral load, 22 (5.4%) low viremia and the rest 16(3.9%) had high viral load number.

Among the participants 227(55.2%) were not enrolled in differentiated service delivery the rest 184(44.8%) were enrolled in DSD.

Table 3 Nutritional and HIV related characteristics of adult HIV clients enrolled in food by prescription program in south achefer district, West Gojjam Zone, Amhara region Ethiopia, 2022.

Variables		Frequency	Percent
WHO stage	Stage 1	287	69.8
	Stage 2	57	13.9
	Stage 3	57	13.9
	Stage 4	10	2.4
Baseline	SAM	97	23.6

nutritional status	MAM	314	76.4
CD4 count	<200 cells/m ³	176	42.8
	200-350 cells/m ³	142	34.5
	>350 cells/m ³	93	22.6
Viralload status	Not detected	350	90.8
	Low viremia	22	5.4
	High viral load	16	3.9
HIV Treatment status	On ART	371	90.3
	Pre ART	40	9.7
ART adherence	Good	321	78.1
	Fair	40	9.7
	Poor	10	2.4
Opportunistic infections	TB	39	9.5
	Chronic Dearhea	14	3.4
	Oral trush	40	9.7
	Bacterial pneumonia	15	3.6
Functional status	Working	351	85.4
	Ambulatory	54	13.1
	Bedridden	6	1.5
DSD	Yes	185	45.0
	No	226	55.0

Comorbidity present	Yes	18	4.4
	No	393	95.6
Disclosure status	Disclosed	260	63.3
	Not disclosed	151	36.7
Nutritional counseling	Yes	358	87.1
	No	53	12.9

5.3 Nutritional Recovery

From a total of 411 patients enrolled into the RUFT 46.5% (95% CI: (41.8-51.1)) were recovered and 53.5% of patients didn't recovered according to the predefined RUFT exit criterion.

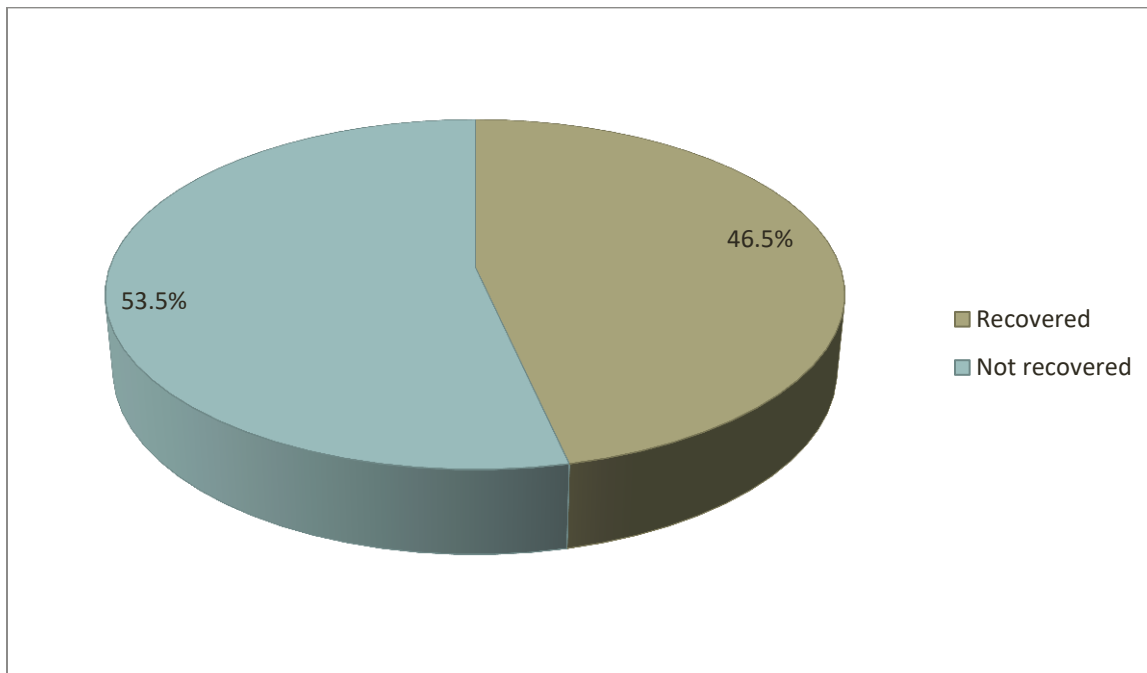


Figure 3 Nutritional recovery of ready to use food therapy among adult HIV clients enrolled in food by prescription program in south achefer district, West Gojjam Zone, Amhara region Ethiopia, 2022.

5.4 Factors Associated with Nutritional Recovery

In bivariable analysis marital status, presence of opportunistic infection (OIs), baseline nutritional status, residence, adherence to ART, Differentiated service delivery enrolment, duration of nutritional treatment, WHO clinical stage and Baseline CD4 count were significantly associated with nutritional recovery at p-value <0.25.

In multivariable analysis baseline nutrition, adherence to ART and Differentiated service delivery enrolment were found to be factors associated with nutritional recovery with 95% CI and p-value <0.05.

Patients diagnosed as severe malnutrition during entry were 2.20 times more likely to not to recovered than moderate malnutrition. Patients enrolled in DSD were 45% more likely to not to recover than with not enrolled in DSD. Patients who had poor adherence were 2.31 more likely to not to recovered.

Table 4 Bivariable and multivariable analysis of predictors of adult HIV clients enrolled in food by prescription program in south achefer district, West Gojjam Zone, Amhara region Ethiopia 2022.

Variable	Recovery rate		COR* (95% CI*)	AOR* (95% CI*)	
	Not Recovered	Recovered			
Resident	Urban	132(60)	102(53.4)	1.31(0.01-1.35)	0.57(0.34-1.00)
	Rural	88(40)	89(46.6)	1	1
Marital status	Married	92(41.8)	94(49.2)	0.74(0.91-1.99)	1.04(0.61-1.80)
	Never married and others	128(58.2)	97(50.8)	1.	1
WHO stage	Stage 1&2	181(82.2)	163(85.3)	0.8(0.58-23.21)	1.23(0.73-2.10)
	Stage 3&4	39(17.8)	28(14.7)	1	1

Adherence to ART	Good	153(80.5%)	168(92.8%)	1	1
	Fair& poor	37(19.5%)	13(7.2%)	3.13(0.02-1.96)	2.31(1.44-8.46) **
Differentiate dservice delivery	Yes	100(45.5%)	85(44.5%)	1	1
	No	120(54.5%)	106(55.5%)	0.96(0.61-400.39)	0.55(0.31-0.98) **
Duration of nutritiontreatment	<3 month	175(79.5)	131(68.6)	1.78(1.138-2.788)	1.31(0.71-2.42)
	>3month	45(20.5)	60(31.4)	1	1
Baseline nutritional status	SAM	66(30)	31(16.2)	2.21(1.087-3.094)	2.20(1.37-3.58) **
	MAM	154(70)	160(83.8)	1	1
OI	Yes	65(29.5)	42(22)	1.49(0.188-0.943)	0.78(0.37-1.64)
	No	155(70.5)	149(49)	1	1
CD4 count	<200 cells/m ³	87(45.6)	89(40.5)	1	1
	200-350 cells/m ³	53(27.7)	89(40.5)	0.61(1.13-5.97)	1.04(0.31-3.47)
	>350 cells/m ³	51(26.7)	42(19)	1.21(0.59-3.66)	0.49(0.17-1.42)

COR* = Crude odds ratio; CI* = Confidence interval; AOR* = Adjusted odds ratio; ** = P-value < 0.05

6. Discussion

In this study, 46.5%(95%CI:(41.8-51.1) of those enrolled in the food-by-prescription program recovered. This study was in line with study in Ethiopia, Malawi and Sub-Saharan Africa (Kenya and Uganda) found 42%, 49.4% and 47.4 percent recovery rate respectively (13, 23, 37).

This may be due to that the nutritional program in HIV clients use the same type of nutritionally dense supplemental foods such as RUTF and RUSF with nearly the same treatment duration (45).

However, this study is lower than those conducted in Mekele (62.6 percent recovery) and Tigray (55.3 percent recovery). (24, 29). The recovery rate is below the sphere standard which is >75% recovery rate (8).

One possible explanation is that most severely malnourished patients have opportunistic infections and are in advanced stages of HIV. Furthermore, being severely malnourished takes longer to recover than being moderately malnourished. The distance from home to health facilities may also affect the recovery rate.

According to the findings of this study, patients who had opportunistic infections at the time of entry were less likely to recover from malnutrition than those who did not have an opportunistic infection. The most common opportunistic infections were diarrhea, tuberculosis, mouth ulcers, and other opportunistic infections such as pneumonia. WHO states that HIV-related infections, such as tuberculosis and diarrhea, not only have nutritional status as a significant determinant of their incidence and severity, but they also have severe nutritional consequences that commonly precipitate appetite loss, weight loss and wasting (4). Similarly, a study done in Mekele found that patients with opportunistic infections had a lower chance of recovering from malnutrition (29). ARVs may have side effects that can affect appetite, and/or the availability, absorption, and utilization of nutrients (1).

The finding in this study is higher than a study conducted at Gonder University, where 24 percent of clients were recovered, and a study conducted in the Amhara region, where 41 percent of clients were recovered (25, 45). A study conducted in Kenya found that the recovery rate was 35.3 percent, which is lower than the rate found in this study (7).

Possible explanation may be good adherence of clients with antiretroviral therapy increase the recovery rate. ART is a crucial part of HIV care. All HIV treatment programs should include nutritional interventions as a core component. Increased focus on food and nutrition may improve ART acceptance, adherence, and effectiveness which in turn improve recovery rate(4).

Differential service delivery, poor adherence to ART, baseline nutritional status were factors associated with low recovery in adult HIV patients enrolled in the food by prescription program. Clients who were severely malnourished at the entry were more likely to not recover than moderately malnourished patients. In line with this, a study conducted in Ethiopia on the effects of food by prescription revealed that being moderately malnourished has a higher chance of recovery than being severely malnourished. Furthermore, a study conducted in the Amhara region and Mekele on the outcome of ready-to-use therapeutic food revealed that being moderately malnourished at enrollment resulted higher rate of recovery from malnutrition(24, 29).

The finding shows that clients enrolled to differentiate service delivery were 45% more likely to not recovered than their counterparts. Clients with poor adherence to ART were more likely not recovered when compared to good adherence to ART. HIV necessitate lifelong care, thus appointment systems are essential for ensuring that patients receive regular follow-up and health care workers are able to track and support patient retention. Utilization of community-based groups of patients for ART refills and adherence assessments has also been shown to increase retention for ART(46) However, patients with severe malnutrition with complications must come two times per month, while those with severe malnutrition without complications must visit once a month. Patients with moderate malnutrition must visit once a month, WHO staging at every visit, including assessment and treatment of opportunistic illnesses is recommended(42).

A study conducted in Ethiopia, Mekele, and Kenya discovered a link between CD4 count at entry, ART treatment status, WHO clinical stage, residency and recovery rate from malnutrition. However, there is no association in this study(7, 23, 24, 29). A study conducted in south Africa, Kenya, shows being male have an association with recovery(7, 24). and study conducted in Ethiopia and Mekele on impacts of food by prescription showed that being female was associated with increased chance of recovery (23, 29). But in this study sex have no association with the outcome variable.

A Study conducted in Kenya showed that younger age was associated with recovery from malnutrition, whereas this study shows no association between age and recovery. A study conducted in Mekele showed that those clients who were illiterate were less likely to recover than educated. But this study shows no association which is in line with study conducted at Gondar university.

7. Strength and Limitation Of The Study

7.1 Strength

The data was collected from food by prescription registration books and patient cards, it was strictly depends on the outcome of BMI. Distance from health facilities to their kebele or got was taken from Google map and local transport office.

7.2 Limitation

Adherence to RUTF , food sharing at the household level, family income, and other factors were not taken into account because the data was gathered retrospectively on the document.

8. Conclusions

In conclusion, the recovery of this study was low when compared to the sphere standard. Severity of malnutrition, clients involved in differentiated service delivery, and poor adherence to ART were factors for nutritional recovery.

9. Recommendations

Durbete and Lalibela Health Center, Durbete Primary Hospital ART Clinics

For Health Care Providers

Enhance quality of life and minimize nutritional impact by promptly treating infections and managing symptoms that affect nutrient intake. It is also preferable to modify the monthly appointments for prescribing ARV drugs for malnurtioed individuals in order to keep clients in the program.

For Adherent Suporters strengthening strong counseling by identifying barieres for poor adherence.

For Researchers

Because the data collected in the document review, it did not consider factors such as hygiene and sanitation, food sharing, and other considerations that should be considered in future studies.

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11. Annexes

Annex1. Data extraction format/check list

This data extraction format is prepared for the collection of socio-demographic, nutritional and HIV/AIDS related information that are important for the assessment of outcome of ready to use food therapy and its predictor among HIV/AIDS clients.

All this information will be retrieved from the food by prescription register book and patient card without mentioning the names of the patient. This information will be collected by the health care provider who is working at Durbete and Lalibela health center.

Mr./Sr.....(Nurse/HealthOfficer
) is/are requested to extract the existing data as you are participating in this Research project.

Annex2. English Version Data extraction format/check list

Socio- demographic characteristics

S.No	Questions	Coding Categories	Skip Pattern
101	Sex	1. Male 2. Female	
102	Age in years(enter number)	-----years	
103	Residence	1. Urban 2.Rural	
104	Religion	1. Orthodox 2.Muslim 3.Protestant 4.Catholic 5.other specify_____	
105	educational level	1. can not read and write 2. Can read and write 3. Secondary 4. Technical and vocation/Diploma and above	
106	Occupation	1. Employed 2. Housewife 3. Farmer 4. Merchant 5. Daily laborer 6. Other (specify	
107	marital status	1.Currently married 2. Cohabiting 3. Never married 4.Divorced 5.Widowed 6. Separated	

General Information (Nutritional and HIV/AIDS related Characteristics)

QID	Questions	Response Options	Skip Pattern
201	Weight	_____kg	
202	Height	_____M	
203	BMI	_____ Kg/m ²	
204	Base line Nutritional status	1. SAM 2. MAM	If2 skip to 206
205	Prescribed RUTF for SAM	1. 4 sachets/day 2. <4 sachets/day	
206	Prescribed RUTF for MAM	1. 2 sachets/day 2. 1sachet /day	
207	WHO clinical stage	1. Stage1 2. Stage2 3. Stage3 4. Stage4	
208	Baseline CD4 count	-----	
209	Baseline Hgb	-----	
210	Viral load status	-----	
211	ART treatment status	1. On ART 2. On pre ART	If 2 skip to 215
212	Duration of ART treatment	-----	
213	Regimen	1. 1 st line 2. 2 nd line	
214	Adherence to ART	1. Good 2. Fair 3. Poor	
215	Is there presence of OI?	1. Yes 2. No	If2 skip to218
216	Which OI Presence?	1. TB 2. Chronic diarrhea 3. Mouth ulcer/Oral Thrush 4. Other OIS	
217	OI managed	1. Yes 2. No	
218	Treatment out come	1. recovered 2.not recovered	
219	Functional status of clients	1. Working 2. Ambulatory 3.Bedrden	
220	Nutritional counseling	1. Yes 2. No	

221	Regular follow-up	1. Yes 2. No	
222	Duration on the nutritional program	1. < 3month 2. > 3month	
223	Disclosure status at enrollment	1. Disclosed 2. Not disclosed	
224	Distance from health facilities	-----	
225	Does the client reside within the catchment area?	1. Yes 2. No	
226	Is there presence of comorbidity?	1. Yes 2. No	If 2 skip to228
227	If yes inQ227Which comorbidity presence?	1. DM 2. Cardiac pro 3. Chronic hepatitis	
228	The number of families in the house?	_____	

Declaration

I, the under signed, declared that this is my original work. It has never been presented in this or any other University, and that all the resources and materials used for the research, have been fully acknowledged.

Principal investigator

Name: Dessalegn Mihiret Adane

Signature: _____

Date: 17/12/2014

Advisors

Name: Dr Dereje Birhanu

Signature: _____

Date: 18/12/2014

Name: Mr Samuel Dagne

Signature: _____

Date: 17/12/2014

Internal examiner

Name: Prof. Netsanet Fentahun

Signature: _____

Date: _____

