DOI: 10.1590/1413-812320172210.02462017

Moderate and severe household food insecurity in families of people living with HIV/Aids: scale validation and associated factors

Amira Rose Costa Medeiros [1]
Rafaela Lira Formiga Cavalcanti de Lima [1]
Leidyanny Barbosa de Medeiros [1]
Flávia Maiele Pedroza Trajano [1]
Amanda Amaiy Pessoa Salerno [1]
Ronei Marcos de Moraes [2]
Rodrigo Pinheiro de Toledo Vianna [1]

Abstract *Vulnerable population groups, including people living with HIV/Aids (PLHA), may have a high prevalence of food insecurity (FI). A cross-sectional study evaluated the internal validity of the Brazilian Food Insecurity Scale (Escala Brasileira de Insegurança Alimentar – EBIA) and measured the prevalence of FI in a sample of 796 PLHA in João Pessoa, Paraíba State (PB). The validation was performed using a Rasch analysis. The association of FI with sociodemographic and clinical characteristics was assessed using the chi-square test. Associated variables were included in a Poisson multiple regression model. The EBIA was valid for PLHA with fit values within the expected limits and item severity conforming to the theoretical model. The EBIA identified 66.5% of PLHA with FI in the sample (30.8% mild FI, 18.1% moderate FI and 17.6% severe FI). Moderate FI and severe FI were associated with an age younger than 43 years (prevalence ratio (PR) = 1.49; 95% confidence interval (CI): 1.14-1.86), primary education (PR=1.64; 95% CI: 1.24-2.17), income per capita lower than ½ minimum wage (MW) (PR=1.83; 95% CI: 1.37-2.44), lack of occupation (PR=1.59; 95% CI: 1.16-2.19) and adult-only households with a female reference person (PR=2.19; 95% CI: 1.45-3.31). The PLHA in this study had a high prevalence of FI, worsening their living conditions and potentially exacerbating their health problems.*

Keywords *Food insecurity, EBIA, HIV, AIDS*

[1] Centro de Ciências da Saúde, UFPB. Cidade Universitária s/n, Castelo Branco III. 58051-900 João Pessoa PB Brasil. amiramedeiros@gmail.com
[2] Centro de Ciências Exatas e da Natureza, UFPB. João Pessoa PB Brasil.

Introduction

Food and nutritional security (FNS) is "the realization of everyone's right to regular and permanent access to quality food, in sufficient quantity, without endangering access to other essential needs, based on food practices that promote health, that respect cultural diversity and that are socially, economically and environmentally sustainable"[1]. At the household level, food security (FS) is associated with food access conditions and is directly related to family income, education, access to other basic needs and living conditions[2,3]. Food insecurity (FI) affects an individual's health, nutritional status and well-being with physical, biological and psychological consequences[4]. In 2013, in Brazil, 22.6% of Brazilian households had FI; this prevalence is historically higher in the north and northeast regions of the country. In Paraíba State in that same year, 36.5% families were experiencing FI[3].

The FS and FI situation has been evaluated using the Brazilian Food Insecurity Scale (Escala Brasileira de Insegurança Alimentar – EBIA), which was adapted and validated for the Brazilian context in 2003[5-7]. Based on the answers to the 14 items of the scale, each household is classified into 1 of 4 groups: FS, mild FI, moderate FI and severe FI. The EBIA has been used to assess the prevalence of FNS and the different FI levels in Brazil and to identify vulnerable groups requiring specific social policies[3].

People living with HIV/AIDS (PLHA) are a specific and vulnerable group under permanent treatment with a complex and high-cost therapy. The Brazilian Antiretroviral Therapy Guidelines for HIV-Infected Adults refer to the importance of healthy eating for providing the necessary nutrients to the body's functioning, preserving the immune system, improving tolerance toward antiretroviral drugs, favoring their absorption and preventing side effects, and helping to promote health and improve physical and mental performance[8].

Studies conducted in Canada showed that the prevalence of FI among people with access to antiretroviral therapy (ARVT) in British Columbia reached 48%, and slightly less than half of those people reported hunger. These individuals were mostly women, aboriginals, people who lived with children, people with a lower educational level, people with a history of drug and alcohol use and people with unstable housing[9]. Subsequently, a follow-up study, also conducted in this province, observed that the FI situation had contributed to the unsatisfactory clinical progression of these individuals: FI was associated with a higher mortality rate and worse clinical outcomes during the sample follow-up[10,11].

In Paraíba State (PB), PLHA are followed at the Complexo Hospitalar de Doenças Infecto-Contagiosas Clementino Fraga (Clementino Fraga Communicable Infectious Diseases Hospital Complex – CHCF) in João Pessoa, which is a referral hospital that treats most patients with HIV from this state. Considering that FI may reach high prevalence rates in population groups with worse living conditions[3] and that PLHA are known to be vulnerable, this study focused on measuring the prevalence of FI and its association with sociodemographic and health factors in this population. Although EBIA is an instrument validated for the Brazilian population in general, PLHA are a specific group with a serious disease. Thus, the EBIA internal validity and response behavior for people from this group must be evaluated because of concern that the disease may affect other aspects of life, such as access to food, which is an FI dimension assessed by the EBIA.

Methods

A cross-sectional study was performed involving PLHA followed at the CHCF in João Pessoa, PB. All persons treated in the department from March 25 to May 27 and from September 2 to December 23, 2015 were selected by convenience. These data collection months were randomly chosen and are independent of any departmental planning. The chosen time periods are periods of routine hospital activities. In total, 796 PLHA were recruited using this strategy, including 399 from the first period and 397 from the second.

All patients were subjected to a face-to-face interview conducted by a team of previously trained researchers. The inclusion criteria were being 18 years of age or older, having been diagnosed with HIV/ AIDS for longer than 6 months, using ARVT, having no neurological or psychiatric disorders and not being pregnant. All participants agreed to participate in the research study and had previously signed an informed consent form.

The questions asked to the interviewees, whenever possible, were open-ended and then categorized to perform an association analysis with the dependent variable FI. The following categories were used for the study variables: a) sex: female or male; b) age in full years: absolute number and categories of below median, median

or older; c) occupation: with occupation/economically active (employed, freelance, students), without occupation (unemployed, homemaker, retired or pensioner), or information not available; d) marital status: living with partner, not living with partner; e) education: none to incomplete primary education, complete primary education or higher; f) family income: total sum of all family income; g) number of household members: absolute value and categories of 1 to 3 members, 4+ members; and h) per capita income (assessed by the ratio between family income and the number of household members) in absolute value and categories of none to ½ minimum wage (MW) and higher than ½ MW.

Weight and height were measured in 479 individuals, using a digital scale with a capacity up to 150 kg and an accuracy to 0.1 kg. Height was measured using an inelastic tape measure fixed to the wall, following the recommendations from the Brazilian Ministry of Health[12]. The weight and height of the rest of the sample were self-reported and subsequently corrected using an equation generated using self-reported and measured values from 20% of the sample. This correction was performed to achieve higher measurement accuracy and decrease the bias resulting from 2 different data collection methods, measured and self-reported data[13]. The body mass index (BMI) was calculated by dividing weight (kg) by height (m) squared. The values obtained were categorized into low weight, normal weight, overweight and obesity[14].

Disease length was considered the difference between the date of diagnosis and the date of the interview, and the length of ARVT use was the difference between the start dates of use recorded in the medical charts and the date of the interview. These time measurements were categorized into tertiles.

EBIA is a 14-item scale for households with adults and minors and an 8-item scale for adult-only households. All answers are dichotomous and evaluate aspects ranging from concern over the lack of food and reduced food quality to the lack of food for the family. Each answer adds a point to the total score of the scale, and the households were classified into: *FS* (no points); *mild FI* (from 1 to 5 points for households with minors or from 1 to 3 points for adult-only households); *moderate FI* (from 6 to 9 points for households with minors or from 4 to 5 points for adult-only households); and *severe FI* (from 10 to 14 points for households with minors or from 6 to 8 points for adult-only households).

The internal validity of the EBIA was performed using the Rasch Model with measurements of severity and fit – infit[15]. Severity is the logarithmic measure of the likelihood of a household to respond positively to an item, whereas fit corresponds to the ratio of the squared difference between the expected and observed estimates and is identified as the mean of the squared residuals, with an acceptable value ranging from 0.5 to 1.5[16]. The infit ratio compares the response pattern in the empirical data and theoretical model, that is, it is used to assess whether an easier item gets a higher number of correct answers than a more difficult item[17]. Both statistics and the number of affirmative answers to each question were calculated. A Rasch analysis was performed using the software WINSTEPS version 3.72. The sample was stratified into 2 groups for the Rasch analysis: adult-only households and households with adults and minors, as a function of the strong association observed between household composition and FS situation or different FI levels.

All variables were described through frequency tables. The measures of central tendency, mean and median, dispersion, standard deviation and 95% confidence intervals (CIs) were also calculated for the continuous variables. The dependent variable of the study, FS or the FI situation, was categorized into group 1 (FS and mild FI) and group 2 (moderate and severe FI) to compare the situation of FS and mild FI (when decreases in food quality or concerns about food quality occur) with more severe situations (when restriction in available food quantity and even household hunger occur). This can identify more serious nutritional problems among PLHA.

The association of FI with the other study variables was tested using the chi-square test with a 5% significance level. To construct the multiple model, the independent variables with a p-value less than or equal to 0.20 were included in a Poisson regression model to estimate the independent effects – prevalence ratio (PR) – of each variable regarding the highest moderate or severe FI situation compared to the FS or mild FI situation. The final model only consisted of significant variables (p-value lower than 0.05).

When a variable lost significance in the multiple model, the variable was analyzed again with the other explanatory variables, forming a new variable – an interaction variable – with several categories equivalent to the product of the number of categories of their originating variables. The possible interaction variables repeated the procedure described above and remained in the

final model when significant, that is, with a p-value of less than 0.05[18].

This research study was approved by the Research Ethics Committee of the Health Sciences Center at the Federal University of Paraíba (UFPB). All ethical considerations set out in Resolution 466/12[19] were observed, particularly because this is a special group, strictly respecting secrecy and anonymity. The researchers declare no conflicts of interest with the research results.

Results

A total of 796 PLHA participated in this research study, of whom 312 (39.2%) were women and 484 (60.8%) were men. The recorded age ranged from 19 to 87 years, with a mean of 44.3 years (SD = 10.7 years) and a median of 43 years. Most participants had incomplete primary education (52.4%) and 66.3% stated having no occupation, declaring themselves as economically inactive. The calculated income per capita ranged widely, with a mean of R$ 632.07 (SD = R$735.41). There was an average of 3.0 residents in a household, and 62.2% of the interviewees lived in adult-only households.

The prevalence of FI in this sample was 66.5%, and the distribution of FS and the different FI levels was significantly associated with adult-only households or households also with minors. The differences observed in the frequency distribution of these 2 groups showed that the prevalence of severe FI was higher in adult-only households even though FS was also higher in this group (Table 1).

These same 2 strata were considered for the psychometric analyses of the scale. The results from the Rasch model respond adequately to the theoretical model of the FI construct according to the severity values of the items and to the infit adjustment of each item in the 2 study groups (Figure 1). The least serious items, "decreasing the quality", "decreasing the variety" and "being concerned", had the lowest severity, followed by the issues "decreasing the quantity", "lacking food" and "decreasing the number of meals". The most serious issues of "feeling hungry" and "skipping meals" had the highest severity, as expected. The infit values of the items remained within the expected range from 0.7 to 1.3, except for the item "being concerned", which had infit scores of 1.36 and 1.38 for adult-only households and household with adults and minors, respectively. These results show that the scale behaved as expected and had internal validity when administered to the population of PLHA.

The mean length of HIV-seropositive diagnosis among the participants was 7.4 years, with a standard deviation of 5.3 years, a minimum length of 6 months (set as the inclusion criterion) and a maximum length observed of 35 years. The median length of diagnosis was 6.2 years. The mean length observed for ARVT use was 6.5 years, with a standard deviation of 5.09 years and a median of 5 years.

A detailed description of sociodemographic, economic and health variables as a function of the FS and FI situation is outlined in Table 2, IA, according to the dichotomization into FS or mild FI (Group 1) and moderate or severe FI (Group 2).

The association test between the dependent variable, FI situation, which was dichotomized in both groups, and the other study variables showed an association with age, sex, income, education and occupation of PLHA. Thus, being a woman ($p < 0.001$) 43 years or younger ($p = 0.013$) and having an income per capita lower than half the MW wage ($p < 0.001$) and incomplete primary education ($p < 0.001$) or lacking occupation ($p < 0.001$) were characteristics associated with a higher prevalence of moderate and severe FI. These significant variables and the variables marital status, length of disease diagnosis and length of ARVT use were included in a Poisson regression model to estimate the independent effects (PRs) of each variable. Only age, income per capita, education and occupation remained significant within the model. The variable sex of PLHA lost significance within the multiple regression model and was associated with income, education, occupation, number of household members, BMI and household composition when testing its association with the other variables. Because the variable number of household members was also associated with household composition – adult-only household and household with adults and minors – 2 interaction variables: sex x BMI and sex x household composition, were created, and the latter was significantly associated with FI, both alone and fitted to the model (Table 3).

The results from the Poisson multiple regression model in the sample of 789 cases of PLHA with full information on the variables selected for the model indicated that the PR of moderate or severe FI among people 43 years or younger was 1.46 times the PR among people older than 43 years of age, which indicates that the likelihood of PLHA having moderate or severe FI increased

Table 1. Prevalence rates of FS and different FI levels in the households of 796 PLHA as a function of their composition. João Pessoa, 2015.

Household Composition*	Food Security		Mild IA		Moderate IA		Grave IA	
	n	%	n	%	n	%	n	%
Adult-only households	193	39.0	123	24.8	78	15.8	101	20.4
Households with adults and minors	74	24.6	122	40.5	66	21.9	39	13.0
Total	267	33.5	245	30.8	144	18.1	140	17.6

* The difference in FS and FI levels, as a function of household composition, was significant ($p < 0.001$).

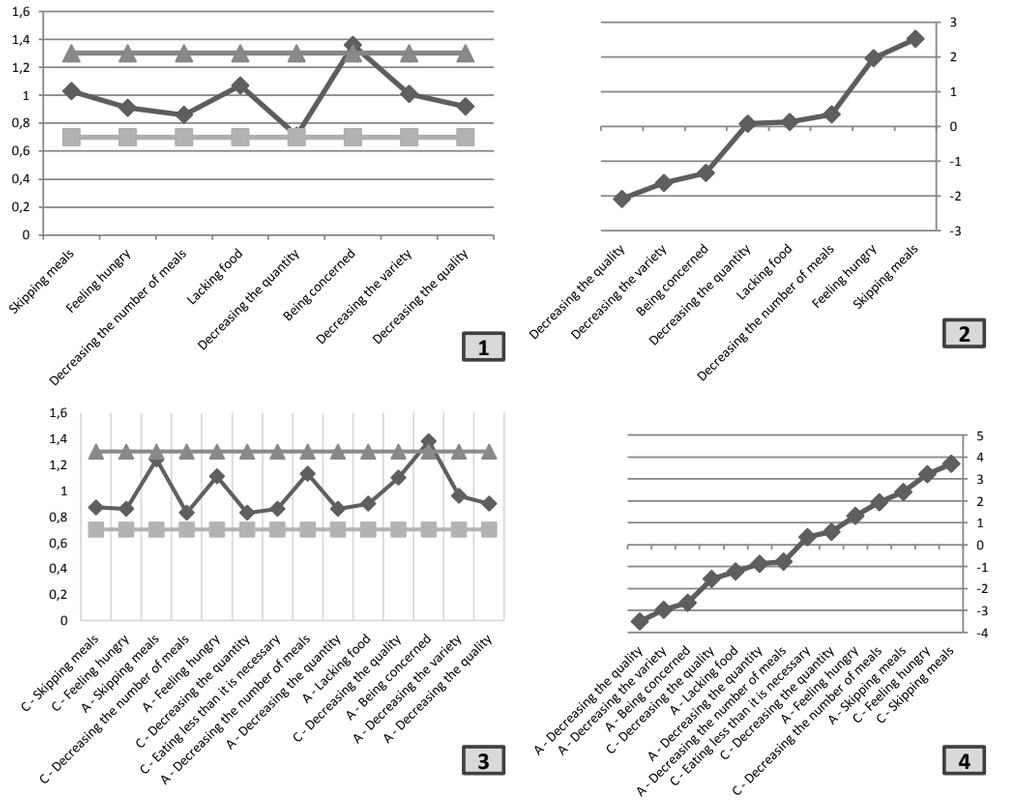

Figure 1. Rasch model statistics. (1) Infit values for adult-only households. (2) Severity values of items for adult-only households. (3) Infit values for households with minors. (4) Severity values of items for households with minors. João Pessoa, 2015.

with age. Similarly, having lower education increased the PR of FI by 64%, lacking occupation or being economically inactive increased the PR by 59.2% and having an income per capita below ½ MW increased the prevalence of moderate or severe FI by 83.1%.

The results from the interaction variable sex of PLHA and household composition showed that the best situation was male PLHA living in households with adults and minors. The prevalence of moderate and severe FI increased by 63.2% when the person of reference was a woman

Table 2. Frequency distribution of sociodemographic, economic and health variables in PLHA as a function of the food security situation. João Pessoa, 2015.

Sociodemographic, economic and health variables	Food Security + Mild FI		Moderate + Severe FI		Total Sample		p-value*
	n_1	%	n_2	%	n	%	
Age							
Up to 43 years (median)	236	*60.0*	157	*40.0*	396	*100.0*	**0.013**
Older than 43 years	276	*68.5*	127	*31.5*	403	*100.0*	
Sex							
Female	171	*54.8*	141	*45.2*	312	*100.0*	< **0.001**
Male	341	*70.4*	143	*29.6*	484	*100.0*	
Per capita income							
Up to ½ minimum wage	229	*52.9*	204	*47.1*	433	*100.0*	< **0.001**
More than ½ minimum wage	283	*78.0*	80	*22.0*	363	*100.0*	
Education**							
Up to incomplete primary education	219	*52.5*	198	*47.5*	417	*100.0*	**0.001**
Incomplete primary education or higher	292	*77.4*	85	*22.5*	377	*100.0*	
Marital status **							
Living with partner	331	*66.1*	170	*33.9*	501	*100.0*	0.177
Not living with partner	179	*61.3*	113	*38.7*	292		
Occupation **							
Employed/economically active	209	*79.5*	54	*20.5*	263	*100.0*	< **0.001**
Unemployed/economically inactive	302	*57.2*	226	*42.8*	528		
Number of household members							
Up to 3	345	*65.6*	181	*34.4*	562	*100.0*	0.297
4 or more	167	*61.8*	103	*38.2*	270		
Length of diagnosis							
Up to 4 years	164	*60.5*	107	*39.5*	271	*100.0*	0.107
Longer than 4 years	348	*66.3*	177	*33.7*	525	*100.0*	
Length of TARV use***							
Up to 3 years	166	*60.8*	107	*39.2*	273	*100.0*	0.135
Longer than 3 years	346	*66.2*	177	*33.8*	523	*100.0*	
BMI**							
Underweight	17	*58.6*	12	*41.4*	29	*100.0*	0.337
Normal weight	262	*64.7*	143	*35.3*	405	*100.0*	
Overweight	175	*67.0*	86	*33.0*	261	*100.0*	
Obesity	52	*55.9*	41	*44.1*	93	*100.0*	
Household composition							
Only adults	316	*63.8*	179	*36.2*	495	*100.0*	0.715
Adults and minors	196	*65.1*	105	*34.9*	301		

* Chi-square test. **Variables without information: education: 2 cases; marital status: 3 cases; occupation: 5 cases; BMI (Body Mass Index): 8 cases. *** Antiretroviral therapy.

in households with adults and minors and 85.7% when the person of reference was a man but lived in an adult-only household; the worst situation was assessed when the person of reference was a woman living in an adult-only household. In this last situation, the prevalence of moderate or severe FI was more than double that of the reference group (119.1%).

Discussion

The present study reported the results from the validation of the EBIA administered to PLHA, the measurements of FI prevalence and the factors associated with FI. PLHA are a vulnerable group with a serious disease that, although there is no cure for, may be controlled with proper

Table 3. Result from the Poisson multiple regression – variables independently associated with moderate or severe FI in the total sample, with the prevalence ratio (PR) and confidence interval (CI). João Pessoa, 2015.

Variable	Category	PR -adjusted	Confidence Interval (95%)	
			Minimum	Maximum
Sex x household composition	Female with an adult-only family	2.191	1.449	3.314
	Male with an adult-only family	1.857	1.247	2.765
	Female with a family of adults and minors	1.632	1.083	2.460
	Male with a family of adults and minors	1		
Age	≤ 43 years	1.459	1.143	1.862
	> 43 years	1		
Education	Up to incomplete primary education	1.640	1.237	2.174
	Primary education or higher	1		
Occupation	Without occupation	1.592	1.156	2.192
	With occupation	1		
Income per capita	≤ ½ minimum wage	1.831	1.373	2.442
	> ½ minimum wage	1		

treatment, enabling a survival rate similar to that of the general population[20,21]. In addition to the disease itself and other serious problems experienced by PLHA, including social prejudice, the need for and complexity of the treatment, this study showed that FI, in its more severe forms, also affects a large part of this population. The EBIA proved adequate for administration to the population group with a good internal validity, according to the tests performed in the Rasch analysis. Acceptable values of fit between the estimated and the expected response, called infit values, should range from 0.5 to 1.5. Because it is a one-dimensional scale, fits ranging from 0.7 to 1.3 are considered adequate and from 0.8 to 1.2 are considered excellent[16]. In this study, the highest infit value observed in adult-only households was 1.36, and the highest infit value observed in households with adults and minors was 1.38. In both cases, these infit values were for the least severe item in the scale: "being concerned about the lack of food". Some low fits are acceptable for the most extreme items.

The positive results from the validation are important to confirm the adequate performance of the scale in this specific population group. Characteristics such as the biological vulnerability of PLHA, risks related to sexual practices and their effect on household structure and changes in taste perception and appetite due to ARVT, among others, could be factors that would change the pattern of responses to EBIA items, thereby compromising the validity of this scale. A study conducted with families living in the interior of PB confirmed the internal and external validity of the EBIA, and its consistency, when administered to adult-only households and households with adults and minors. In the validation study, adult-only households have fewer members and higher income per capita, thereby having higher FS than households with adults and minors (66.6% vs 38.1%) and substantially lower severe FI (3.1% vs 15.4%)[22]. In this study, a similar result of a higher prevalence of FS was observed in families of PLHA without the presence of minors. However, the same household composition had a higher prevalence of severe FI. This behavior could be further studied because this may be a key risk factor for the severe FI situation, although the present study failed to collect data for such purpose.

The different behavior of the distribution of safety PRs and the 3 levels of FI as a function of household composition also justifies the household stratification as a function of this characteristic to perform the validation analysis. The result, as expected, enables using EBIA in families of PLHA, regardless of their composition.

Regarding the results from the PRs observed, the findings of this study on PLHA were almost twice as high as those observed in the general population of the state of Paraíba in 2013 (36.5% according to the Instituto Brasileiro de Geografia e Estatística [Brazilian Institute of Geography and Statistics – IBGE][3] compared to 66.5% in this study). Of the total study sample, 17.6% cases were classified as severe FI, which represents, according to the EBIA, experiencing hunger in

the last 3 months. This result shows a very serious problem that reflects a great social inequality experienced by the population infected with HIV who are treated in the main public healthcare service for infectious diseases of the state of Paraíba. The combined PRs of moderate and severe FI in this population group are higher than those among homeless people or people living in poor households in San Francisco, California, USA, wherein 25% were classified as severe FI and the other 24% as mild or moderate FI[23]. Notably, the scale used in the USA refers to events that occurred in the previous year[24], whereas the scale used in Brazil refers only to the previous 3 months.

The FI prevalence among PLHA varies in the literature. In Brazil, a study conducted with 103 PLHA in Brasília evaluated FI in this sample and found results better than the results from João Pessoa, that is, 33.8% FI prevalence among people with HIV and 36.8% among those with AIDS. This lower prevalence may be attributed to characteristics specific to the region. However, these values are much higher than those observed by the national survey in 2013, wherein the FI prevalence among the general population of the Federal District was 13.3%[25].

These results are also similar to the context of developed countries, including Canada, where 71% of a sample of 457 PLHA using ARVT were experiencing FI, regardless of the level of severity[10]; India, where 50.9% of patients from a clinic undergoing ARVT experienced some level of FI[26]; or poor countries, including Ethiopia, where 63% of a sample of 319 PLHA also experienced FI[27]. FI in the context of PLHA may be a key risk factor for the occurrence of negative outcomes[28]. FI has been associated with a 1.3 times increased likelihood of showing a worse CD4 cell count, according to a recent meta-analysis[29], and is associated with depression symptoms, worse treatment compliance and exacerbation of side effects[30]. PLHA experiencing FI have a 1.29 times higher likelihood of showing incomplete viral load suppression and a 1.48 times higher likelihood of failing to comply with the treatment[31]. A follow-up study with PLHA conducted in India found that moderate or severe FI is a risk factor for depression among male patients, reinforcing the notion that food assistance may decrease stress and provide key benefits for the treatment of PLHA[32].

FI and compromised nutritional status may accelerate the progression of diseases related to AIDS, impair the compliance with and response to ARVT and exacerbate the socioeconomic impacts of the virus. Infection with the virus itself weakens FS and compromises the nutritional status by reducing the work capacity and productivity and jeopardizing the means of subsistence of households or families[33]. PLHA experiencing FI exacerbate their self-perception of social failure, as reported in a sub-group receiving food assistance[30].

The variables associated with moderate and severe FI that remained in the final Poisson multiple regression model were incomplete primary education, age younger than the median (43 years), income per capita lower than half the MW, being economically inactive or lacking occupation and adult-only households, particularly when the person infected with HIV is a woman. Because the scale measures access to food, these results are quite consistent and meet the theoretical threshold of FI where social inequalities are directly related to the FI phenomenon, that is, the worse the household socioeconomic conditions are, the higher the FI prevalence and intensity will be, according to the results from other studies on FI in PLHA[34,35]. These relationships are well known in regional or nationwide studies performed with other population groups. In Paraíba, the external validity of the EBIA was confirmed with the direct relationship between the decrease in income and the increase in FI[22]. In Brazil, the lack of access to public services, lower household income per capita, female person of reference, lower education and worse working conditions were associated with higher FI[3]. These results show that the negative effects of social inequalities are directly related to the perception of FI[36]. Notably, the factors measuring the occurrence of FI among PLHA are similar to those reported in general, but they more intensely affect individuals with a more vulnerable economic situation.

In Ethiopia, a study showed that FI was associated with low family income, low education level and occupation. A higher educational level provides better opportunities for PLHA to engage in income-generating activities toward decreasing the vulnerability to FI[27]. The association of FI with worse social class and lower education among PLHA was also shown in Brazil[25].

The univariate analysis showed that women undergoing treatment for HIV/AIDS had a higher prevalence of moderate or severe FI than men. The analysis of this variable in combination with household composition showed that this relationship remained significant in the mul-

tiple regression model. In Brazil, FI is higher in households in which a woman is the person of reference[5]. Another nationwide research study also showed that women experiencing a severe FI situation were more likely to show risk behaviors that could lead to infection with HIV[31]. The sex distribution observed in this study, in which nearly 40% of PLHA were women, confirms the need for further studies addressing the issue of gender and its impact on the treatment and living conditions of HIV-positive women.

The observed relationship of a higher prevalence of moderate and severe FI among PLHA with lower income (lower than ½ MW per capita) confirms that this phenomenon is observed in FI studies conducted with other population groups. However, income restriction in PLHA may be worse than that experienced by families without chronic diseases due to the urgent demand for treatment needs and their consequences[37]. Facing poverty and FI problems in PLHA may be a crucial element to obtain improved treatment compliance and clinical results with ARVT.

This study identifies factors associated with the increase in prevalence of moderate and severe FI in PLHA, although the FI effects on treatment, compliance and efficacy and clinical outcomes of these patients must be known. These data are important to organize public policies adequate to food access and assistance and social support to improve the survival and quality of life of patients undergoing ARVT[10,38] and to ensure the FNS of PLHA[27].

Some limitations of this study should be considered, particularly because this is a cross-sectional study in which the causal relationships cannot be examined. Selection bias may also occur in both the recruitment method and research using cases from the hospital of reference of the state as a source. The sample space used by this study included 2 different periods to recruit all patients accessing the service, and no initiative, campaign or specific activity of the hospital that could bias the sample occurred during the data collection months. Thus, considering that the sample randomization of this population was precluded, the option used obtained a sample large enough to ensure the internal validity of the results and with a high likelihood of representing PLHA undergoing treatment in the state of Paraíba because it is a small state, with high coverage by the Unified Health System (Sistema Único de Saúde – SUS), and most cases are treated in this referral hospital. Furthermore, because this is a serious disease, the percentage of underreporting is expected to be lower than that of other less serious diseases. Nevertheless, prejudice and discriminatory aspects related to infection with HIV remain a barrier to the identification and timely treatment of the disease[39], particularly when combined with the difficulty of perceiving themselves as vulnerable to infection, often for fear of embarrassment, and the poor care in testing and counseling centers[40].

Conclusions

The present study showed that EBIA is a valid instrument for measuring FI among PLHA, which also highlights that this evaluation is important because a high prevalence (66.5%) of PLHA undergoing treatment in an FI situation was found in the state of Paraíba. The most serious forms of FI - moderate and severe, with quality and quantity restrictions and even hunger among household members - affected 35.7% of PLHA and were associated with worse socioeconomic conditions, confirming the negative impact on health and nutrition due to social inequalities.

Further studies are necessary to assess the FI effects on HIV/AIDS treatment compliance and efficacy, clinical outcomes and their impact on the quality of life of these people. The results from this study show that people undergoing treatment for HIV/AIDS, with known biological and social vulnerability, also have high FI PRs. Promoting policies and initiatives facilitating access to quality food or even conducting food assistance initiatives may minimize this problem by positively affecting the disease treatment and quality of life of these people.

Collaborations

ARC Medeiros, RLFC Lima and RPT Vianna worked on the conception, design, data analysis and interpretation, manuscript writing and approval of the final version. LB Medeiros, FMP Trajano and AAP Salerno worked on the research and methods. RM Moraes worked on the design, data interpretation, critical revision and approval of the final version.

References

1. CONSEA. Princípios e Diretrizes de uma Política de Segurança Alimentar e Nutricional: *Textos de Referência da II Conferência Nacional de Segurança Alimentar e Nutricional*. [acessado 2017 set 28]. Disponível em: http://www4.planalto.gov.br/consea/eventos/conferencias/2a-conferencia-nacional-de-seguranca-alimentar-e-nutricional/documento-de-referencia
2. Vianna RPT, Segall-Corrêa AM. Household food insecurity in municipalities of the Paraíba State, Brazil. *Rev Nutr* 2008; 21(Supl.):111s-122s.
3. Instituto Brasileiro de Geografia e Estatística (IBGE). *Pesquisa Nacional por Amostra de Domicílios – Segurança Alimentar 2013*. Rio de Janeiro: IBGE. [acessado 2017 set 28]. Disponível em: http://www.ibge.gov.br/home/estatistica/populacao/seguranca_alimentar_2013/
4. Campbell CC. Food insecurity: a nutritional outcome or a predictor variable? *J Nutr* 1991; 121(3):408-415.
5. Pérez-Escamilla R, Segall-Corrêa AM, Kurdian Maranha L, Sampaio MMF, Marín-León L, Panigassi G. An adapted version of the U.S. Department of Agriculture Food Insecurity module is a valid tool for assessing household food insecurity in Campinas, Brazil. *J Nutr* 2004; 134(8):1923-1928.
6. Segall-Corrêa AM, Escamilla RP, Maranha LK, Sampaio MFA. (In) Segurança Alimentar no Brasil: Validação de metodologia para acompanhamento e avaliação. [acessado 2017 fev 3]. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/validacao_brasil1.pdf
7. Segall-Corrêa AM, Marin-León L, Melgar-Quiñonez H, et al. Refinement of the Brazilian Household Food Insecurity Measurement Scale: Recommendation for a 14-item EBIA. *Rev Nutr* 2014; 27:241-251.
8. Brasil. *Protocolo Clínico e Diretrizes Terapêuticas para manejo da Infecção pelo HIV em Adultos*. [acessado 2017 fev 2]. Disponível em: http://www.aids.gov.br/sites/default/files/anexos/publicacao/2013/55308/protocolo_13_3_2014_pdf_28003.pdf
9. Normén L, Chan K, Braitstein P, Anema A, Bondy G, Montaner JS, Hogg RS. Food insecurity and hunger are prevalent among HIV-positive individuals in British Columbia, Canada. *J Nutr* 2005; 135(4):820-825.
10. Anema A, Weiser SD, Fernandes KA, Ding E, Brandson EK, Palmer A, Montaner JS, Hogg RS. High prevalence of food insecurity among HIV-infected individuals receiving HAART in a resource-rich setting. *AIDS Care* 2011; 23(2):221-230.
11. Anema A, Chan K, Chen Y, Weiser S, Montaner JS, Hogg RS. Relationship between Food Insecurity and Mortality among HIV-Positive Injection Drug Users Receiving Antiretroviral Therapy in British Columbia, Canada. *PLoS ONE*; 8(5):e61277.
12. Brasil. Ministério da Saúde (MS). *Orientações para a coleta e análise de dados antropométricos em serviços de saúde : Norma Técnica do Sistema de Vigilância Alimentar e Nutricional - SISVAN*. Brasília: Secretaria de Atenção à Saúde. Departamento de Atenção Básica. [acessado 2017 set 28]. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/orientacoes_coleta_analise_dados_antropometricos.pdf
13. Duran ACFL, Florindo AA, Jaime PC. Can self-reported height and weight be used among people living with HIV/AIDS? *Int J STD AIDS* 2012; 23(4):e1-e6.
14. World Health Organization (WHO). *Physical status: the use and interpretation of anthropometry*. Geneva: WHO Expert Committee. [acessado 2017 jan 31]. Disponível em: http://www.who.int/childgrowth/publications/physical_status/en/
15. Bond T, Fox CM. *Applying the Rasch Model: Fundamental Measurement in the Human Sciences, Third Edition, 3rd Edition (Paperback) - Routledge*. Third. [acessado 2016 jul 22]. Disponível em: https://www.routledge.com/Applying-the-Rasch-Model-Fundamental-Measurement-in-the-Human-Sciences/Bond-Fox/p/book/9780415833424
16. Derrickson JP, Fisher AG, Anderson JE. The core food security module scale measure is valid and reliable when used with Asians and Pacific Islanders. *J Nutr* 2000; 130(11):2666-2674.
17. John M Linacre. *Winsteps and Facets Comparison*. In: Winsteps and Facets Rasch Software. [acessado 2016 set 8]. Disponível em: http://www.winsteps.com/winfac.htm
18. Francisco PMSB, Donalisio MR, Barros MBA, Cesar CLG, Carandina L, Goldbaum M. Association measures in cross-sectional studies with complex sampling: odds ratio and prevalence ratio. *Rev Bras Epidemiol* 2008; 11(3):347-355.
19. Brasil. Resolução CNS no. 466, de 12 de dezembro de 2012-Estabelece as diretrizes e normas brasileiras regulamentadoras de pesquisas envolvendo seres humanos. *Rev Bras Bioét* 2012; 8:105-120.
20. Rezende ELLF, Vasconcelos AMN, Pereira MG. Causes of death among people living with HIV/AIDS in Brazil. *Braz J Infect Dis* 2010; 14(6):558-563.
21. Samji H, Cescon A, Hogg RS, Modur SP, Althoff KN, Buchacz K, Burchell AN, Cohen M, Gebo KA, Gill MJ, Justice A, Kirk G, Klein MB, Korthuis PT, Martin J, Napravnik S, Rourke SB, Sterling TR, Silverberg MJ, Deeks S, Jacobson LP, Bosch RJ, Kitahata MM, Goedert JJ, Moore R, Gange SJ; North American AIDS Cohort Collaboration on Research and Design (NA-ACCORD) of IeDEA. Closing the Gap: Increases in Life Expectancy among Treated HIV-Positive Individuals in the United States and Canada. *PLoS ONE* 2013; 8(12):e81355.
22. Vianna RPT, Hromi-Fiedler AJ, Segall-Correa AM, Pérez-Escamilla R. Household food insecurity in small municipalities in Northeastern Brazil: a validation study. *Food Secur* 2012; 4(2):295-303.
23. Weiser SD, Frongillo EA, Ragland K, Hogg RS, Riley ED, Bangsberg DR. Food insecurity is associated with incomplete HIV RNA suppression among homeless and marginally housed HIV-infected individuals in San Francisco. *J Gen Intern Med* 2009; 24(1):14-20.
24. Swindale A, Bilinsky P. *Household dietary diversity score (HDDS) for measurement of household food access: indicator guide*. Washington: Food and Nutrition Technical Assistance Project, Academy for Educational Development; 2005.
25. 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):751-753.

26. Dasgupta P, Bhattacherjee S, Das DK. Food Security in Households of People Living With Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome: A Cross-sectional Study in a Subdivision of Darjeeling District, West Bengal. *J Prev Med Pub Health* 2016; 49(4):240-248.
27. Tiyou A, Belachew T, Alemseged F, Biadgilign S. Food insecurity and associated factors among HIV-infected individuals receiving highly active antiretroviral therapy in Jimma zone Southwest Ethiopia. *Nutr J* 2012; 11:51.
28. Weiser SD, Tsai AC, Gupta R, Frongillo EA, Kawuma A, Senkungu J, Hunt PW, Emenyonu NI, Mattson JE, Martin JN, Bangsberg DR. Food insecurity is associated with morbidity and patterns of healthcare utilization among HIV-infected individuals in a resource-poor setting. *AIDS Lond Engl* 2012; 26(1):67-75.
29. Aibibula W, Cox J, Hamelin A-M, Mamiya H, Klein MB, Brassard P. Food insecurity and low CD4 count among HIV-infected people: a systematic review and meta-analysis. *AIDS Care* 2016; 28(12):1577-1585.
30. Whittle HJ, Palar K, Seligman HK, Napoles T, Frongillo EA, Weiser SD. How food insecurity contributes to poor HIV health outcomes: Qualitative evidence from the San Francisco Bay Area. *Soc Sci Med* 2016; 170:228-236.
31. Weiser SD, Yuan C, Guzman D, Frongillo EA, Riley ED, Bangsberg DR, Kushel MB. Food insecurity and HIV clinical outcomes in a longitudinal study of urban homeless and marginally housed HIV-infected individuals. *AIDS Lond Engl* 2013; 27(18):2953-2958.
32. Heylen E, Panicker ST, Chandy S, Steward WT, Ekstrand ML. Food Insecurity and Its Relation to Psychological Well-Being Among South Indian People Living with HIV. *AIDS Behav* 2015; 19(8):1548-1558.
33. Castleman T, Seumo-Fosso E, Cogill B. *Food and Nutrition Implications of Antiretroviral Therapy in Resource Limited Settings*. [acessado 2015 jul 21]. Disponível em: http://pdf.usaid.gov/pdf_docs/Pnacw463.pdf
34. Anema A, Vogenthaler N, Frongillo EA, Kadiyala S, Weiser SD. Food insecurity and HIV/AIDS: current knowledge, gaps, and research priorities. *Curr HIV/AIDS Rep* 2009; 6(4):224-231.
35. Palermo T, Rawat R, Weiser SD, Kadiyala S. Food Access and Diet Quality Are Associated with Quality of Life Outcomes among HIV-Infected Individuals in Uganda. *PLoS ONE*; 8(4):e62353.
36. Kepple AW, Segall-Corrêa AM. Conceptualizing and measuring food and nutrition security. *Cien Saude Colet* 2011; 16(1):187-199.
37. UNAIDS. *UNAIDS Policy Brief: HIV, Food Security and Nutrition*. [acessado 2015 fev 11]. Disponível em: http://www.tandfonline.com/doi/abs/10.2989/AJAR.2009.8.4.4.1041
38. Interlenghi GS, Salles-Costa R. Inverse association between social support and household food insecurity in a metropolitan area of Rio de Janeiro, Brazil. *Public Health Nutr* 2015; 18(16):2925-2933.
39. Santos ECM, França Junior I, Lopes F. Quality of life of people living with HIV/AIDS in São Paulo, Brazil. *Rev Saude Publica* 2007; 41(Supl. 2):64-71.
40. Souza V, Czeresnia D. Demandas e expectativas de usuários de centro de testagem e aconselhamento anti -HIV. *Rev Saude Publica* 2010; 44(3):441-447.

Article submitted 05/10/2016
Approved 05/05/2017
Final version submitted 07/05/2017