Association between food insecurity and chronic non-communicable diseases in older adults covered by the family health strategy: a cross-sectional study in the Brazilian Northeast

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Abstract

Objective: To investigate the association between Food Insecurity (FI) and Chronic Non-Communicable Diseases (NCDs) in older adults in the Family Health Strategy (FHS). *Method*: Cross-sectional study carried out with older adults from a city in the Northeast of Brazil. The presence of NCDs (Diabetes mellitus (DM); Systemic Arterial Hypertension (SAH); and dyslipidemia) was investigated through self-reported medical diagnosis (yes or no). FI was assessed using the Brazilian Food Insecurity Scale (EBIA). In data processing, descriptive analysis, bivariate analysis with Pearson's chi-square test and binomial logistic regression were carried out. The significance level was considered at $p<0.05$. *Results*: 316 older adults were evaluated and a prevalence of 63.3% for FI was observed (37.7% for mild FI and 25.6% for moderate/severe FI). Regarding the NCDs investigated, a prevalence of 24.1% for DM, 69.9% for hypertension and 30.7% for dyslipidemia was observed. In the regression analysis, after adjustments, there was no association between FI and SAH or DM. There was only an association between mild FI and dyslipidemia (OR 2.036; 95% CI: 1.072 – 3.866). No association was found between moderate/severe FI and dyslipidemia (OR 1.779; 95% CI: 0.877 – 3.610). *Conclusion*: The study points to FI as a social and public health problem in older adults cared for by the FHS in a municipality in northeastern Brazil, both due to the prevalence found and the association with chronic diseases. The implementation of specific public policies for older adults can improve access to healthy food and help maintain health.

Keywords: Aging. Nutrition. Food Security. Chronic Diseases. Primary Health Care.

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INTRODUCTION

Food security (FS) is understood as the realization of the right of all citizens to regular and permanent access to food, both in sufficient quality and quantity; guided by healthy eating practices; and that does not compromise access to other basic daily needs[1]. On the other hand, Food Insecurity (FI), which can be acute or chronic, is related to the difficulty in regular access to food, characterized by food instability and irregularity, generally caused by insufficient financial resources[2]. FI can present progressive stages, with mild FI, where there will be anxiety and uncertainty regarding access to food and a decrease in the quality of the food consumed; moving to moderate FI, with also a reduction in the amount of food; up to severe FI, with experiences of famine and deprivation[3].

FI is increasing among Brazilians, according to the latest population surveys. In 2013, there were 22.6% of households in FI; in 2018, it was observed that 36.7% were in this condition; and during the COVID-19 pandemic (2022), around 58.7% of the population had some degree of FI, that is, more than half of Brazilians did not have regular and permanent access to food[4]. Studies carried out with Brazilian older adults indicate prevalences above 50% in the samples studied[3,5]. In this context, FI appears to be a social and public health problem, especially in the older population, considering the economic, social, family, psychological and pathophysiological changes that occur with the aging process[6].

The existence of FI in homes with older adults results from the interaction of several factors, with the economic aspect being a crucial determinant of this condition[7]. However, other issues are also relevant, such as: occupation, sex, age, education, housing conditions, household density, loneliness, functionality, social support, access to health services and management of chronic diseases[8,9]. Once installed, the FI condition is characterized by changes in eating patterns, both with a decrease in quality and diversity, as well as in the quantity of food consumed. Furthermore, chronic stress, caused by repeated moments of instability in nutrient consumption, can impact physiological systems, causing the body to lose its ability to maintain homeostasis[10]. This scenario in food consumption has a direct impact on nutritional status and can contribute to the emergence of Chronic Non-Communicable Diseases (NCDs)[6,11]. In other words, FI may be associated with the presence of NCDs in older adults[11].

In the panorama of Brazilian population aging, the increase in NCDs and multimorbidity is increasingly noticeable[12,13]. Multimorbidity is understood as the coexistence of two or more chronic diseases in the same individual[14]. Among the main chronic diseases, Systemic Arterial Hypertension (SAH), Diabetes mellitus (DM) and dyslipidemia stand out[14]. This situation may be related to the aging process itself, however, an unbalanced diet and low nutritional quality, a characteristic eating pattern among individuals with FI, is one of the main factors that contribute to the emergence of NCDs[10,11].

Therefore, considering the challenges of the growth of the older population in Brazil and the search for active aging and quality of life, it is essential to know aspects that negatively impact the health of these individuals. FI has been identified as an important exposure factor for NCDs and thus can contribute to an increase in morbidity and mortality in this population. However, there are different experiences of FI (mild, moderate and severe), with completely different eating patterns, which can have different repercussions on the health of the older adult. The relationship between different levels of FI and the presence of NCDs is not well established in the literature. In this context, the results of this work will be important to generate new hypotheses on this topic. Thus, this study set out to investigate the association between FI (mild and moderate/severe) and NCDs in older adults cared for by the FHS in a municipality in the Brazilian Northeast.

METHOD

This is a cross-sectional and quantitative study, carried out with older individuals. The preparation of this article followed recommendations from the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) checklist[15]. This work is part of a more comprehensive research project entitled "Health assessment of older residents in the city of Barreiras (BA)". The research was carried out in the

municipality of Barreiras, which is located in the western region of the State of Bahia, Northeast Brazil. According to data from the last demographic census, the municipality's population is around 159,734 inhabitants, with the majority living in urban areas[16].

The study participants were older adults aged 60 or over, living in households in urban areas and registered with the FHS. At the time of data collection (2017/2018), FHS coverage was 52.5% of the population, with 4828 older adults distributed across the city's 23 FHS teams. In the sample calculation of the matrix project, which presented different objectives and outcomes, a general prevalence of 50%, an error of 5% and a confidence level of 95% were adopted, totaling a sample of 356 participants. Furthermore, the power of the study was calculated (*posteriori*), using specific statistical software for sample calculation. As the study presented multiple outcomes, the prevalence of dyslipidemia was considered for the calculation.

The sampling process included two stages. Firstly, stratified sampling with proportional allocation, considering the number of older adults in each FHS team. The calculation was carried out, which presented the number of older adults per Family Health Unit (FHU), ensuring proportionality and representativeness. In a second step, simple random sampling was applied. A draw was made, based on the list of older adults in each FHU team, to obtain the names of the individuals who would participate in data collection.

The following were considered eligible to participate in the study: older adults, without sex restrictions, residents of urban areas, registered at the FHU and who were selected at random. Older adults who were residents of Long-Term Care Institutions (LTC) were excluded from the study, due to the municipality only having one LTC located in one of the sampling strata, as well as due to the particularities that this population presents; older adults hospitalized and who would consequently be absent at the time of the invitation to participate in the research; those individuals affected by a health condition that prevented travel to the data collection location; as well as older adults with severe cognitive impairment, indicated by the FHS teams, and who were unable to answer the research questions.

Data collection took place at the FHU where the participants were registered. The invitation was delivered by Community Health Agents (CHA) to the selected older adults, which contained information about the date and time for attendance at the FHU, as well as technical information for carrying out data collection. The collection was carried out by a trained team of researchers, made up of health professionals and university students. Training was carried out through standardization workshops. At these moments, each item, measurement or data present in the structured research questionnaire was presented, executed and discussed. In addition to the theoretical part, there were practical moments to standardize the team as a measure to guarantee the reliability of the data collected, based on the exhaustive performance of the procedures, minimizing the risk of information bias.

As a data collection instrument, a general questionnaire with comprehensive questions was used for this study, which allowed the characterization of individuals based on demographic, social, lifestyle and health condition variables, including the diagnosis of NCDs. In addition, specific scales were applied to investigate FI (Brazilian Food Insecurity Scale-EBIA) and nutritional status (Mini Nutritional Assessment - MNA)[17,18].

The presence of NCDs, identified through self-reported medical diagnosis by the older adults, was considered the outcome in this study. The information was collected from a structured questionnaire, which was previously tested and coded, presenting dichotomous questions (yes/no): "Do you have high blood pressure?" is an example of how the questions were asked. The researchers explained the question in more detail: Has a doctor ever diagnosed you as having (each disease)? Yes answers (with or without treatment) were considered as presence of the disease and no answers were considered as absence of the disease. If in doubt, the researchers also asked about the use of any regularly used medication prescribed by a doctor. The NCDs investigated in this study were DM, hypertension and dyslipidemia. Older adults who presented either one of these conditions or a combination were considered to have dyslipidemia: hypercholesterolemia, hypertriglyceridemia and mixed hyperlipidemia (high triglycerides and cholesterol).

FI was classified as an independent variable and was evaluated using EBIA. It is a psychometric scale adapted and validated for the Brazilian population, being the main instrument used in Brazil to analyze this phenomenon, both in scientific research and in population surveys (Family Budget Surveys - POF; and National Sample Survey of Households - PNAD) carried out by the Brazilian Institute of Geography and Statistics (IBGE)[2,17]. The EBIA presents 14 questions (yes/no) and focuses mainly on aspects related to access to food and possible economic and financial difficulties in obtaining it. From the responses collected, a score was generated and households with older adults were classified as FS, Mild FI, Moderate FI or Severe FI, with the reference values considering the presence or absence of people under 18 years of age. Thus, the following cutoff points were applied: FS (0 point), mild FI (1-4 points), moderate FI (5-6 points) and severe FI (7-8 points), in situations without individuals under 18 years of age; and FS (0 point), mild FI (1-5 points), moderate FI (6-9 points) and severe FI (10-14 points), when there were individuals under 18 years old[2].

The covariates analyzed were:

- Demographic, social and lifestyle: age (60 to 69 years; 70 to 79 years or 80 years of age or older), sex (male or female), education (<4 years or ≥4 years of study), marital status (with partner or without partner), self-declared race/color (white and others or black and brown), alcohol consumption (yes or no), smoking (yes or no) and physical activity (yes or no). Older adults who self-declared (yes or no) that they performed any level or modality were considered to be practicing physical activity.

- Nutritional, food and health conditions: Body Mass Index (BMI) was assessed, according to the Pan American Health Organization (PAHO)[19] (2002): >28 kg/m2 (with overweight) or ≤28 kg /m2 (without overweight), as it is considered a specific cutoff point for the older population and was derived from studies with populations from Latin America and the Caribbean, including Brazilian older adults in the sample. Furthermore, waist circumference (WC) was analyzed, according to the World Health Organization[20](1998): <80cm for women or <94cm for men, as normal; ≥80cm for women or ≥94cm for men, as high. The food consumption variables were collected through the application of the MNA: daily consumption of fruits and vegetables (yes or no), weekly consumption of legumes and eggs (yes or no), and number of meals (<3 or ≥3)[18]. Furthermore, the quantity of medications used (<3 or ≥3 medications) was investigated.

The characterization of the studied population was carried out through descriptive analysis of the data, with frequency distribution (absolute and relative). In the bivariate analysis, Pearson's chi-square test was used to verify the presence of an association between the categorical variables. Variables with significance lower than 0.20 in the bivariate analysis were included in the multivariate model.

Binomial logistic regression analysis was applied in order to verify the association between FI (exposure) and each NCD (outcomes). At this time, FI was categorized into three levels: FS, mild FI and moderate/severe FI. For each NCD (SAH, DM and dyslipidemia) an analysis was carried out using two models: In model 1, only the insertion of the FI variable was considered; and in model 2, in addition to the FI, the variables age and sex were added, given their scientific relevance, as well as other variables were included according to the result of the bivariate analysis (p-value<0.20). After analysis, the crude and adjusted Odds Ratios (OR) with their respective 95% confidence intervals (95%CI) were obtained as measures of association. The assumptions of absence of multicollinearity, minimum sample size for the number of variables in the model and absence of outliers were met. The quality of the model was evaluated using the Hosmer and Lemeshow test. A significance level of 0.05 was used and all tests were carried out using a statistical program.

The study was analyzed and approved by the Research Ethics Committee (opinion no. 1.447.361/2016), in accordance with the standards set out by the National Health Council of the Ministry of Health. All older adults in the study participated voluntarily and signed or performed the fingerprint on the Free and Informed Consent Form (FICF).

DATA AVAILABILITY

The entire dataset supporting the results of this study is available upon request from the corresponding author.

RESULTS

316 older adults were analyzed (11.2% of losses), most of whom were female (61.7%), self-declared black/brown race/color (51.9%), had less than four years of education (72. 8%) and with a mean age of 70.5 years (±7.5) (Table 1). Considering lifestyle, it was observed that 40.5% practiced physical activity. Regarding health conditions, 47.9% used three or more medications and 25.9% were overweight. As for eating habits, 86.1% ate more than three meals. The prevalence of FI was 63.3%, with 37.7% of mild FI and 25.6% of moderate/severe FI. Regarding NCDs, prevalences of 24.1% were observed for DM, 69.9% for hypertension and 30.7% for dyslipidemia (Table 2). The results of each variable by NCD can be consulted in Tables 1 and 2. In the bivariate analysis, considering NCDs, there was no statistically significant association between dyslipidemia and FI (p=0.054), FI and SAH (p=0.465), and FI and diabetes mellitus (p=0.263), as shown in (Table 2).

In the logistic regression analysis, after adjusting for possible confounding variables, there was a statistically significant association only between mild FI and dyslipidemia (OR 2.036; 95% CI=1.072–3.866). There was no association between moderate/severe FI and dyslipidemia. The results showed no association between FI and diabetes, either with mild FI or with moderate/severe FI. Likewise, it was not possible to observe an association between FI and SAH, considering mild FI and moderate/severe FI (Table 3).

When calculating the power of the study (*a posteriori*), the sample of older adults identified an OR of 1.5; with a prevalence of 34.5% among those exposed and 24.1% among those not exposed, considering a test power of 53.1%, with a significance level of 5%.

Table 1. Characterization of the sample according to demographic, social and lifestyle variables (N=316). Barreiras, Bahia, Brazil, 2017-2018.

Variables	Total	Dyslipidemia		Hypertension		Diabetes	
	n(%)	n(%)	p-value	n(%)	p-value	n(%)	p-value
Age (years)							
60 – 69	172 (54.4)	55 (32.0)	0.039	116 (67.4)	0.554	45 (26.2)	0.580
70 – 79	102 (32.3)	36 (35.3)		75 (73.5)		21 (20.6)	
80 or older	42 (13.3)	6 (14.3)		30 (71.4)		10 (23.8)	
Sex							
Female	195 (61.7)	70 (35.9)	0.011	149 (76.4)	0.011	45 (23.1)	0.607
Male	121 (38.3)	27 (22.3)		72 (59.5)		31 (25.6)	
Race/color							
White and others	152 (48.1)	50 (32.9)	0.415	102 (67.1)	0.291	31 (20.4)	0.143
Black/brown	164 (51.9)	47 (28.7)		119 (72.6)		45 (27.4)	
Schooling (years)							
<4	230 (72.8)	69 (30.0)	0.661	159 (69.1)	0.609	56 (24.3)	0.840
≥4	86 (27.2)	28 (32.6)		62 (72.1)		20 (23.3)	
Marital status							
With a partner	163 (51.6)	49 (30.1)	0.801	106 (65.0)	0.050	39 (23.9)	0.957
Without a partner	153 (48.4)	48 (31.4)		115 (75.2)		37 (24.2)	
Alcohol consumption							
Yes	44 (13.9)	9 (20.5)	0.112	24 (54.5)	0.016	9 (20.5)	0.547
No	272 (86.1)	88 (32.4)		197 (72.4)		67 (24.6)	

to be continued

Continuation of Table 1

Variables	Total	Dyslipidemia		Hypertension		Diabetes	
	n(%)	n(%)	p-value	n(%)	p-value	n(%)	p-value
Smoking							
Yes	34 (10.8)	5 (14.7)	0.032	20 (58.8)	0.135	5 (14.7)	0.177
No	282 (89.2)	92 (32.6)		201 (71.3)		71 (25.2)	

Table 2. Characterization of the sample according to nutritional and dietary variables and health conditions (N=316). Barreiras, BA, Brazil, 2017-2018.

Variables	Total	Dyslipidemia		Hypertension		Diabetes	
	n(%)	n(%)	p-value	n(%)	p-value	n(%)	p-value
Quantity of medications							
<3	164 (52.1)	36 (22.0)	0.001	85 (51.8)	0,001	14 (8.5)	0.001
≥3	151 (47.9)	60 (39.7)		135 (89.4)		62 (41.1)	
Physical activity							
Yes	128 (40.5)	46 (35.9)	0.096	91 (71.1)	0,711	38 (29.7)	0.053
No	188 (59.5)	51 (27.1)		130 (69.1)		38 (20.2)	
BMI							
With Overweight	82 (25.9)	27 (32.9)	0.611	69 (84.1)	0.001	23 (28.0)	0.325
Without Overweight	234 (74.1)	70 (29.9)		152 (65.0)		53 (22.6)	
WC							
Normal	69 (22.0)	16 (23.2)	0.132	37 (53.6)	0,001	5 (7.2)	0.001
High	245 (78.0)	80 (32.7)		183 (74.7)		71 (29.0)	
Number of meals (daily)							
< 3	44 (13.9)	17 (38.6)	0.218	30 (68.2)	0.784	8 (18.2)	0.326
≥3	272 (86.1)	80 (29.4)		191 (70.2)		68 (25.0)	
Fruit/vegetables (daily)							
Yes	173 (54.7)	49 (28.3)	0.315	131 (75.7)	0.014	46 (26.6)	0.245
No	143 (45.3)	48 (33.6)		90 (62.9)		30 (21.0)	
Legumes/eggs (weekly							
Yes	288 (91.1)	88 (30.6)	0.862	201 (69.8)	0.857	69 (24.0)	0.902
No	28 (8.9)	9 (32.1)		20 (71.4)		7 (25.0)	
Hypertension							
Yes	221 (69.9)	73 (33.0)	0.170	-	-	68 (30.8)	0.001
No	95 (30.1)	24 (25.3)		-		8 (8.4)	
Diabetes							
Yes	76 (24.1)	36 (47.4)	0.001	-	-	-	-
No	240 (75.9)	61 (25.4)		-		-	
Dyslipidemia							
Yes	97 (30.7)	-	-	-	-	-	-
No	219 (69.3)	-		-		-	
Food insecurity							
FS	116 (36.7)	28 (24.1)	0.149	84 (72.4)	0.280	32 (27.6)	0.198
Mild FI	119 (37.7)	40 (33.6)		77 (64.7)		22 (18.5)	
Moderate/ severe FI	81 (25.6)	29 (35.8)		60 (74.1)		22 (27.2)	

Source: Prepared by the authors; BMI: Body mass index; WC: Waist circumference; FS: Food Security.

Table 3. Binomial logistic regression models between NCDs and food insecurity in older adults (N =316). Barreiras, BA, Brazil, 2017-2018.

Variables/categories	Dyslipidemia		Diabetes		Hypertension	
	Model 1 OR (CI)	Model 2[a] OR (CI)	Model 1 OR (CI)	Model 2[b] OR (CI)	Model 1 OR (CI)	Model 2[c] OR (CI)
Food Insecurity (FI)						
Mild FI	1.612 (0.910 – 2.853)	2.036 (1.072 – 3.866)*	0.602 (0.325 – 1.115)	0.823 (0.393 – 1.724)	0.689 (0.396 – 1.201)	1.092 (0.557 – 2.143)
Moderate/ severe FI	1.632 (0.869 – 3.064)	1.779 (0.877 – 3.610)	0.996 (0.526 – 1.884)	1.268 (0.574 – 2.799)	1.143 (0.597 – 2.188)	1.555 (0.698 – 3.465)
Sex						
Female		1.608 (0.875 – 2.955)		0.364 (0.187 – 0.708)		1.536 (0.809 – 2.914)
Age (years)						
70-79		1.240 (0.706 – 2.178)		0.605 (0.305 – 1.203)		1.673 (0.889 – 3.147)
80 or older		0.411 (0.156 – 1.086)		0.716 (0.278 – 1.840)		1.205 (0.492 – 2.954)
Smoking						
Yes		0.425 (0.148 – 1.220)		1.029 (0.326 – 3.244)		1.011 (0.423 – 2.418)
Alcohol consumption						
Yes		0.660 (0.283 – 1.540)		-		0.664 (0.306 – 1.440)
Physical activity						
No		0.620 (0.358 – 1.073)		0.556 (0.299 – 1.034)		-
BMI						
With overweight		-		-		2.697 (1.245 – 5.844)*
WC						
High		0.947 (0.458 – 1.959)		5.250 (1.846 – 14.932)*		0.928 (0.447 – 1.924)
Quantity of medications						
≥3		1.855 (1.048 – 3.285)*		6.990 (3.488 – 14.010)*		4.907 (2.534 – 9.501)*
Race/Color						
Black/brown		-		-		1.173 (0.664 – 2.070)
Marital status						
Without a partner		-		-		1.359 (0.725 – 2.546)
Fruit/vegetables (daily)						
No		-		-		0.622 (0.343 – 1.129)

to be continued

Continuation of Table 3

Variables/categories	Dyslipidemia		Diabetes		Hypertension	
	Model 1 OR (CI)	Model 2[a] OR (CI)	Model 1 OR (CI)	Model 2[b] OR (CI)	Model 1 OR (CI)	Model 2[c] OR (CI)
Diabetes						
Yes		2.183 (1.163-4.100)		-		2.561 (1.056-6.213)*
Dyslipidemia						
Yes		-		2.144 (1.134-4.053)*		-

Source: Prepared by the authors; BMI: Body mass index; WC: Waist circumference; Statistical significance:* *p*-value<0.20; ***p*-value <0.05); CI: 95% Confidence Interval.

[a]: The regression between dyslipidemia and FI was adjusted for sex, age, smoking, alcohol consumption, physical activity, WC and quantity of medications; [b]: The regression between diabetes mellitus and FI was adjusted for sex, age, smoking, physical activity, WC and quantity of medications and dyslipidemia; [c]: The regression between arterial hypertension and FI was adjusted for sex, age, smoking, alcohol consumption, physical activity, BMI, WC, quantity of medications, race/color, marital status, fruit consumption and diabetes mellitus.

DISCUSSION

The main results of this study indicated that there was a significant association between mild FI and dyslipidemia in households with older adults from the FHS in a municipality in the Brazilian Northeast. On the other hand, it was seen that there was no association between FI and SAH, as well as between FI and DM. In other words, FI may be related to the presence of some NCDs and not others. Evidence that corroborates these results is found in a study of Americans aged 50 to 80 years. The authors pointed out that FI may be related to some negative health outcomes, such as diabetes, chronic pain, kidney disease; but with other health problems this association did not occur, such as cardiovascular diseases, lung disorders, cancer, among others[21].

Older adults with FI are more exposed to chronic conditions compared to individuals with FS[10,11,21]. The FI condition affects the health of this population beyond nutritional aspects, when there is a decrease in the quality and quantity of the diet. FI generates moments of physiological stress, with dysregulation of body systems, mainly metabolic and inflammatory. In other words, older adults in FI present an increase in allostatic load[10]. A cohort study carried out with older Portuguese adults showed that the chance of having a chronic disease was greater in those people who had some level of FI[11]. Even so, there is still a discussion about the causality of FI in relation to NCDs. A study carried out in the USA indicated that the opposite may occur, where the burden of NCDs may increase the risk of having FI, as these diseases put pressure on the family budgets of the older population, and consequently may compromise access to food[11,21,22].

One of the main results of this study pointed out that households with older adults on mild FI were twice as likely to develop dyslipidemia, when compared to those on FS. There is little research on this topic in older adults and some studies did not find an association between these conditions[11,21]. This is because the analyzes did not consider the different levels of FI (mild, moderate and severe) and grouped all individuals into a single category, Food Insecurity[23]. Individuals with mild FI have a different dietary pattern than those with moderate/severe FI, and this characteristic can establish different levels of risk for NCDs[24,25]. However, in other life cycles there is already evidence about the presence of FI, accompanied by the risk of biochemical changes linked to lipids[26,27]. An association was observed in American adults only between mild FI and abnormal levels of low-density lipoprotein (LDL-C), compared to people with FS[26,27].

Individuals with mild FI, faced with economic difficulties, may purchase excessively high-calorie foods, with a high amount of fat and a low concentration of nutrients important for the proper functioning of the body[28]. A dietary pattern with reduced nutritional quality in individuals with

FI may favor the emergence of dyslipidemia[29]. In some scenarios, a lower consumption of meals at home can also be observed, with an increase in the frequency of consumption of *fast food*[30]. Furthermore, in individuals with FI, there is a reduction in the intake of fresh foods[29].

The dietary pattern of older adults with FI is characterized by instability in consumption, depending on the level of FI (mild, moderate or severe), marked by periods of deprivation and underconsumption, alternating with moments of excessive consumption (mainly of processed foods), when food becomes available. This dietary pattern has been identified as a risk factor for the development of obesity, which in turn, appears to be a mediator between the presence of FI and dyslipidemia[25,29]. In other words, there may be a relationship between FI, changes in dietary patterns, the emergence of excess weight and obesity, and changes in lipid metabolism in the body[29,31]. In these older adults with obesity, the effects of pro-inflammatory adipokines occur in adipose tissue, which generate a change in the metabolism of lipoproteins, through increased lipolysis and excessive release of free fatty acids into the bloodstream, which causes increased formation of very low-density lipoproteins (VLDL) in the liver, as well as a decrease in high-density lipoproteins (HDL) or modifications in relation to their functions[29].

Furthermore, older individuals with FI, faced with food shortages, experience more episodes of stress and psychological distress, which can cause changes in the metabolism of cortisol and other metabolic hormones. Along with this, it is worth highlighting that in the FI condition, due to the qualitative reduction in the diet, there is a reduction in the consumption of nutrients with antioxidant function, present in fruits, vegetables, seeds and grains, which would be important in protecting against HDL peroxidation[25,29].

Another important result of this study was the high prevalence of FI. This scenario appears both in high-income countries and in those with medium and low incomes, pointing to the global growth of this problem among older adults[31]. Thus, faced with a heterogeneous aging process, being an older adult becomes a risk factor for FI[5,10,11]. This scenario may be related to a reduction in the income of older adults and their families and, at the same time, to the increase in food prices, which made access to food difficult. This is because many countries adopted policies that impacted social security systems, reducing the scope or exclusion of social programs, freezing pension and salary values, increasing taxes and increasing personal spending on health[31,32]. All of this has an impact on dietary patterns.

Another aspect that deserves to be highlighted is that the data from this study predates the COVID-19 pandemic and shows that the FI situation was already worrying, at least among the older adults studied. However, given the many vulnerabilities that older adults face, the pandemic has had a strong impact on this group, both in the lethality and mortality rate of the coronavirus, and in the repercussions on other aspects, such as health, income, care and access to food[33]. Research carried out during and post-pandemic shows that there has been an increase in FI, with important reductions in foods that are essential for maintaining an adequate and healthy diet[4,33].

Despite the methodological rigor, the present study has some limitations. Due to its cross-sectional nature, it was not possible to establish a cause-effect relationship between the variables analyzed. The scarcity of longitudinal studies contributes to maintaining the hypothesis as an object of study. Another aspect involves collecting the dependent variable through self-reported medical diagnosis. However, there is reliability in self-reported data[34]. Another limitation was the sample size, which may have influenced the study power value, calculated *a posteriori* (53.1%). The losses may have contributed to this aspect, but it did not affect the representativeness of the sample, considering that the distribution of losses was not concentrated in some strata. In relation to the merits, we can highlight the focus of the study on community-dwelling older adults cared for in Primary Health Care (PHC) and the carrying out of statistical analyzes based on the different levels of FI (mild, moderate/severe). Furthermore, through searches carried out in the main databases, it is believed to be the first study on this topic carried out only with Brazilian older adults.

CONCLUSION

From this study and considering the Chronic Noncommunicable Diseases analyzed, it can be concluded that there is an association only between mild Food Insecurity and dyslipidemia in older adults living in the community in a municipality located in the Brazilian Northeast. Furthermore, it was not possible to observe an association between Food Insecurity and the other diseases studied (SAH and diabetes). The results obtained warn about the high prevalence of Food Insecurity in this population and the importance of research in the area.

The creation or expansion of public policies aimed at this group (popular restaurants, community kitchens, income transfer programs, Popular Pharmacy, among others) can improve access to healthy food in quantity and quality, an aspect that could help maintain the health, control and treatment of NCDs. Furthermore, the capillarization of professional nutritionists in Primary Health Care, together with Food and Nutritional Education actions, could help improve dietary choices.

AUTHORSHIP

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