

Factors associated with food insecurity among people living with the Human Immunodeficiency Virus

Fatores associados à insegurança alimentar de pessoas vivendo com o vírus da imunodeficiência humana

*Factores asociados a la inseguridad alimentaria de personas viviendo con el virus de inmunodeficiencia* 

Lorena Nogueira Frota da Costa (i) Federal University of Ceara (Universidade Federal do Ceará - UFC) – Fortaleza (CE) – Brazil Fernando Natalense da Costa (i) State University of Ceara (Universidade Estadual do Ceará - UECE) – Fortaleza (CE) – Brazil

Cláudia Machado Coelho Souza de Vasconcelos () State University of Ceara (Universidade Estadual do Ceará - UECE) – Fortaleza (CE) – Brazil

Mônica Cardoso Façanha (b) Federal University of Ceara (Universidade Federal do Ceará - UFC) – Fortaleza (CE) – Brazil

### ABSTRACT

Objective: To analyze the association between food insecurity and the socioeconomic, demographic, clinical, epidemiological, nutritional, and dietary profiles of people living with HIV/AIDS treated in the public health system and living in Fortaleza-CE. Method: 359 individuals were interviewed from July to December 2019 at three health units that treated more than 60% of the municipality's reported HIV/AIDS cases. A questionnaire was applied to collect anthropometric, socioeconomic, clinical epidemiological, dietary, and food insecurity data, and medical records were consulted to check CD4+ and viral load. Food insecurity was verified using the Brazilian food insecurity scale. The groups were compared using Pearson's chi-square test. Associated variables were included in the Poisson multiple regression test. Results: Of the 359 interviewees, 51.5% were food insecure, and this was initially associated with being female, having up to elementary school education, having a family income of less than two minimum wages, receiving financial aid from the government, tap water source and having a CD4 count of less than 499. Consumption of lunch, vegetables, and physical activity were associated with food security. After adjustments, food insecurity remained associated with being female and having an income below two minimum wages. Conclusion: This study showed that food insecurity is a relevant challenge among people living with HIV/AIDS, especially in groups with greater socioeconomic vulnerability, such as women and low-income families. Health promotion strategies that prioritize interventions aimed at vulnerable populations are necessary.

Descriptors: Food and nutrition security; Food law; HIV; Acquired immunodeficiency syndrome.

### RESUMO

**Objetivo:** Analisar associação entre insegurança alimentar e perfis socioeconômico, demográfico, clínico, epidemiológico, nutricional e alimentar de pessoas que vivem com HIV/AIDS atendidas na rede pública e residentes em Fortaleza-CE. **Método:** Foram entrevistados 359 indivíduos, de julho a dezembro de 2019, em três Serviços de Atenção Especializada, que atendem mais de 60% dos casos notificados de HIV/AIDS do município. Foi aplicado questionário para coletar dados antropométricos, socioeconômicos, clínicos epidemiológicos, alimentares e de insegurança alimentar, consultado prontuário para verificação de CD4<sup>+</sup> e carga viral. A insegurança alimentar foi verificada através da Escala Brasileira de Insegurança Alimentar. Os grupos foram comparados com o teste de Quiquadrado de Pearson. As variáveis associadas foram incluídas no teste de regressão múltipla de Poisson. **Resultados:** Dos 359 entrevistados, 51,5% estavam em insegurança alimentar, estando, inicialmente, associada ao sexo feminino, à escolaridade até ensino fundamental, à renda familiar inferior a dois salários-mínimos, ao recebimento de auxílio financeiro do governo, à fonte de água para beber da torneira e à contagem de CD4 inferior 499. Consumo do almoço, verduras e legumes e prática de atividade física estiveram associados à segurança alimentar. Após os ajustes, a insegurança alimentar



This Open Access article is published under the a Creative Commons license which permits use, distribution and reproduction in any medium without restrictions, provided the work is correctly cited Recebido em: 10/02/2023 Aceito em: 11/21/2024 manteve-se associada ao sexo feminino e à renda menor que dois salários-mínimos. **Conclusão:** Este estudo evidenciou que a insegurança alimentar é um importante desafio entre pessoas vivendo com HIV/AIDS, especialmente em grupos com maior vulnerabilidade socioeconômica, como mulheres e famílias de baixa renda. Estratégias de promoção da saúde que priorizem intervenções voltadas para populações vulnerabilizadas são necessárias.

Descritores: Segurança alimentar e nutricional; Direito alimentar; HIV; Síndrome da imunodeficiência adquirida.

#### RESUMEN

**Objetivo:** Analizar asociación entre inseguridad alimentaria y perfiles socioeconómico, demográfico, clínico, epidemiológico, nutricional y alimentario de personas que viven con VIH/SIDA atendidas en la red pública y residentes en Fortaleza-CE. Método: Fueron entrevistados 359 individuos, de julio a diciembre de 2019, en tres Servicios de Atención Especializada, que atenden más de 60% de los casos notificados de VIH/SIDA del municipio. Fue aplicado cuestionario para recoger datos antropométricos, socioeconómicos, clínicos epidemiológicos, alimentarios y de inseguridad alimentaria, consultado registro para verificación de CD4 + y carga viral. La inseguridad alimentaria fue verificada por medio de la Escala Brasileña de Inseguridad Alimentaria. Los equipos fueron comparados con la prueba Chicuadrado de Pearson. Las variables asociadas fueron inclusas en la prueba de regresión múltiple de Poisson. **Resultados:** De los 359 entrevistados, 51,5% estaban en inseguridad alimentaria, estando, inicialmente, asociada al sexo femenino, a la escolaridad hasta la enseñanza primaria, a la renta familiar abajo de dos sueldos mínimos, al recibimiento de ayudas financeiras del gobierno, a la fuente de agua para tomar del grifo y al contaje de CD4 debajo de 499. Consumo de la comida, verduras y legumbres y práctica de actividad física estuvieron asociados a la seguridad alimentaria. Pasado los ajustes, la inseguridad alimentaria se mantuvo asociada al sexo femenino y a la renta debajo de dos sueldos mínimos. **Conclusión:** Este estudio evidenció que la inseguridad alimentaria es un importante reto entre personas viviendo con VIH/SIDA, especialmente en equipos con mayor vulnerabilidad socioeconómica, como mujeres y familias de baja renta. Estrategias de promoción de la salud que prioricen intervenciones dirigidas para poblaciones vulnerables son necesarias.

Descriptores: Seguridad alimentaria y nutricional; Derecho alimentario; VIH; Síndrome de inmunodeficiencia adquirida.

## INTRODUCTION

The human immunodeficiency virus/human immunodeficiency syndrome (HIV/AIDS) epidemic, which began in 1981, affected large urban centers and predominantly homosexual and/or bisexual men. Currently, it affects people of both sexes, heterosexuals, from all social classes, and mainly, those who live in conditions of poverty and low education<sup>(1,2)</sup>.

In 2023, 630 thousand people died worldwide due to HIV/AIDS infection and 39.9 million people were living with HIV, with 1.3 million new cases the same year<sup>(3)</sup>.

In Brazil, from 1980 to June 2023, 1,123,063 cases of AIDS were registered. In Ceará, from 1983 to 2024, 26,255 cases of AIDS and 23,019 cases of HIV were registered, with the Regional Health Superintendence (SRS) of Fortaleza with the highest detection rate, concentrating the highest number of cases in the State<sup>(4,5)</sup>.

People living with HIV/AIDS (PLWHA) represent a unique and vulnerable group of carriers of a serious disease that, although there is no cure, is controlled with complex and high-cost treatment guaranteed by the Brazilian government. When the treatment is proper and permanently done, it allows survival equivalent to that of the general population<sup>(6)</sup>.

In addition to the disease itself and other serious problems experienced by people living with HIV/AIDS (PLWHA), such as the negative impact on social relationships in the family, community, and work environment associated with social stigma, these people also suffer from the high prevalence of food insecurity (FI), including in its most severe forms<sup>(6)</sup>.

FI is the uncertainty of access or the limited ability to acquire safe, quality food in nutritional aspects, in adequate quantity, and in a socially acceptable way, which often leads the population to experience hunger<sup>(7)</sup>.

As FI directly and indirectly, interferes in the process of illness and adherence to HIV treatment, it is relevant to know its associated factors to subsequently break these associations so that the patient has a better quality of life and longer survival. It is worth noting that Brazil has few works on this topic for this public, this being the first work of this magnitude for a municipality in the Brazilian Northeast.

This study aimed to analyze the association between food insecurity and the socioeconomic, demographic, clinical, epidemiological, nutritional, and dietary profiles of people living with HIV/AIDS treated in the public health system and residing in Fortaleza-CE.

### METHOD

It is an observational, cross-sectional, analytical study with a quantitative approach to food insecurity among PLWHA treated in the public network and residing in Fortaleza-CE.

The research was carried out in three Specialized Care Services (SAE): Walter Cantídio University Hospital, SAE of the João Pompeu Lopes Randal Polyclinic (Regional Health Coordination – CORES VI) and SAE of the UAPS Carlos Ribeiro (CORES I), selected for jointly treat more than 60% of the reported cases of HIV/AIDS in the municipality. Data collection was carried out from July to December 2019, on weekdays, from Tuesday to Friday. Monday was excluded, as the previous day's diet is usually atypical.

The research was carried out with people diagnosed with HIV/AIDS undergoing outpatient treatment who lived in Fortaleza-CE and were approached before or after their consultations. The diagnosis of AIDS was established according to the modified CDC and Rio/Caracas criteria<sup>(8)</sup>. Treatment adherence was considered when the patient took the medication on at least 95% of the days in the last three months<sup>(9)</sup>. CD4+ cell count was categorized as <200, 200 to 499, and >500(<sup>10</sup>).

Participants were selected by convenience from among PLWHA who attended the outpatient clinics during the research period.

The sample of PLWHA was determined using the calculation for finite populations, with a 95% confidence interval, 5% margin of error, and 60% prevalence, resulting in 360 patients to be interviewed from a total population of approximately 15,353 PLWHA residing in Fortaleza and treated by the public network. Sampling calculations were obtained using the Epi Info program version 7.

Individuals diagnosed with HIV/AIDS of both sexes, over 18 years of age, who were undergoing outpatient follow-up in the public health system, who had CD4 and/or viral load test results, and who resided in Fortaleza-CE were included in the research.

Pregnant patients, residents who lived in the same household as a participant already selected, patients diagnosed on the day of the interview without CD4+ and viral load records simultaneously, and those who did not complete the interview were excluded from the study.

Furthermore, anthropometric variables (weight, height, BMI), demographic variables (sex, age, marital status, residence, race/color), socioeconomic (religion, education, profession, household income, government financial assistance, type of housing, water source, alcohol, drugs, physical activity), epidemiological clinics (CD4+, viral load, time since HIV and AIDS diagnosis, time on treatment, treatment adherence, comorbidities), frequency of food consumption (consumption on the previous day of beans; fresh fruits; vegetables and/or legumes; hamburgers and/or sausages; sweetened beverages; instant noodles, packaged snacks or salty biscuits; and stuffed biscuits, sweets or treats) and FI (safe, mild FI, moderate FI, severe FI) were collected. The dependent variable was FI, and the other variables were independent.

Data collection followed the proposed methodology<sup>(11)</sup> and collected data from medical records and interviews using a structured questionnaire. Information on CD4+ count and viral load was collected from the medical records. During the interview, carried out in a private room at the clinic by a trained professional, a structured questionnaire was applied in three stages.

In the first stage, a questionnaire was applied with questions related to socioeconomic, demographic, clinical, and epidemiological conditions to characterize the study population. The sample was classified according to the location of the residence by region, in which region zero is the city center. The age range was divided into groups: every 20 years; the marital status was divided into with a partner and without a partner; the education level was divided into illiterate, with studies up to elementary school and with secondary and/or higher education; and the income was divided by minimum wages (MW). In addition, medications were cataloged in letters from A to F to facilitate analysis, in which scheme A consisted of the medication lamivudine, tenofovir, and efavirenz; scheme B had tenofovir, lamivudine, and dolutegravir; scheme C contained abacavir, darunavir, ritonavir, and lamivudine; scheme E contained atazanavir, lamivudine, and tenofovir; and in scheme F the medications abacavir, dolutegravir, and tenofovir were part of it. The remaining drug schemes were included in the other category.

The second stage was the verification of FI through the Brazilian Food Insecurity Scale (EBIA), composed of 15 yes or no questions, in which each positive answer (yes) counts as one point and each negative answer (no) counts as zero points. The scale attests to food security (zero points) and classifies insecurity as mild (1 to 5 points), moderate (6 to 10 points), and severe (11 to 15 points)<sup>(6)</sup>.

The third stage was the frequency of food consumption evaluation, which used the food consumption marker from the Food and Nutrition Surveillance System (SISVAN) referring to the previous day's diet<sup>(12)</sup>.

In the statistical analysis, the outcome (food insecurity) was correlated with nutritional, socioeconomic, demographic, clinical, and epidemiological variables. Data from continuous variables were presented as median, 25 percentile, and 75 percentile. Categorical variables were presented in frequency and percentage.

The comparison between groups in numerical variables was performed using the Mann-Whitney test, and the non-normality of the variables was verified by the Shapiro-Wilk test. In categorical variables, Fisher's Exact test and Pearson's Chi-square test were used to verify the association of independent variables with the outcome. The significance level adopted was 5% (p<0.05). Adjustments were made with multiple Poisson regression for variables with p<0.20). The prevalence ratio (PR) was calculated using the prevalence of the exposed category divided by the unexposed category, with a 95% confidence interval.

The present study followed the standards and guidelines followed by the National Health Council, described in Resolution No. 466/12, for research involving human beings(<sup>13</sup>).

This project was submitted for approval by the research ethics committee of the Walter Cantídio University Hospital of the Federal University of Ceará with opinion number 3,141,320.

#### RESULTS

Of the 359 patients interviewed, 185 (51.5%) were in FI, being: 37.8% (n=136) of mild insecurity (MFI), 10.3% (n=37) of moderate insecurity (MFI), and 3.3% (n=12) of severe insecurity (SFI), according to Table I.

**Table I –** Food insecurity, according to the Brazilian Food Insecurity Scale, of people living with HIV/AIDS. Fortaleza, CE, 2022.

Food Safety Diagnosis	Ν	%
Food safety	174	48.47%
Food insecurity	185	51.53%
Mild	136	37.88%
Moderate	37	10.31%
Severe	12	3.34%

Source: Brazilian Food Insecurity Scale, 2014. Note: Table prepared by the author.

The diagnosis of FI was associated with the variables sex, education, income, government financial aid, source of tap water, CD4+ T cell count, lunch consumption, consumption of vegetables and legumes, and physical activity (Table II) (p<0,05).

Among the interviewees, 98 (27.3%) were women, 68 (69.4%) were in FI, and 30 (30.6%) were in FS. Of the 261 (72.7%) men interviewed, 117 (44.8%) were in FI, and 144 (55.2%) were in FS (p<0.05). FI was more frequent among women (p<0.001).

Of the 84 (23.4%) patients with education up to the elementary level, 56 (66.7%) were in FI and 28 (33.3%) in FS. Of the 265 (76.6%) patients with secondary or higher education, 129 (46.9%) were in FI and 146 (53.1%) in FS (p<0.005). Education level was associated with the outcome (p<0.006) in which FI was more frequent among patients with education up to the elementary level.

Of the 39 (10.9%) people with income below one MW, 31 (79.5%) were in FI and eight (20.5%) in FS. Of the 208 (57.9%) people with income greater than or equal to one MW and below two MW, 124 (59.6%) were in FI and 84 (40.4%) in FS. Of the 68 (18.9%) people with income greater than or equal to two MW and below four MW, 23 (33.8%) were in FI and 45 (66.2%) in FS. Of the 44 (12.3%) people with income greater than or equal to four MW, seven (15.9%) were in FI and 37 (84.1%) in FS. Income was associated with FI (p < 0.001), with FI being more prevalent among individuals with incomes below one MW and with incomes between one and two MW.

Of the 98 (27.3%) receiving financial assistance from the government, 68 (69.4%) were in FI and 30 (30.6%) in FS. Of the 261 (72.7%) who did not receive financial assistance from the government, 117 (44.8%) were in FI, and 144 (55.2%) were in FS. Thus, receiving financial assistance from the government was associated with FI (p<0.001).

Of the 63 (17.6%) who have a source of drinking water from the tap, 40 (65.5%) were in FI and 23 (36.5%) in FS. Of the 296 (82.5%) who had other sources of drinking water, 145 (49.0%) were in FI, and 151 (51.0%) were in FS. The use of tap water as a drinking source showed a significant association with the diagnosis of FI (p=0,036).

**Table II –** Bivariate analysis between socioeconomic, demographic, and epidemiological data and diagnosis of food insecurity of PLWHA. Fortaleza, CE, 2022.

	Total			Food		Food			
	Indiv	iduals	Sec	curity	Inse	curity	Raw	IC 95%	p-value b
Variables	(359)		(1	74)	(185)		RP		P
	n	%	n	%	n	%		-	
SER °									0.226b
0	10	2.8	8	4.6	2	1.1	0.39	0.11-1.40	
1	67	18.7	32	18.4	35	18.9	1.02	0.70-1.49	
2	41	11.4	20	11.5	21	11.4	1.00	-	
3	56	15.6	29	16.7	27	14.6	0.94	0.63-1.41	
4	53	14.8	23	13.2	30	16.2	1.11	0.76-1.62	
5	81	22.5	33	19.1	48	25.9	1.16	0.82-1.64	
6	51	14.2	29	16.7	22	11.9	0.84	0.55-1.30	
Age range									0.418b
19 to 39	204	56.8	104	59.8	100	54.1	0.76	0.50-1.16	
40 to 60	141	39.3	65	37.4	76	41.1	0.84	0.55-1.28	
> 60 years	14	3.9	5	2.9	9	4.9	1.00	-	
Gender									<0.001b
Female	98	27.3	30	17.2	68	36.8	1.54	1.28-1.86	
Male	261	72.7	144	82.8	117	63.2	1.00		
Sexual orientation									0.183b
Heterossexual	149	41.5	66	37.9	83	44.9	1.00	-	
Homossexual	210	58.5	108	62.1	102	55.1	0.87	0.71-1.07	
Marital status									0.319b
With a partner	91	25.3	40	23.0	51	27.6	1.00	-	
Without a partner	268	74.7	134	77.0	134	72.4	0.89	0.72-1.11	
Race color									0.843b
Yellow/White	74	20.6	35	20.1	39	21.1	1.00	-	
Indigenous	3	0.8	1	0.6	2	1.1	1.41	0.61-3.25	
Brown/Black	282	78.6	138	79.3	144	77.8	1.08	0.83-1.41	
Religion									0.369b
Catholic	172		90	51.7	82	44.3	1.00	-	
Evangelical	68		30	17.2	38	20.5	0.93	0.68-1.26	
Other	119		54	31.0	65	35.1	0.95	0.74-1.22	
Education									<0.006b
illiterate	11	3.1	3	1.7	8	4.3	1.55	1.06-2.27	
Up to elementary level	73	20.3	25	14.4	48	25.9	1.40	1.14-1.73	
Intermediate or higher level	275	76.6	146	83.9	129	69.7	1.00	-	
Education level of the head of the family									0.158b
illiterate	15	4.3	6	3.4	9	4.9	1.25	0.81-1.93	
Up to elementary level	108	30.1	45	25.9	63	34.1	0.87	0.67-1.13	
Intermediate or higher level	236	65.7	123	70.7	113	61.1	1.00	-	
Casa própria									0.093b
Yes	215	59.9	112	64.4	103	55.7	1.00	-	
No	144	40.1	62	35.6	82	44.3	1.19	0.97-1.45	
Income				0010				0.01 11.0	<0.001b
< 1 Minimum wage	39	10.9	8	46	31	16.8	4 97	2 49-10 0	
1 - 1 2 Minimum wage	208	57.9	84	48.3	124	67.0	3.75	1 88-7 46	
2 - 1 4 Minimum wage	68	18.9	45	25.9	23	12.4	2.13	0.10-4.53	
> 4 Minimum wage	44	12.3	37	21.3	7	3.8	1.00	-	
Receive financial assistance from the		12.0	01			0.0			
government.									<0.001b
Yes	212	59.1	30	17.2	68	36.8	1.00	_	
No	1/7	10.0	111	82.9	117	63.0	2 / 9	2 00 3 07	
10	141	+0.9	144	02.0	117	00.2	2.40	2.00-0.07	

Mineral water source									0.272b
Yes	306	85.2	152	87.4	154	83.2	1.00	-	
No	53	14.8	22	12.6	31	16.8	1.16	0.90-1.49	
Tap water source									0.036b
Yes	63	17.5	23	13.2	40	21.6	1.00	-	
No	296	82.5	151	86.8	145	78.4	0.77	0.62-0.96	
Deep well water source									0.487b
Yes	12	3.3	7	4.0	5	2.7	1.00	-	
No	347	96.7	167	96.0	180	97.3	1.25	0.63-2.45	
AIDS									0.307b
Yes	174	49.3	79	46.5	95	51.9	1.11	0.91-1.36	
No	179	50.7	91	53.5	88	48.1	1.00	-	

Source: Food and Nutrition Surveillance System, 2022.

Note: The prevalence ratio (PR) was calculated using the prevalence of the exposed category. 95% CI, confidence interval of the prevalence ratio.

Note: Fisher's exact test and Pearson's chi-square test were used to verify the association of the independent variables with the outcome. The significance level adopted was 5% (p<0.05).

Note: Regional Executive Secretariat of Residence (SER).

CD4+ T cell count <200 was associated with outcome (p = 0.045). Of the 174 (48.5%) people who practiced physical activity, 76 (43.7%) were in FI and 98 (56.3%) in FS. Of the 185 (51.5%) who did not practice physical activity, 109 (58.9%) were FI and 76 (41.1%) in FS. FI was less frequent among those who practiced physical activity (p=0.004) (Table III).

Table III - Bivariate anal	ysis between clinical, nu	tritional, and food insecurity	diagnosis of PLWHA	Fortaleza, CE, 2022.
	,	,	0	, ,

Variables	Total Individuals (359)		Food Security (174)		Food Insecurity (185)		Raw RP	IC 95%	p-value b
	n	%	n	%	n	%			
CD4+ cell count <sup>c</sup>									0.045b
< 200	10	2.8	2	1.2	8	4.4	1.48	1.06-2.06	
200   499	94	26.7	53	31.4	41	22.4	0.81	0.62-1.04	
>500	248	70.5	114	67.5	134	73.2	1.00	-	
Time since HIV diagnosis (years)	-	-	4	2-8.6	4.2	2 - 9	-	-	0.826b
Time since AIDS diagnosis (years)	-	-	5	2 - 10	5	2.25 - 8	-	-	0.283b
Treatment time			Λ	2 7	Λ	2 - 8			0.8265
(years)	-	-	4	2 - 1	4	2-0	-	-	0.0200
Type of medication									0.378b
Scheme A	82	22.9	42	24.1	40	21.6	1.00	-	
Scheme B	163	45.4	75	43.1	88	47.6	1.11	0.85-1.44	
Scheme C	23	6.4	8	4.6	15	8.1	1.34	0.92-1.94	
Scheme D	12	3.3	9	5.2	3	1.6	0.51	0.19-1.40	
Scheme E	5	1.4	2	1.1	3	1.6	1.23	0.58-2.6	
Scheme F	5	1.4	2	1.1	3	1.6	1.23	0.58-2.6	
Others	69	19.2	33	19.3	36	19.1	1.07	0.78-1.47	
Treatment adherence									0.163b
Yes	315	87.7	158	90.3	157	85.3	1.00	-	
No	44	12.3	17	9.7	27	14.7	1.22	0.94-1.58	
Comorbidities									0.271b
Yes	182	50.7	83	47.7	99	53.5	1.12	0.92-1.37	
No	177	49.3	91	52.3	86	46.5	1.00	-	
Use of alcoholic beverages									0.240b
Yes	166	46.2	86	49.4	80	43.2	0.89	0.72-1.09	
No	193	53.8	88	50.6	105	56.8	1.00	-	

Drug use									0.204b
Yes	74	20.6	31	17.8	43	23.2	1.17	0.93-1.46	
No	285	79.4	143	82.2	142	76.8	1.00	-	
Practice of physical activity									0.004b
Yes	174	48.5	98	56.3	76	41.1	1.00	-	
No	185	51.5	76	43.7	109	58.9	1.35	1.10-1.66	
Nutritional diagnosis									0.575b
Malnutrition	21	5.9	8	4.6	13	7.0	1.25	0.86-1.82	
Eutrophy	139	38.7	70	40.2	69	37.3	1.00	-	
Overweight/Obesity	199	55.4	96	55.2	103	55.7	1.04	0.84-1.30	

Source: Food and Nutrition Surveillance System, 2022.

Note: The prevalence ratio (PR) was calculated using the prevalence of the exposed category. 95% CI, confidence interval of the prevalence ratio.

Note: Fisher's Exact and Pearson's chi-square tests were used to verify the association of independent variables with the outcome. The significance level adopted was 5% (p<0.05).

Note: A total of 352 patients had CD4+ recorded in their medical records.

Absence of lunch the previous day was associated with FI (6.5%, n=12) (p=0.001).

Of the 180 patients (50.1%) who consumed vegetables and/or legumes the previous day, 77 (42.8%) were in FI and 103 (57.2%) in FS. Of the 179 (49.9%) who did not consume vegetables and/or legumes the previous day, 108 (60.3%) were in FI and 71 (39.7%) in FS. FI was less frequent among those who consumed vegetables and/or legumes (p=0.004) (Table IV).

**Table IV –** Bivariate analysis between food consumption data and diagnosis of food insecurity of PLWHA. Fortaleza, CE, 2022.

Variable	Total Individuals (359)		Food Security (174)		Food Insecurity (185)		Raw RP	IC 95%	p-value b
	n	%	n	%	n	%			
Eat breakfast		-							0.536b
Yes	331	92.2	162	93.1	169	91.4	1.00	-	
No	28	7.8	12	6.9	16	8.6	1.12	0.80-1.57	
Eat your morning snack									0.075b
Yes	152	42.3	82	47.1	70	37.8	1.00	-	
No	207	57.7	92	52.9	115	62.2	1.21	0.98-1.49	
Eat lunch									0.001b
Yes	347	96.7	174	100	173	93.5	1.00	-	
No	12	3.3	0	0.0	12	6.5	2.01	1.81-2.23	
Eat your afternoon snack									0.370b
Yes	271	75.5	135	77.6	136	73.5	1.00	-	
No	88	24.5	39	22.4	49	26.5	1.11	0.89-1.38	
Eat dinner									0.547b
Yes	339	94.4	163	93.7	176	95.1	1.00	-	
No	20	5.6	11	6.3	9	4.9	0.87	0.53-1.42	
Eat supper									0.071b
Yes	88	24.5	50	28.7	38	20.5	1.00	-	
No	271	75.5	124	71.3	147	79.5	1.26	0.97-1.64	
Did you eat beans yesterday?									0.203b
Yes	272	75.8	137	78.7	135	73.0	1.00	-	
No	87	24.2	37	21.3	50	27.0	1.16	0.93-1.44	
Did you eat fresh fruit									0.407
yesterday?									0.137b
Yes	196	54.6	102	58.6	94	50.8	1.00	-	
No	163	45.4	72	41.4	91	49.2	1.16	0.95-1.42	

Did you eat vegetables and/or									0.001b
legumes yesterday?									0.0010
Yes	180	50.1	103	59.2	77	41.6	1.00	-	
No	179	49.9	71	40.8	108	58.4	1.4	1.15-1.73	
Did you eat hamburgers and/or									0.407
cold cuts yesterday?									0.407b
Yes	98	27.3	44	25.3	54	29.2	1.10	0.88-1.36	
No	261	72.7	130	74.7	131	70.8	1.00	-	
Did you consume sweetened									0.040
beverages yesterday?									0.949b
Yes	277	77.2	134	77.0	143	77.3	1.01	0.79-1.28	
No	82	22.8	40	23.0	42	22.7	1.00	-	
Did you eat instant noodles,									0.000
snacks, or crackers yesterday?									0.262b
Yes	56	15.6	31	17.8	25	13.5	0.85	0.62-1.15	
No	303	84.4	143	82.2	160	86.5	1.00	-	
Did you eat stuffed cookies,									0.0001
sweets, or treats yesterday??									0.393b
Yes	46	12.8	25	14.4	21	11.4	0.87	0.62-1.22	
No	313	87.2	149	85.6	164	88.6	1.00	-	
No Did you eat instant noodles, snacks, or crackers yesterday? Yes No Did you eat stuffed cookies, sweets, or treats yesterday?? Yes No	82 56 303 46 313	22.8 15.6 84.4 12.8 87.2	40 31 143 25 149	23.0 17.8 82.2 14.4 85.6	42 25 160 21 164	22.7 13.5 86.5 11.4 88.6	1.00 0.85 1.00 0.87 1.00	- 0.62-1.15 - 0.62-1.22 -	0.2621

Source: Food and Nutrition Surveillance System, 2022.

Note: The prevalence ratio (PR) was calculated using the prevalence of the exposed category. 95% CI, confidence interval of the prevalence ratio.

Note: Fisher's Exact test and Pearson's Chi-square test were used to verify the association of the independent variables with the outcome. The significance level adopted was 5% (p<0.05).).

After adjustments with Poisson regression, only the variables sex, income, and consumption of the main meal, lunch, remained associated with the FI outcome (Table V).

FI remained more prevalent among women (RP= 1.08), in individuals who received less than one minimum wage (RP=1.37), and one to two minimum wages (RP=1.31). FI remained less prevalent (RP = 0.8) among those who had lunch the previous day.

**Table V** – Adjusted association between socioeconomic, demographic, clinical, epidemiological, nutritional data, food consumption, and diagnosis of food insecurity of PLWHA. Fortaleza, CE, 2022.

Variáveis	RP (IC95%)	р
Education		
illiterate	1.02 (0.94 – 1.1)	0.724
Up to elementary level	1.02 (0.89 – 1.16)	0.819
Intermediate or higher level	Reference	
Income		
< 1 Minimum wage	1.37 (1.2 – 1.56)	<0.001
1 -  2 Minimum wage	1.31 (1.18 – 1.46)	<0.001
2 -  4 Minimum wage	1.13 (1 - 1.28)	0.056
> 4 Minimum wage	Reference	
CD4		
<200	1.05 (0.91 – 1.21)	0.479
200   499	0.94 (0.88 – 1.02)	0.127
>500	Reference	
Gender Female	1.08 (1.01 – 1.16)	0.027
Receives government assistance	1.06 (0.98 – 1.14)	0.138
Tap water	1.06 (0.98 – 1.14)	0.149
Lunch	0.8 (0.74 – 0.86)	<0.001
Did you eat vegetables and/or legumes yesterday?	0.95 (0.89 - 1.02)	0.144
Practice of physical activity	0.96 (0.9 – 1.03)	0.254

Source: Prepared by the author.

Note: The Prevalence ratio and 95% confidence interval obtained by multiple Poisson regression adjusted with significant variables in the bivariate analyses and diagnosis of food insecurity.

### DISCUSSION

More than half of the PLWHA served by the public network in Fortaleza/CE (Brazil) were in FI, this variable being initially associated with sex, income, education, receiving financial aid from the government, source of tap water, absence of lunch, vegetables and legumes, physical activity practice and CD4+ T cell count. These findings reinforce the complexity of the interactions between social, economic, nutritional, and immunological aspects in the health of this population.

Food insecurity in PLWHA is related to reduced adherence and response to antiretroviral therapy, with a consequent decrease in defense cells (CD4), increased viral load, and higher incidence of opportunistic infections<sup>(14)</sup>. On the other hand, treatment adherence promotes health and quality of life, preventing the progression of the disease and its adverse effects<sup>(15)</sup>. Although the present study found no association between FI and treatment adherence or increased viral load, the relationship with the reduction in CD4+ T cells highlights the immunological impact of FI.

HIV infection can accentuate the socioeconomic impacts on people's lives, accelerating the progression of the disease and reducing individual survival rates and quality of life <sup>(14)</sup>. An association was found between FI and income, education, and tap water sources (an indirect measure of economic level). FI may act as an amplifier of socioeconomic inequalities, accentuated by the impact of HIV on the lives of PLWHA.

The association between FI, low income, and education, found in the present study, was consistently observed in other Brazilian<sup>(2,6,11,16)</sup> and international studies<sup>(7,17,18)</sup>. Although a large proportion of PLWHA in FI receives financial assistance from the government, their continued presence in this state suggests that this assistance is insufficient, that it was recently acquired, that it needed to be shared with other family members, or even that it was inappropriately used<sup>(19)</sup>. Data from the latest National Survey on FI in the context of the COVID-19 pandemic in Brazil (VIGISAN) corroborate this interpretation by pointing to a high proportion of moderate/severe FI among households that received emergency aid<sup>(16)</sup>.

From a demographic point of view, the higher prevalence of FI among women in the present study and others<sup>(6,16,17,19,20)</sup> reflects structural inequalities. Studies highlight that women living with HIV are particularly vulnerable due to gender discrimination, poverty, and lack of social support, especially when they are heads of households. These inequalities constitute a "parallel epidemic"<sup>(21)</sup>, worsening this population's health and nutritional conditions.

The economic context can have decisive implications for PLWHA due to correct treatment, including a healthy and adequate diet. Therefore, financial issues can interfere with the progression of the disease and the improvement of quality of life, as treating the infection is seen as a health promotion measure<sup>(15)</sup>.

So, it is understood that the relationship between FI and nutritional status also deserves emphasis. Although an association with malnutrition was not observed, the increased metabolic needs of HIV infection and the systemic effects of co-infections reinforce the elevated risk of malnutrition among PLWHA<sup>(21)</sup>.

Regarding food, FI was associated with low consumption of vegetables and legumes and the absence of lunch. This reduction in dietary diversity is aligned with the literature<sup>(22,23)</sup> that identifies the low quality of diets in populations in situations of FI. Poor diet quality can lead to nutritional deficiencies – such as "hidden hunger" – and immunosuppression, worsening the vulnerability of PLWHA to opportunistic infections and disease progression<sup>(22)</sup>.

A healthy diet is essential for people living with HIV/AIDS, as it improves the functioning of the body, preserves immunity, and improves tolerance to medication, thus preventing its side effects, in addition to promoting the individual's physical and mental performance<sup>(23,24)</sup>.

Physical activity is also relevant to maintain the well-being and health of the population. In this study, the lack of physical activity was initially associated with FI, predominating among sedentary individuals. However, after adjustments, this association did not remain. This lack of statistical significance is corroborated by a previous study<sup>(11)</sup>, which did not identify an association between physical activity and FI in PLWHA. These findings suggest that the relationship between these variables may be direct or mediated by other factors.

Another central determinant of FI appears to be the region of the country. Less favored areas, such as the Northeast, have higher FI rates compared to places with better living conditions. National and regional data confirm this inequity. For example, the prevalence of FI found in this study (51.53%) was higher than the national average (36.7%) of the 2017-2018 Household Budget Survey (POF) but similar to that of the Northeast (50.3%)<sup>(26)</sup>. However, the percentage of FI (35.1%) found in Ceará in 2023 was lower than that of the current study<sup>(27)</sup>. These data demonstrate the need for regional approaches to tackling FI.

Of the four national studies of FI in PLWHA available in the Brazilian literature, two present similar results to those of this study (51% in Limeira-SP and 47.3% in Fortaleza-CE), and two others diverge, one found a lower FI (35.9% in Brasília) and the other a higher one (66.5% in Paraíba)<sup>(2,6,14,11)</sup>.

When analyzing the FI levels, it was found that the values found do not follow either the national findings or the regional ones, with mild insecurity being above the levels found in the Northeast region (29.8%) and moderate and severe insecurity below (13.4% and 7.1% respectively)<sup>(26)</sup>. Interestingly, severe FI (3.34%) was below the national prevalence (4.6%) and the Brazilian studies compared (10.7% – Fortaleza, 16.5% – Brasília, 17.6% – Paraíba.)<sup>(6,14,11)</sup>.

The limitations of this study include the convenience sample and the fact that the study was cross-sectional and had reverse causality. However, it should be noted that the findings of this research allow other researchers to formulate their hypotheses for causality analysis.

The study of this topic contributes to supporting the implementation of specific and effective public health strategies for this population, making food and nutritional security interventions a component of health promotion, care, and support programs for PLWHA.

Addressing FI should become an integral part of HIV treatment and prevention of associated diseases, consistent with supporting HIV-infected individuals in meeting basic needs, such as food and housing, thus ensuring a better quality of life, health promotion, and comprehensive care, a principle of the Unified Health System (SUS).

# CONCLUSION

Being a woman with an income of less than two minimum wages and without eating lunch is the worst FI scenario in this population. FI worsens the living conditions of PLWHA, who are known to be vulnerable, marginalized, and stigmatized. In addition to dealing with the problems of the disease itself, the difficulty in obtaining income and food causes these people to experience hunger. Given the relevant relationship between FI and HIV/AIDS, it is essential to intervene in this vicious cycle through health promotion strategies focusing on this population to guarantee Food and Nutrition Security. Furthermore, it is suggested that longitudinal studies be carried out to deepen the understanding of the relationships between food security, nutritional status, and progression of HIV/AIDS, contributing to more effective strategies for dealing with this condition.

# ACKNOWLEDGMENTS AND CONFLICTS OF INTEREST

There are no conflicts of interest.

# CONTRIBUTIONS

All authors contributed equally to the manuscript construction and are responsible for its content, integrity, and accuracy.

## FUNDING SOURCES

There were no funding sources.

## REFERENCES

- Divino F, Peiter P. Caracterização da epidemia de HIV/AIDS no escudo das guianas e possível influência das migrações na disseminação do vírus. Hygeia - Rev Bras Geogr Médica e da Saúde. 2022; (spe):74-86. Available from: https://doi.org/10.14393/Hygeia73356
- Rasteiro JM, Oliveira JM. (In)segurança alimentar e nutricional em pessoas que vivem com HIV/AIDS atendidas no serviço especializado em moléstias infecto-contagiosas de Limeira, SP [Internet]. Segur Aliment Nutr. 2014 [accessed on 30 nov 2024]; 21(1):337-346. Available from: https://doi.org/10.20396/san.v21i1.1659
- 3. UNAIDS. Ficha Informativa de 2023 [Internet]. Brasília: UNAIDS; 2024 [accessed on 30 nov 2024]. Available from: https://unaids.org.br/wp-content/uploads/2024/07/20240722\_UNAIDS\_Global\_HIV\_ Factsheet\_PTBR.pdf
- 4. Ministério da Saúde (BR). Boletim Epidemiológico: HIV/AIDS [internet]. Brasília: Ministério da saúde; 2023 [accessed on 30 nov 2024]. Available from: https://www.gov.br/aids/pt-br/central-de-conteudo/boletins-epidemiologicos/2023/hiv-aids/boletim-epidemiologico-hiv-e-aids-2023.pdf
- Secretaria da Saúde do Ceará. Boletim Epidemiológico: HIV/AIDS, nº 1 [internet]. Fortaleza: SESA/CE; 2024 [accessed on 30 nov 2024]. Available from: https://www.saude.ce.gov.br/wp-content/uploads/sites/9/2018/06/ Boletim\_Epidemiologico\_HIV\_Aids\_2024\_VERSAO01.pptx.pdf

- Lima RLFC de, Silva M de F, Gomes NIG, Silva JNC da, Viana MACBM, Vianna RP de T. Differences in quality of life and food insecurity between men and women living with HIV/AIDS in the state of Paraíba, Brazil [Internet]. Cienc e Saúde Coletiva. 2021[accessed on 30 nov 2024]; 26(Supl.2):3917-3925. Available from: https://doi.org/10.1590/1413-81232021269.2.33992019
- Victor A, Victor C, Maurício B da S, Gotine ARM, Mahoche M, Xavier SP, et al. Prevalência e fatores associados a insegurança alimentar entre adultos com HIV/AIDS tratados em hospital de referência em Moçambique [Internet]. Research, Society and Development. 2022 [accessed on 30 nov 2024]; 11(12);1-11. Available from: http://dx.doi.org/10.33448/rsd-v11i12.35127
- 8. Ministério da Saúde (BR). Revisão da definição nacional de casos de AIDS em indivíduos com 13 anos ou mais, para fins de vigilância epidemiológica. Brasília: Ministério da Saúde; 1998.
- Ministério da Saúde (BR). Manual de adesão ao tratamento para pessoas vivendo com HIV e Aids [Internet]. Brasília: Ministério da Saúde; 2008 [accessed on 29 jul 2021]. Available from: https://bvsms.saude.gov.br/bvs/ publicacoes/manual\_adesao\_tratamento\_hiv.pdf
- Benzekri NA, Sambou JF, Ndong S, Diallo MB, Tamba IT, Faye D, et al. The impact of food insecurity on HIV outcomes in Senegal, West Africa: a prospective longitudinal study. BMC Public Health [Internet]. 2021[cited 2024 Nov 29];21(1):1-13. Available from: http://dx.doi.org/10.1186/s12889-021-10444-1
- Costa LNF da, Braga MM, Rocha M, Lima MS, Campêlo WF, Vasconcelos CMCS. Fatores associados à insegurança alimentar em pessoas que vivem com HIV/AIDS [Internet]. Revista Brasileira em Promoção da Saúde. 2018[accessed on 29 jul 2021]; 31(1):1-8. Available from: https://doi.org/10.5020/18061230.2018.6884
- 12. Ministério da Saúde (BR). Orientações para a coleta e análise de dados antropométricos em serviços de saúde: Norma Técnica do Sistema de Vigilância Alimentar e Nutricional -SISVAN [Internet]. Brasília: Ministério da Saúde; 2011[accessed on 06 dez 2024]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/ orientacoes\_coleta\_analise\_dados\_antropometricos.pdf
- Conselho Nacional de Saúde. Resolução nº. 466, de 12 de dezembro de 2012. Diretrizes e normas regulamentadoras de pesquisas envolvendo seres humanos. Diário Oficial da União [Internet]. 13 jun 2013; 12(seção 1):59. Available from: https://bvsms.saude.gov.br/bvs/saudelegis/cns/2013/ res0466\_12\_12\_2012.html
- 14. Charão APS, Batista MHRS, Ferreira LB. Food insecurity of HIV/AIDS patients at a unit of outpatient healthcare system in Brasilia, Federal District, Brazil. Rev Soc Bras Med Trop. 2012; 45(6):751-3.
- Fonseca AE de C, Garcia PT, Nascimento ABBL, Oliveira RC dos S. Repercussões do diagnóstico do Vírus da Imunodeficiência Humana e perspectivas acerca do tratamento. Rev Bras em Promoção da Saúde. 2022; 35:1-9.
- 16. Rede PENSSAN. Inquérito Nacional sobre Insegurança Alimentar no Contexto da Pandemia da Covid-19 no Brasil [Internet]. Rio de Janeiro: Rede Brasileira de Pesquisa; 2021[accessed on 29 jul 2021]. Available from: f https://pesquisassan.net.br/olheparaafome/
- 17. Boneya DJ, Ahmed AA, Yalew AW. Food insecurity and its severity among adults receiving antiretroviral therapy in health facilities, northcentral Ethiopia: a multi-facility-based cross-sectional study. Front Public Heal. 2024; 12:1-11.
- Demisse A, Demena M, Ayele BH, Mengistu A. Food insecurity and associated factors among adult HIV patients on anti-retroviral therapy in Dessie referral hospital, South Wollo Zone, North Central Ethiopia. PLOS Glob Public Heal. 2022; 2(9):1-11.
- Valerio LA, Rzepka MC, Davy-Mendez T, Williams A, Perhac A, Napravnik S, et al. Food Insecurity Prevalence and Risk Factors among Persons with HIV in a Southeastern US Clinical Care Setting. AIDS and Behavior. 2024;(1):45-54.
- 20. Pérez-Salgado D, Compean-Dardón MS, Ortiz-Hernández L. Inseguridad alimentaria y adherencia al tratamiento antirretroviral en personas con VIH de México. Cien saude colet. 2017; 22(2):543-551.
- Weiser SD, Young SL, Cohen CR, Kushel MB, Tsai AC, Tien PC, et al. Conceptual framework for understanding the bidirectional links between food insecurity and HIV/AIDS. Am J Clin Nutr. 2011; 94(6):1729S-1739S.

- 22. Sholeye OO, Amimasahum VJ, Salako AA, Oyewolw BK. Household food insecurity among people living with HIV in Sagamu, Nigeria: A preliminary study. Nutrition and Health. 2017; 23(2):95-102.
- 23. Oluma A, Abadiga M, Mosisa G, Etafa W, Fekadu G. Food Insecurity among People Living with HIV/ AIDS on ART Follower at Public Hospitals of Western Ethiopia. International Journal of Food Science. 2020; 2020:1-10.
- Alum EU, Obeagu EI, Ugwu OPC, Samson AO, Adepoju AO, Amusa MO. Inclusion of nutritional counseling and mental health services in HIV/AIDS management: A paradigm shift. Med (United States). 2023; 102(41):1-4.
- 25. Desconsi D, Martins IC. Promoção da saúde de pessoas portadoras do HIV: Uma revisão. Rev Ibero-Americana Humanidades, Ciências e Educ. 2021; 7(3):11.
- 26. Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2017-2018: Análise da segurança alimentar no Brasil. Rio de Janeiro: IBGE; 2020.
- 27. Secretaria do Planejamento e Gestão do Estado do Ceará. A Segurança Alimentar no Ceará em 2023 [internet]. Fortaleza: IPECE; 2024 [accessed on 17 dez 2024]. Available from: https://www.ipece.ce.gov.br/ wp-content/uploads/sites/45/2024/07/ipece\_informe\_249\_04Jul2024.pdf

### First author and correspondence address

Lorena Nogueira Frota da Costa Programa de Pós-Graduação em Nutrição e Saúde, Universidade Estadual do Ceará – UECE Endereço: Av. Dr. Silas Munguba, 1700 Bairro: Itaperi CEP: 60714-903 / Fortaleza (CE) – Brazil E-mail: Ilorena.nutri@gmail.com

How to cite: Costa FN da, Vasconcelos CMCS de. Fatores associados à insegurança alimentar de pessoas vivendo com o vírus da imunodeficiência humana. Rev Bras Promoç Saúde. 2024;37: e14690. https://doi.org/10.5020/18061230.2024.14690