

Assessment of Nutritional Status and Associated Factors among Prisoners Living with HIV/AIDS in Kality Prison, Addis Ababa, Ethiopia

Tsebaot Kassa, Atsede Alle and Mehret Tesfu*

College of Medicine and Health Sciences, Debre Markos University, Debre Markos, Ethiopia

Abstract

Introduction: In the case Human Immune Deficiency virus/Acquired Immune Deficiency Syndrome (HIV/AIDS), prison conditions not only contribute to the risk of transmission, it also hastens the progression of HIV and deterioration in the health of prisoners living with HIV/AIDS. Prisons typically comprise marginalized sections of society and at high nutritional risk due to lack of diet diversity, as these prisoners depend on few kinds of food for a long time and in a situation, adequacy of nutritional requirement is a great issue of concern.

Objective: To assess nutritional status and associated factors among prisoners living with HIV/AIDS in Kality prison, Addis Ababa, Ethiopia, 2016.

Method: Institution based cross sectional study design was conducted among randomly selected 412 prisoners on pre Anti-Retroviral Therapy and Anti-Retroviral Therapy in Kality prison, Addis Ababa, Ethiopia from February to March, 2016. The data entered to Epi-info version 7.0 and export to Statistical Package for Social Science version 20.0 for further analysis. Descriptive statistics, binary and multivariable logistic regression analysis were employed to identify nutritional status and associated factors that affect nutritional status of prisoners living with HIV/AIDS.

Results: The overall magnitude of malnutrition was found to be 43% among prisoners living with HIV/AIDS. Female respondents were 92% times less likely to develop malnutrition than male respondents (AOR 0.08 [95% CI 0.02, 0.42] and those who were in the age range of ≥ 50 were eight times more likely to be malnourished with (AOR 8.68 [95% CI 1.59, 47.28]) than other age groups.

Conclusion: The prevalence of underweight was very high among prisoners living with HIV/AIDS in this area.

Recommendation: The prison administrative body should give emphasis on increasing diversified food and Proper nutritional assessment should be the vital part of HIV care management by health workers.

Keywords: Prisoners; HIV/AIDS; Nutritional status

Abbreviations: AA: Addis Ababa; AIDS: Acquired Immune Deficiency Syndrome; ART: Anti-Retroviral Therapy; BMI: Body Mass Index; CD4: Cluster of Differentiation 4; ETB: Ethiopian Birr; FAO: Food and Agriculture Organization; HAART: Highly Active Anti Retro Viral Therapy; HIV: Human Immune Deficiency Virus; MSF: Medicines sans Frontiers; MSM: Men who have Sex with Men; OI: Opportunistic Infections; PLWHIV/AIDS: People living With HIV/AIDS; RUTF: Ready to Use Therapeutic Food; SPSS: Statistical Package for Social Science; TB: Tuberculosis; USA: United States of America; WHO: World Health Organization

Introduction

Prison is an institution that holds people who have been sentenced to a period of imprisonment by the courts for offences against the law. On the other hand, a prisoner also known as inmate or detainee, is a person who is deprived of liberty against his or her will and have no control over their environment as a result of their incarceration [1]. Since prisoners are not free living people, they usually depend on prison diet and have no control over the quality and quantity of meals consumed [2].

Since the first reports of HIV/AIDS in prisons published more than 25 years ago, the prison health issue has been the most highly researched worldwide. Studies on prison populations in most countries have consistently reported rates of HIV infection in prisons exceeded than the general population. Most time, access to health care in prison settings is limited and not equivalent to the services that are available in

the wider community. When people living with HIV/AIDS especially those who are taking ART medication are incarcerated. The health risk is due to treatment adherence of inmates and has proved to be challenging, particularly where food is scarce [3,4].

There is convincing evidence on the relationship between the HIV epidemic and malnutrition, PLWHIV are more likely to become malnourished due to reduced food intake, side effects of medication, depression, poor absorption of nutrients and HIV-caused intestinal cell damage, increased energy needs as a result of virus replication and opportunistic infections, changes in the way the body uses the nutrients it receives or has stored. Malnutrition on the other hand, contributes to immune system impairment, making the body vulnerable to frequent illness, there by accelerating disease progression [5]. Additionally, appropriate nutrition can improve ART absorption and tolerance as well as improve quality of life of PLWHIV/AIDS [6-8].

***Corresponding author:** Mehret Tesfu, College of Medicine and Health Sciences, Debre Markos University, Debre Markos, Ethiopia; Tel: 251913256221 ; E-mail: mercytes3@gmail.com

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Methods

Study design and period

Institutional based cross-sectional quantitative study was conducted in Kality prison, Adis Abeba, Ethiopia, to assess the nutritional status and associated factors among prisoners living with HIV/AIDS, from February to March, 2016.

Study area

Kality prison is a Federal state prison center which is located in Akaki/Kality subcity woreda 7 around 25 km from Addis Ababa, Ethiopia. It is located on the southern edge of the city and serves as the main prison of Ethiopia. The prison is divided into male and female zones, comprising around 4,000 sentenced prisoners currently, of which 3,400 were males and 600 were females. There were a total of approximately 550 prisoners living with HIV/AIDS currently, of which 300 were on pre ART and 250 were on ART. The institution has its own clinic with the composition of ART clinic, TB clinic, inpatient and outpatient departments, laboratory and pharmacy. The ART clinic is supervised by a trained BSC nurse and a data clerk.

The source population

All prisoners above 18 years and living with HIV/AIDS in Kality prison during the study period.

The study population

Prisoners who were above 18 years living with HIV/AIDS and randomly selected in Kality prison during the study period.

Inclusion criteria

Prisoners above 18 years old, living with HIV/AIDS, both pre ART and ART participants and who stayed in the prison for at least six months were included.

Exclusion criteria

Subjects who were severely ill to participate as well as those who had incomplete information (CD4 cell count, WHO clinical stage, adherence status) in the registration book were excluded.

Sample size determination and sampling procedure

Sample size for the first objective: calculated using the formula for the estimation of single population proportion:

$$n = z^2 PQ / d^2$$

n=sample size required in the study

Z=95% confidence level (1.96)

P= (malnutrition among prisoners living with HIV/AIDS or the whole prisoners 50%)

$$Q = 1 - p \quad (1 - 0.5)$$

d²=margin of error (5%)

$$= 384$$

By considering a non response rate of 10%, the sample size was 422

Sampling procedure: The HIV status was ascertained from the prisoner medical chart available at prisoners' card room. The total numbers of prisoners living with HIV/AIDS in Kality prison were around 550, From these 300 were on ART and 250 were on Pre- ART,

and in order to select 422 participants from on ART and Pre-ART proportionately, mathematical equation was applied;

$$n1 = (N1 * nf) / Nf$$

Where n1: is the required sample size from ART clients,

N1: is total number of clients on ART,

nf is the sample size of this study,

Nf is total number of prisoners living with HIV/AIDS in Kality prison,

Where as

$$n_2 = (N_2 * n_f) / N_f$$

Where n₂ is the required sample size from Pre- ART clients and

N2 is total number of Pre-ART clients,

$$n1 = 300 * 422 / 550 = 230, n2 = 250 * 422 / 550 = 192,$$

Then by using systematic random sampling technique the first subject was selected after having a complete serial number list from using ART registration book ($k = N/n = 550/422 = 1.3$). The first subject was selected by lottery and then every other subject was selected going on serially until the total number was achieved. Repeated visits were excluded by using codes, recording and checking their registration number of each client at the time of data collection.

Variables of the study

Dependent variable: The dependent variable was nutritional status of prisoners living with HIV/AIDS measured by BMI.

Independent variables:

Socio-demographic characteristics: Sex, age, educational status, marital status, source of support.

Medical and other related factors: Presence of eating difficulty, type of eating difficulty, presence of current/past OI, adherence status to ART, CD4 cell count status, Clinical stage.

HIV treatment related factors: Pre ART or on ART, duration of ART, type of ART currently in use, change of regimen of ART, reasons for changing regimen of ART, Side effects.

Prison related factors: Duration of stay in prison, Source of water.

Meal frequency: Frequency of source of energy, proteins, vitamins and minerals consumption.

Operational definition

Nutritional status: Nutritional status is the nutritional condition of an individual measured by Body Mass Index (BMI).

BMI: BMI is the ratio of weight for height squared (wt/ht^2) measured by kilogram per meter squared (kg/m^2).

Based on WHO BMI classification:

<16 kg/m^2 =severe under nutrition

16-16.99 kg/m^2 =moderate under nutrition

17-18.49 kg/m^2 =mild under nutrition

18.5-24.99 kg/m²=normal nutrition status

25-29.9 kg/m²=over weight

≥ 30 kg/m²=obese

WHO criteria for CD4 cell count classification

<200 cells/mm³=severe immune deficiency

200-499 cells/mm³=moderate immune deficiency

>500 cells/mm³=mild immune deficiency

Criteria for adherence classification:

Good adherence: If average adherence is >95% (he/she missed ≤ 2 doses of 30 doses or ≤ 3 doses of 60 doses).

Fair adherence: If average adherence is 85%-94% (he/she missed 3-5 doses of 30 doses or 4-8 doses of 60 doses).

Poor adherence: If average adherence is <85% (he/she missed ≥ 6 doses of 30 doses or ≥ 9 doses of 60 doses).

WHO Clinical stage of established HIV infection: Stage I-Asymptomatic

Stage II-Mild symptoms

Stage III-Advanced symptoms

Stage IV-Severe symptoms

Eating difficulty: If a subject having any of the following symptoms at the time of data collection:

-Loss of appetite

-Nausea/vomiting

-Swallowing difficulty

-Others like heartburn, abdominal cramp, bloating

Data collection procedure and quality control

Data were collected using a structured interviewer's administered questionnaire which was developed in English and translated to Amharic language and back to English by language expert to keep the consistency of the questions. The questionnaire was pretested on five percent of study population in another prison center that was not included in the main study for consistency of understanding and completeness of data. The Amharic version was used for collecting information.

The height and weight of the patients was measured in light clothing and bare feet. The values were recorded to the nearest 0.1 cm and 0.1 kg, respectively. Height was measured while the patients were standing erect in a Frankfurt position and the weight was measured on a standing scale. When it was not possible to measure height as in the case of people unable to assume erect positions, height could be estimated from arm span or demi span or knee height position.

Participants medical chart were reviewed for CD4 cell count status which was done every six months as routine follow up purpose. Their last visit CD4 cell count and clinical status were taken based on WHO clinical staging-Stage I, Stage II, Stage III, Stage IV to review clients clinical condition of their last month visit and their last month drug adherence status were obtained from clients medical chart.

Training was given for two data collectors and one supervisor

who were diploma nurses on how to fill questionnaires and taking anthropometric measurements properly for one day duration. The principal investigator was supervised data collection process and reviewed every questionnaire for completeness.

Data processing and analysis

The collected data were cleared for completeness and consistencies and the responses in each question were coded for simplicity of data entry. The data were entered to Epi-info version 7.0 and exported to SPSS version 20.0 for analysis.

A binary logistic regression analysis was employed to examine the relationship between the outcome variable and independent variables. Those variables found to be significant at P<0.2 in the binary logistic regression analysis were entered into multivariable logistic regression model and statistical significance was considered at P<0.05. Results were presented with tables and graph as appropriate.

Results

Socio demographic characteristics

A total of 412 prisoners living with HIV/AIDS enrolled in this study with a response rate of 97.6%. The majority of respondents were male 362 (87.9%). The mean age of the respondents was 35.9 years with a standard deviation of ± 9.6 years. The largest numbers of clients were in the age range of 30-39 years (36.7%). From participants, 83 (20.1%) had source of support and from these 62 (74.7%) were from visitors (Table 1).

Medical and other related problem of respondents

The presence of eating difficulty were observed in 256 (62.1%) of respondents and loss of appetite was the commonest 134 (52.3%) followed by nausea/vomiting 81 (31.6%). From respondents, HIV related symptoms were observed in 170 (41.3%) and from these, chronic diarrhea 57 (33.5%) was the leading cause. Majority of respondents were in WHO clinical stage I 181 (43.9%), with CD4 cell count 200-499 (36.4%) (Table 2).

Variables	Category	Number	Percent
Sex	Male	362	87.9
	Female	50	12.1
Age	18-29	115	27.9
	30-39	151	36.7
	40-49	106	25.7
	≥50	40	9.7
Marital status	Single	193	46.8
	Married	87	21.1
	Divorced	104	25.2
	Widowed	28	6.8
Educational status	Formal education	270	65.5
	Have no formal education	142	34.5
Presence of source of support	Yes	83	20.1
	No	329	79.9
Source of support	Visitors	62	74.7
	Prisoners general committee	19	22.9
	Currently working in Prison Technical and vocational institute	2	2.4

Table 1: Socio-demographic characteristics of prisoners living with HIV/AIDS at Kaliti prison center, Addis Ababa, Ethiopia February 24-March 30, 2016,(n=412).

Anti HIV treatment related status

Majority of participants were on ART 230 (55.8%), and the commonest ART regimen was 1e 137 (59.6%). From participants, 20 (4.9%) changed ART regimen with a major reason of side effects of ART medication 16 (80.0%), from these the commonest observed side effect was vomiting 6 (37.5%), followed by rash 4 (25.0%). From respondents, 38 (9.2%) interrupted ART medication, the commonest reason were side effects of medication 13 (34.2%) followed by lack of adequacy of food 12 (31.6%) (Table 3).

Prison related conditions

The majority of prisoners living with HIV/AIDS stayed in the prison for more than 5years duration (53.6%), followed by 1-5 years (25.5%) and less than one year 86 (20.9%). All respondents have got drinking water from public tap water.

Meal frequency of respondents

Consumption of source of energy: Results showed that, 396 (96.1%) of prisoners living with HIV/AIDS did not consume maize meal for the whole week. Only 12 (2.9%) of respondents consumed maize meal once per week. Large number of respondents did not consume rice 354 (85.9%) and sweet potato 378 (91.7%) for the whole week. Majority of participants received their source of energy from wheat 379 (92.0%) every day of the week (Table 4).

Consumption of source of protein: Results showed that, majority of respondents got their source of protein from bean 357 (86.7%), followed by milk 3 (0.7%) every day of the week (Table 5).

Consumption of source of vitamins and minerals: Results showed that, majority of participants did not consume mango 402 (97.6%) orange 396 (96.1%), salad 379 (92.0%) and cabbage 370 (89.8%) for the whole week. Only 4 (1.0%) of respondents consumed banana, followed by papaya, salad and cabbage in equal proportion 2 (0.5%) every day for a week (Table 6).

Nutritional status of respondents: Majority of respondents had normal nutritional status 57.0%. The prevalence of the overall malnutrition among respondents was 43%. From this 0.5%, 8.0% and 26.7% were under weight; moderately underweight and mildly underweight respectively.

Problem	Category	Number	Percent
Presence of eating difficulty	Yes	256	62.1
	No	156	37.9
Type of eating difficulty	Loss of appetite	134	52.3
	Nausea/vomiting	81	31.6
Presence of HIV related symptom	Swallowing difficulty	41	16.0
	Yes	170	41.3
Type of symptom	No	242	58.7
	Chronic diarrhea	57	33.5
	Chronic cough	52	30.6
	Nervous system infection	12	7.1
	Oral thrush	42	24.7
	*other	7	4.1
CD4 cell count (WHO criteria)	<200	142	34.5
	200-499	150	36.4
Clinical stage (WHO criteria)	>500	120	29.1
	Stage I	181	43.9
	Stage II	69	16.7
	Stage III	143	34.7
	Stage IV	19	4.6

*other - Extra pulmonary Tuberculosis, Anemia, Weight loss

Table 2: Medical and other related problem of prisoners living with HIV/AIDS at Kality prison center, Addis Ababa, Ethiopia February 24-March 30, 2016,(n=412).

Treatment condition	Category	Number	Percent
ART status	Pre ART	182	44.2
	ART	230	55.8
Type of ART regimen currently in use	1c	46	20.0
	1d	30	13.0
	1e	137	59.6
	1f	13	5.7
Length of treatment	Second line	4	1.7
	≤ 3 months	90	39.1
	3-6 months	25	10.9
	≥ 6 months	115	50.0
	Yes	20	4.9
	No	210	51.0
Change of ART regimen	Side effect	16	80.0
	Resistance	3	15.0
Reason for change of regimen	TB treatment	1	5.0
	Neuropathy	3	18.8
Type of side effect	Anemia	3	18.8
	Vomiting	6	37.5
	Rash	4	25.0
	Yes	38	9.2
Interruption of treatment	No	192	46.6
	Lack of food adequacy	12	31.6
Reason for interruption of treatment	Lack of ART medication	4	10.5
	Side effects of medication	13	34.2
	Due to transfer to zonal prison center	6	15.8
	**Other	3	7.9
Adherence status	Good	190	82.6
	Fair	10	4.3
	Poor	30	13.0

**Other - Lack of transfer in paper, Loss of ART identification card, Lack of availability of guard to bring the client to the clinic at the time of appointment, Feeling of hopelessness

Table 3: Anti HIV treatment related status of prisoners living with HIV/AIDS at Kality prison center, Addis Ababa, Ethiopia February 24-March 30, 2016,(n=412).

Factors associated with nutritional status

Association between dependent variable and every independent variable were tested with binary logistic regressions. The result showed that sex, age, educational status, presence of source of support, presence of eating difficulty, presence of HIV related symptom and CD4 cell count status had association with nutritional status of prisoners living with HIV/AIDS in Kality prison center.

Thereafter, multivariable logistic regression analysis was applied to control confounders and identify the actual factors that are significantly associated with nutritional status of prisoners living with HIV/AIDS. Those variables found to be significant from binary logistic analysis at p-value<0.2 were entered into the multivariable logistic regression model. After analysis, sex, age, presence of source of support, presence of eating difficulty and presence of HIV related symptom, were found to be significantly associated with nutritional status.

Female respondents were 92% times less likely to develop malnutrition than male respondents (AOR 0.08 [95% CI 0.02, 0.42]), and those who were in the age range of ≥ 50 were eight times more likely to be malnourished with (AOR 8.68 [95% CI 1.59, 47.28]). Participants who had source of support were 97% times less likely to be malnourished (AOR 0.03 [95% CI 0.01, 0.13]). Persons with no eating difficulty were 95% times less likely to develop malnutrition with (AOR 0.05 [95% CI 0.01, 0.19]). Respondents with presence of HIV related symptoms were two times more likely at risk to develop malnutrition (AOR 2.73 [95% CI 1.09, 5.03]).

Source of energy(Cereals, roots and tubers consumption)								
Intake per week(times)	Maize		Wheat		Rice		Sweet potato	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Zero	396	96.1	1	0.2	354	85.9	378	91.7
One	12	2.9	2	0.5	24	5.8	25	6.1
Two	1	0.2	8	1.9	13	3.2	3	0.7
Three	2	0.5	4	1.0	3	0.7	2	0.5
Four	1	0.2	17	4.1	4	1.0	1	0.2
Five	0	0.0	1	0.2	0	0.0	0	0.0
Six	0	0.0	0	0.0	0	0.0	0	0.0
Seven	0	0.0	379	92.0	14	3.4	3	0.7

Table 4: Frequency(times per week) consumption of sources of energy of prisoners living with HIV/AIDS at Kality prison center, Addis Ababa, Ethiopia February 24-March 30, 2016,(n=412).

Intake per week(times)	Bean		Meat		Milk		Fish		Egg	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Zero	7	1.7	343	83.3	282	68.4	394	95.6	368	89.3
One	2	0.5	50	12.1	106	25.7	14	3.4	28	6.8
Two	4	1.0	10	2.4	11	2.7	3	0.7	11	2.7
Three	9	2.2	2	0.5	8	1.9	0	0.0	1	0.2
Four	13	3.2	3	0.7	2	0.5	1	0.2	1	0.2
Five	13	3.2	1	0.2	0	0.0	0	0.0	1	0.2
Six	7	1.7	1	0.2	0	0.0	0	0.0	0	0.0
Seven	357	86.7	2	0.5	3	0.7	0	0.0	2	0.5

Table 5: Frequency(times per week) consumption of sources of proteins of prisoners living with HIV/AIDS at Kality prison center, Addis Ababa, Ethiopia February 24-March 30, 2016,(n=412).

Source of vitamins and minerals(fruits and vegetables consumption)												
Intake per week(times)	Banana		Mango		Orange		Papaya		Salad		Cabbage	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Zero	349	84.7	402	97.6	396	96.1	397	96.4	379	92.0	370	89.8
One	32	7.8	5	1.2	11	2.7	7	1.7	22	5.3	19	4.6
Two	16	3.9	0	0.0	1	0.2	1	0.2	5	1.2	13	3.2
Three	9	2.2	4	1.0	3	0.7	3	0.7	2	0.5	6	1.5
Four	2	0.5	1	0.2	1	0.2	2	0.5	1	0.2	1	0.2
Five	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Six	0	0.0	0	0.0	0	0.0	0	0.0	1	0.2	1	0.2
Seven	4	1.0	0	0.0	0	0.0	2	0.5	2	0.5	2	0.5

Table 6: Frequency(times per week) consumption of sources of vitamins and minerals of prisoners living with HIV/AIDS at Kality prison center, Addis Ababa, Ethiopia February 24-March 30, 2016,(n=412).

Discussion

In this study, the prevalence of malnutrition in prisoners living with HIV/AIDS was 43%. The prevalence was higher than studies done in Gueckedou, Guinea (38%) [9], Oyo, Nigeria (39%) [10], prisons among the general prisoners and a study done in selected prisoners of Tanzania among prisoners living with HIV/AIDS 23% [2]. The discrepancy of malnutrition status might be due to the existence of different socio-economic factors of the study areas, partly due to the country's limited resources and inadequate physical activity and feeding habits of the prisoners.

Females were 92% times less likely to develop malnutrition (AOR 0.08 [95 % CI 0.02, 0.42]) than males, this might be due to the coordinated effort to improve the situation by female prisoners administrative office that put female prisoners often in a relatively better state of health and nutrition than male prisoners and generally benefit from better living conditions, access to water and food in the study area.

Subjects in the age group ≥ 50 were eight times more likely to develop malnutrition (AOR 8.68 [95 % CI 1.59, 47.28]) than other age groups. This might be due to older adults were prone to age-related diseases, functional impairment and physical inability that may interfere with the maintenance of a good nutritional status [11].

In this study, respondents who had source of support were 97%

times less likely to develop malnutrition (AOR 0.03 [95 % CI 0.01, 0.13]) than who had no source of support. This could be due to people who are socially isolated and that cannot attain nutritious foods due to low income and no nutritional support are most associated with inadequate diet and disease that leads to malnutrition [12-14].

Participants who had not suffered from eating difficulties were 95% times less likely to develop malnutrition (AOR 0.05 [95% CI 0.01, 0.19]). This finding is in accordance with the results of former studies conducted in Butajira [5] and Bahir dar [15] among PLWHIV/AIDS. This might be due to reduction of food consumption due to eating difficulties like loss of appetite, vomiting, nausea and oral thrush as well as with the food eaten is poorly absorbed, the body draws on its reserve stores of energy from body fat and protein from muscle. As a result, the person loses weight because body weight and muscles are lost [16].

With regard to HIV/AIDS related symptoms, those who developed symptoms in the past six months were two times more malnourished (AOR 2.73 [95% CI 1.09, 5.03]) than those who were free of symptoms. In places where there are inadequate food supplies, many PLWHIV may already be malnourished. Their weakened immune systems further increase their vulnerability to opportunistic infections. Symptoms that accompany infections such as loss of appetite, diarrhea and fever lead to further reduced food intake, poor nutrition absorption, nutrient loss

Variables	Categories	Nutritional status		COR (95% CI)	AOR (95%CI)	P-values
		Normal	Malnourished			
Sex	Male	212	150	1	1	0.003
	Female	23	27	1.66 (0.92, 3.01)	0.08 (0.02, 0.42)	
Age	18-29	78	37	1.20 (0.67, 2.13)	0.36 (0.10, 1.28)	0.01
	30-39	62	89	3.64 (2.14, 6.20)	2.16 (0.76, 6.12)	
	40-49	76	30	1	1	
	≥ 50	19	21	2.80 (1.32, 5.93)	8.68 (1.59, 47.28)	
Educational status	Formal education	177	93	1	1	0.00
	No formal education	58	84	2.76 (1.81, 4.19)	0.61 (0.23, 1.63)	
Presence of source of support	Yes	73	10	7.53 (3.75, 15.08)	0.03 (0.01, 0.13)	0.00
	No	162	167	1	1	
Presence of eating difficulty	Yes	88	168	1	1	0.00
	No	147	9	0.03 (0.02, 0.07)	0.05 (0.01, 0.19)	
Presence of HIV related symptom	Yes	15	155	0.01 (0.00, 0.02)	2.73 (1.09, 5.03)	0.00
	No	220	22	1	1	
	<200	37	105	3.52 (2.15, 5.76)	1.48 (0.58, 3.80)	
CD4 cell count	200-499	83	67	1	1	0.26 (0.05, 1.49)
	>500	115	5	0.05 (0.02, 0.14)	0.26 (0.05, 1.49)	
ART status	Pre ART	99	83	0.82 (0.56, 1.22)	—	1
	ART	136	94	1	1	

Table 7: Logistic regression of BMI with independent variables among prisoners living with HIV/AIDS at Kaliti prison center, Addis Ababa, Ethiopia February24-March 30, 2016, (n=412).

and altered metabolism; all of these contribute to malnutrition which in turn further weaken the immune system [17].

Conclusion

The prevalence of underweight was very high among prisoners living with HIV/AIDS in this area. Sex, age, presence of source of support, presence of eating difficulty and presence of HIV related symptoms were predictors of malnutrition among prisoners living with HIV/AIDS in Kaliti prison. From participants' male prisoners and old age respondents were more likely to become malnourished.

Recommendation

Improving living conditions of male prisoners like female prisoners by prison administrative bodies. Improving financial capacity of the prisoners by providing vocational training and able to work in the compound. The prison administrative body should give emphasis on increasing diversified food. Further studies on the effect of nutritional support on malnourished respondents which was not included on this study are worth to be investigated by other researchers.

Ethical Approval

Ethical clearance and formal letter was obtained from health research and post graduating institutional research ethical review committee of public health and medical science of Debre Markos University.

Competing Interests

There is no competing interest with the presented data as external data collectors collected it. There was not financial interest between the funder and the research area community and us. We, the researchers, have no any form of competing financial and non-financial interest between ourselves

Authors' Contributions

We, the three, have significant contribution in the proposal development, defending for fund obtaining, data collection and data analysis and manuscript preparation process of this work.

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