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Original Article

Association between nutritional status and food insecurity in adult HIV patients aged 18 to 60 at María Auxiliadora Hospital, Lima, Peru

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Abstract

Food insecurity (FI) may have significant implications for people with Human Immunodeficiency Virus (HIV), potentially affecting nutritional status and treatment response. This study aimed to determine the association between food insecurity and the nutritional status of adult HIV patients receiving antiretroviral therapy in Lima, Peru. A descriptive cross-sectional study was conducted with 222 adult HIV patients receiving antiretroviral therapy for at least 6 months at María Auxiliadora Hospital. Anthropometric measurements and the Latin American and Caribbean Food Security Scale were applied. Chi-square and ordinal logistic regression were used to analyze associations. 78.4% of patients lived with FI, with higher prevalence in households without minors (48.2%) *versus* those with minors (30.2%). A significant association was found between BMI and food insecurity (p=0.023). While 7.2% presented caloric malnutrition and 22.5% protein malnutrition, 50.9% had overweight or obesity. Patients with severe FI had 1.57 times higher malnutrition prevalence, and those in families with >7 members showed 1.54 times greater prevalence. The findings suggest a considerable prevalence of food insecurity in the studied population, with significant associations with nutritional status. These results highlight the importance of considering nutritional and socioeconomic factors in HIV patient care.

Keywords: food insecurities, Human Immunodeficiency Virus, nutritional status, malnutrition, socioeconomic factors (source: MeSH NLM)

Introduction

The Human Immunodeficiency Virus (HIV) affects the immune system, causing immunosuppression and, in some cases, progressing toward Acquired Immunodeficiency Syndrome (AIDS). Globally, according to the Global Burden of Disease 2019, approximately 36.85 million people were infected, with 863,840 associated deaths [1]. While in Peru, 137 thousand HIV-positive cases were reported until February 2021 [2]. This progression of infection impacts both nutritional status and immune response, even in patients receiving antiretroviral therapy (ART) [3]. Furthermore, malnutrition could not only worsen general health status but also accelerate disease progression, significantly increasing the risk of developing AIDS and other associated infections.

A key factor related to nutritional status is food insecurity (FI), which is defined as insufficient capacity to access healthy and nutritious foods. Evidence shows a close relationship between FI and HIV, which elevates the risk of poor clinical outcomes [4]. HIV can

increase FI, as patients tend to reduce food consumption, decrease productivity and face stigma and discrimination, limiting economic access and reducing employment opportunities, thus increasing malnutrition risk [5].

Poor adherence to ART causes deterioration of both the immune system and nutritional status due to treatment efficacy loss, increasing morbidity and HIV transmission risk [6]. Furthermore, ART adherence is also associated with food insecurity [7]. In urban Peru in 2012, HIV-positive patients living in food insecurity were twice as likely to fail treatment compliance [8]. Similar results have been found in other low- and middle-income countries; in Mexico, at least 60% of the studied HIV population lived in food insecurity with two to three times more possibility of ART non-adherence [9].

Despite this international evidence, there is a lack of national data on food insecurity and the nutritional status of this population group. This cross-sectional study seeks to determine the association between both variables in adult HIV patients under ART for at least 6 months, using the Latin American and Caribbean Food Security Scale (ELCSA) and various anthropometric measures.

Material and methods

Study design and population

This cross-sectional study included HIV patients aged 18–60 years under outpatient ART at María Auxiliadora Hospital for at least six months, using non-probabilistic convenience sampling. Exclusion criteria: pregnant/lactating women, edentulous patients with moderate dental problems, and those with open wounds in anthropometric measurement areas. The sample size was calculated using Derose *et al.* [10] with 80% power and 95% confidence, resulting in a sample size of 192 patients. Adding 15% for losses/rejections yielded a total of 222 patients.

Nutritional status and food insecurity evaluation

Anthropometric measurements were performed by ISAK level 1 certified personnel using validated equipment: a stadiometer for height, an electronic scale for weight, a Slim Guide caliper for triceps skinfold (a caloric malnutrition indicator), and a measuring tape for arm circumference to calculate arm muscle circumference (a protein malnutrition indicator). Data were analyzed according to Frisancho's (1990) reference tables [11]. Food insecurity was evaluated using the ELCSA, a validated 15-question instrument that classifies households into four levels: secure, mild, moderate, or severe food insecurity. Cronbach's alpha confirmed internal consistency (0.899 for households with minors, 0.887 without minors).

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 28. Due to non-normal distribution (Kolmogorov-Smirnov test, $p<0.05$), non-parametric tests were employed. Descriptive statistics summarized population characteristics. Chi-square (χ^2) was used to evaluate associations between qualitative variables, while ordinal logistic regression with a 95% confidence interval was used to analyze factors associated with malnutrition. The prevalence ratio was calculated to determine the magnitude of the association, and a complete case analysis was used to handle missing data.

Results

Sociodemographic characteristics

The sample comprised 222 patients, of whom 45.0% (100 patients) were between 18 and 35 years old, and 72.5% (161 patients) were men. 38.3% (85 patients) identified as part of the LGBTQ+ community. 49.1% (109 patients) had received ART between 6 months and 5 years

Table 1: Sociodemographic characteristics and food insecurity.

	n (%)
Age (years)	
18–34	100 (45.0)
35–44	64 (28.8)
45–54	40 (18.0)
55+	18 (8.1)
Sex	
Male	161 (72.5)
Female	61 (27.5)
LGBTQ+ identification	
Yes	85 (38.3)
No	137 (61.7)

Table 1: Continued.

	n (%)
Treatment duration (years)	
0.6–5	109 (49.1)
5.1–15	94 (42.3)
15+	19 (8.6)
Marital status	
Single	150 (67.6)
Cohabiting	51 (23.0)
Married	15 (6.8)
Widowed	6 (2.7)
Educational level	
Complete secondary	84 (37.8)
Non-university higher	56 (25.2)
University higher	35 (15.8)
Incomplete secondary	35 (15.8)
Primary	12 (5.4)
Employment status	
Formal employment	109 (49.1)
Informal employment	74 (33.3)
Unemployed	39 (17.6)
Place of residence	
Urban	209 (94.1)
Rural	13 (5.9)
Family size	
≤4 members	147 (66.2)
5–6 members	51 (23.0)
7+ members	24 (10.8)
Average income (soles)	
<1300	128 (57.7)
1300–2439	77 (34.7)
2480–3970	13 (5.9)
>3970	4 (1.8)
Food insecurity level	
Food security	48 (21.6)
Mild FI	80 (36.0)
Moderate FI	50 (22.5)
Severe FI	44 (19.8)
Total FI	174 (78.4)

prior to the study. Additionally, 67.6% (150 patients) were single, and only 41.0% (91 patients) had completed higher education. Regarding employment, 50.9% (113 patients) were unemployed or in informal employment. 78.4% (174 households) presented some degree of food insecurity (Table 1).

Food insecurity levels showed that 48.2% of households without minors under 18 years reported some degree of food insecurity, predominantly mild insecurity, with 22.1% experiencing moderate insecurity. In households with minors under 18 years, 30.2% presented food insecurity, with mild being most prevalent at 14.0% (Table 2).

Nutritional status according to anthropometric indicators

As shown in Figure 1, the nutritional status categories revealed that 15.8% (35 patients) presented with obesity and 35.1% (78 patients) presented as overweight, according to BMI. 7.2% (16 patients) presented with fat mass (FM) depletion or caloric malnutrition, and 24.3% (54 patients) had a below-average FM or were at risk of caloric malnutrition, as determined by the triceps skinfold. Regarding arm muscle circumference, 22.5% (50 patients) presented with low muscularity or protein malnutrition, and 16.7% (37 patients) had below-average muscle mass or were at risk of protein malnutrition.

Association between nutritional status and food insecurity

Statistical analysis revealed a significant relationship between BMI and food insecurity, with a p-value of 0.023. For the triceps skinfold, analysis yielded a p-value of 0.060, while for arm muscle circumference, a p-value of 0.199 was obtained (Table 3).

Among patients with severe food insecurity, 45.5% (20 patients) were overweight according to BMI. Furthermore, 16.0% (8 patients) with moderate FI presented with FM depletion or caloric malnutrition, as indicated by the triceps skinfold. Additionally, 25.0% (11 patients), 26.0% (13 patients), and 20.0% (16 patients) with severe, moderate, and mild FI, respectively, had low muscularity or protein malnutrition, as indicated by arm muscle circumference.

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Table 2: Food insecurity level by household type.

Category	Households with minors under 18 years (%)	Households without minors under 18 years (%)
Food security	8 (3.6%)	40 (18.0%)
Mild food insecurity	31 (14.0%)	49 (22.1%)
Moderate food insecurity	22 (9.9%)	28 (12.6%)
Severe food insecurity	14 (6.3%)	30 (13.5%)
Total food insecurity	67 (30.2%)	107 (48.2%)

Variables associated with nutritional status

For BMI, people with severe food insecurity had 1.57 times more prevalence of malnutrition (95% CI: 1.09–2.27) compared to those with food security. Families with 7 or more members showed 1.54 times more prevalence of malnutrition than families with 4 or fewer members (95% CI: 1.12–2.12).

Regarding triceps skinfold, people with mild and moderate insecurity had 1.92 and 1.83 times more prevalence of caloric malnutrition (95% CI: 1.13–3.25) and (95% CI: 1.03–3.24), respectively. People between 18–34 years and 35–44 years had 0.45 and 0.38 times more prevalence of caloric malnutrition (95% CI: 0.27–0.76) and (95% CI: 0.22–0.70), respectively. For arm muscle circumference, no significant association was found with any variable (Table 4).

Discussion

This research determined the association between food insecurity and nutritional status in adult HIV patients. The main findings reveal a high prevalence of food insecurity, affecting 78.4% of participants, which is considerably higher than the Peruvian national average of 51.6% [12]. Simultaneously, 50.9% presented as overweight or obese according to BMI, while 7.2% showed caloric malnutrition and 22.5% exhibited protein malnutrition. A statistically significant association was found between BMI and severe food insecurity, as well as a higher prevalence of malnutrition among younger patients (18–34 years) and those belonging to large families (more than 7 members).

This high food insecurity pattern is observed in other similar contexts: Bolivia, the Dominican Republic,

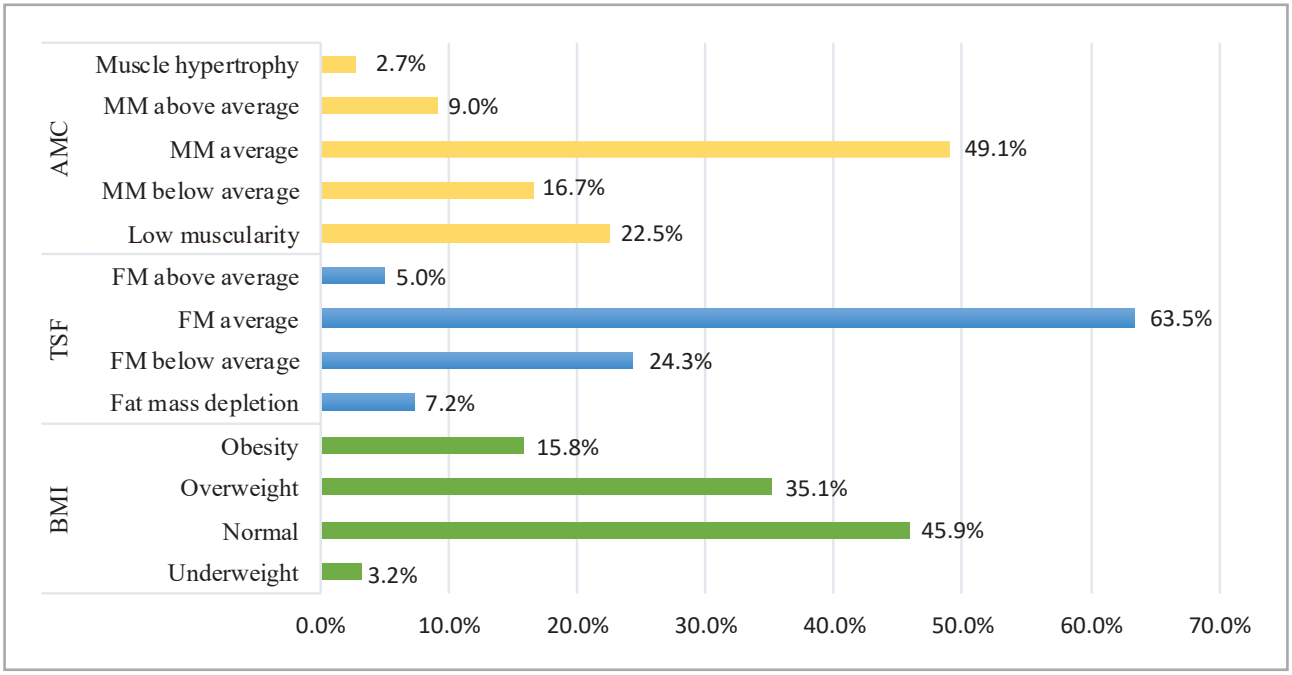

Figure 1: Nutritional status according to BMI, TSF and AMC. AMC – arm muscle circumference; TSF – triceps skinfold; BMI – body mass index; MM – muscle mass; FM – fat mass.

Table 3: Study results of patients with food insecurity according to nutritional status.

Indicators	Food security	Mild FI	Moderate FI	Severe FI
Body Mass Index classification				
Underweight	0 (0.0%)	6 (7.5%)	0 (0.0%)	1 (2.3%)
Normal	27 (56.3%)	31 (38.8%)	30 (60.0%)	14 (31.8%)
Overweight	16 (33.3%)	27 (33.8%)	15 (30.0%)	20 (45.5%)
Obesity	5 (10.4%)	16 (20.0%)	5 (10.0%)	9 (20.5%)
p-value		**0.023**		
Fat mass reserve classification				
Fat mass depletion	2 (4.2%)	4 (5.0%)	8 (16.0%)	2 (4.5%)
FM below average	11 (22.9%)	22 (27.5%)	11 (22.0%)	10 (22.7%)
FM average	34 (70.8%)	46 (57.5%)	29 (58.0%)	32 (72.7%)
FM above average	1 (2.1%)	8 (10.0%)	2 (4.0%)	0 (0.0%)
p-value		**0.06**		
Lean mass reserve classification				
Low muscularity	10 (20.8%)	16 (20.0%)	13 (26.0%)	11 (25.0%)
MM below average	7 (14.6%)	13 (16.3%)	14 (28.0%)	3 (6.8%)
MM average	25 (52.1%)	40 (50.0%)	19 (38.0%)	25 (56.8%)
MM above average	6 (12.5%)	9 (11.3%)	3 (6.0%)	2 (4.5%)
Muscle hypertrophy	0 (0.0%)	2 (2.5%)	1 (2.0%)	3 (6.8%)
p-value		**0.199**		

Note: FI – Food insecurity; FM – Fat mass; MM – Muscle mass; p-value for chi-square test.

and Honduras reported levels of 61%, 68%, and 87%, respectively [5]; Mexico registered approximately 60% [9]; and Ethiopia showed 62.4% [13]. These similarities may reflect shared social determinants among middle- to low-income countries [14], a situation that is exacerbated in Peru by the increase in poverty to 27.5% in 2022 [14]. Given this scenario, food insecurity evaluation in HIV patients is crucial, given its potential influence on disease progression and clinical outcomes [15].

Regarding the demographic characteristics of our study population, the majority (61.7%) did not identify as part of the LGBTQ+ community, highlighting the need to reconsider narratives that exclusively associate HIV with this population. This distribution could reflect both the diverse epidemiological reality of HIV and possible methodological limitations. Stigmatization contexts can influence participants' willingness to reveal information about their sexual orientation or gender identity in clinical settings [16].

Our results showed that HIV patients living with severe FI had a higher prevalence of underweight. In comparison, those with mild and moderate FI presented a higher prevalence of caloric malnutrition compared to those with food security. Possible causes predisposing these patients to malnutrition include poor ART adherence in people with FI [7], medication side effects such as malabsorption and appetite loss [17], and direct HIV impact on work productivity and economic access to foods [5].

Another relevant factor in nutritional vulnerability is the occurrence of opportunistic infections, such as oral candidiasis and ulcers, which have been consistently associated with an increased risk of malnutrition in this population [18]. This scenario is further complicated by stigma and discrimination faced by people with HIV, factors that limit their socioeconomic opportunities and could contribute significantly to food insecurity [19].

Another relevant finding was that a higher prevalence of caloric malnutrition was observed among younger patients (18–44 years). These results align with previous research, which has documented similar

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Table 4: Variables associated with nutritional status (adjusted prevalence ratios and 95% CI).

	BMI aPR (95% CI)	TSF aPR (95% CI)	AMC aPR (95% CI)
Food insecurity level			
Mild FI	1.442 (0.99–2.08)	1.919 (1.13–3.25)	1.176 (0.81–1.71)
Moderate FI	0.910 (0.57–1.45)	1.830 (1.03–3.24)	1.385 (0.94–2.03)
Severe FI	1.572 (1.09–2.27)	1.003 (0.54–1.88)	0.914 (0.57–1.47)
Food security	Reference	Reference	Reference
Sex			
Male	0.889 (0.68–1.16)	0.752 (0.53–1.08)	1.012 (0.76–1.36)
Female	Reference	Reference	Reference
LGBTQ+ identification			
No	1.120 (0.84–1.50)	1.099 (0.74–1.64)	1.023 (0.76–1.36)
Yes	Reference	Reference	Reference
Educational level			
Primary	1.019 (0.63–1.64)	1.263 (0.59–2.71)	0.968 (0.49–1.87)
Incomplete secondary	0.907 (0.57–1.43)	1.189 (0.64–2.21)	1.055 (0.67–1.67)
Complete secondary	0.892 (0.59–1.33)	1.019 (0.59–1.76)	1.051 (0.70–1.57)
Non-university higher	0.940 (0.62–1.42)	1.457 (0.84–2.53)	0.991 (0.64–1.55)
University	Reference	Reference	Reference
Marital status			
Single-widowed	0.882 (0.67–1.15)	0.977 (0.65–1.46)	1.337 (0.95–1.88)
Married-cohabiting	Reference	Reference	Reference
Employment status			
Unemployed	0.742 (0.49–1.12)	0.859 (0.50–1.47)	1.197 (0.84–1.70)
Informal work	1.080 (0.84–1.38)	0.884 (0.59–1.31)	0.809 (0.58–1.14)
Formal work	Reference	Reference	Reference
Average income (soles)			
<1300	0.902 (0.45–1.78)	0.854 (0.37–1.96)	0.872 (0.27–2.85)
1300–2439	0.960 (0.48–1.91)	1.385 (0.63–3.07)	1.021 (0.32–3.27)
2480–3970	1.448 (0.66–3.16)	1.407 (0.47–4.18)	1.299 (0.36–4.69)
>3970	Reference	Reference	Reference
Family size			
≤4 members	Reference	Reference	Reference
5–6 members	0.993 (0.74–1.34)	0.862 (0.55–1.34)	1.156 (0.87–1.54)
7+ members	1.539 (1.12–2.12)	1.211 (0.70–2.09)	0.850 (0.53–1.36)
Place of residence			
Urban	0.645 (0.42–1.00)	0.809 (0.35–1.86)	0.944 (0.55–1.62)
Outside Lima	Reference	Reference	Reference

Table 4: Continued.

	BMI aPR (95% CI)	TSF aPR (95% CI)	AMC aPR (95% CI)
Age (years)			
18–34	0.918 (0.56–1.50)	0.452 (0.27–0.76)	1.198 (0.69–2.09)
35–44	1.313 (0.82–2.11)	0.388 (0.22–0.70)	0.973 (0.54–1.77)
45–54	1.164 (0.70–1.93)	0.637 (0.37–1.11)	1.190 (0.65–2.18)
55+	Reference	Reference	Reference
Treatment duration (years)			
0.6–5	0.887 (0.59–1.33)	1.002 (0.56–1.80)	0.915 (0.55–1.51)
5.1–15	0.760 (0.49–1.16)	0.936 (0.52–1.70)	0.825 (0.50–1.36)
15+	Reference	Reference	Reference

Note: BMI – Body Mass Index; TSF – Triceps Skinfold; AMC – Arm Muscle Circumference; FI – Food Insecurity, aPR – Adjusted prevalence ratio; CI – Confidence interval.

patterns of nutritional vulnerability in this age group [20]. Various socioeconomic factors may explain this association, including characteristically irregular dietary patterns and eating habits in young adults [21] and economic precarity and high unemployment rates that disproportionately affect this population segment [22].

When analyzing the associations between food insecurity and various anthropometric measures, a significant correlation was observed between nutritional status, as measured by BMI, and food insecurity. These findings are consistent with a study conducted in Iran, where FI decreased by 10% each time BMI increased by one unit [23]. In contrast, no association was found between food insecurity and nutritional status measured through triceps skinfold and arm muscle circumference. This lack of association could be attributed to possible ART side effects, such as lipodystrophy, in these patients, which may bias measurement results [24].

The coexistence of high food insecurity levels with elevated prevalence of overweight and obesity constitutes a nutritional paradox documented in previous investigations [25]. Our findings align with those of other Latin American countries [4] but show higher rates than those reported in Brazil (37.1%) [24]. This paradox is particularly prevalent in households experiencing economic stress, a characteristic present in our population, where 57.7% reported an income below 1300 soles and 50.9% were unemployed or in informal employment.

Based on these findings, the results evidence an urgent need for multisectoral interventions to address food insecurity in adult HIV patients, considering its high prevalence (78.4%) and link with caloric-protein malnutrition. Prioritization should focus on households with severe food insecurity and large families, while health services are strengthened through specialized nutritional programs addressing both malnutrition and overweight and obesity.

It is important to acknowledge some limitations in this study. The use of convenience sampling in a single hospital, limited to patients in regular ART follow-up, restricts our ability to generalize these results to broader populations. Additionally, the cross-sectional nature of the design enables us to identify associations between variables; however, it does not allow us to establish causal relationships. Finally, considering the stigma that still surrounds HIV, it is possible that some participants provided socially desirable responses, which could have influenced our findings.

Conclusion

This study reveals that nearly eight out of ten HIV patients experienced food insecurity, far exceeding national averages. What is particularly notable is the coexistence of malnutrition alongside overweight and obesity within the same population, with younger adults and those from larger families showing greater vulnerability. Our findings underscore the intricate connection between food insecurity and nutritional status in HIV patients, highlighting the need for comprehensive assessment tools beyond simple weight measurements. We recommend integrating food security screening into routine HIV care and developing

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targeted interventions that consider each patient's socioeconomic context, as early identification and intervention could substantially improve both nutritional outcomes and overall treatment success for people living with HIV.

Conflict of interest

The authors declare no conflict of interest.

Ethics approval

This study was approved by the Institutional Ethics Committees of Universidad Científica del Sur (084-CIEI-CIENTÍFICA-2023) and María Auxiliadora Hospital (HMA/CIEI/022/2023), and was conducted in accordance with the Declaration of Helsinki.

Consent to participate

Written informed consent was obtained from all the participants.

Artificial intelligence use statement

During manuscript preparation, the authors used Claude (Anthropic) as a support tool for style correction. The authors meticulously reviewed the content, ensuring accuracy and assuming complete responsibility for the final version of this publication.

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