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Evaluation of consumption of food and predictors of cardiovascular risk in hypertensive protectors of the State of Alagoas, Brazil

Raphaela Costa Ferreira (https://orcid.org/0000-0002-1613-8819) [1]
Sandra Mary Lima Vasconcelos (https://orcid.org/0000-0002-9438-3537) [1]
Ewerton Amorim dos Santos (http://orcid.org/0000-0001-8453-017X) [2]
Bruna Merten Padilha (https://orcid.org/0000-0001-7594-2578) [1]

Abstract *The present article aimed to evaluate the consumption of protective foods and predictors of cardiovascular (CV) risk and its relationship with cardiovascular risk factors (CVRF) by hypertensive individuals in the state of Alagoas. A population-based cross-sectional study was carried out from 2013 to 2016 with 655 hypertensive adults of both sexes. Food consumption was assessed by a validated food frequency questionnaire with measurements converted to scores and the foods were divided into three groups: I – processed foods/CV risk predictors; II – ultraprocessed foods/higher CV risk predictors; III - in natura or minimally processed foods/ CV risk protectors. Socioeconomic, demographic, biochemical, clinical and anthropometric variables were also analyzed. The consumption scores of food groups I, II and III were, respectively, 0.11; 0.13 and 0.24 (p = 0.001). The consumption of processed foods was correlated positively with high blood cholesterol (p = 0.045) and negatively with age (p = 0.001); while that of ultraprocessed foods was correlated with the sedentary lifestyle (p = 0.01). Thus, it was observed a relationship between the consumption of CV risk predictors foods with high blood cholesterol and sedentary lifestyle, reflecting the need for nutricional education actions.*

Key words *Food consumption, Hypertension, Adult, Risk factors, Obesity*

[1] Faculdade de Nutrição, Universidade Federal de Alagoas. Av. Lourival Melo Mota, Tabuleiro do Martins. 57072-900 Maceió AL Brasil. raphinhacosta2010@hotmail.com
[2] Núcleo de Saúde Pública, Universidade Estadual de Ciências da Saúde de Alagoas. Maceió AL Brasil.

Introduction

Cardiovascular disease (CVD) is the main cause of morbidity and mortality in both developed and developing countries[1,2]. CVD is a multifactorial disorder influenced by genetic factors and, above all, lifestyle risk factors. One of the main CV risk factors (CVRF) is systemic hypertension (SH), which affects between 22.3% and 43.9% of Brazil's adult urban population[3].

Studies of dietary patterns have shown that the typical Western diet, characterized by a high intake of fat, sugar, salt, and processed and ultra-processed foods, is directly associated with a risk of becoming obese and developing CVD and SH[4,5].

Furthermore, a concomitant reduction in the consumption of fruit and vegetables and other fresh, minimally processed foods[6], which protect against the development of CVD and other diseases, favors the increase in the prevalence of these chronic non-communicable diseases (NCDs)[7].

In this context, the characterization of a given population's dietary patterns using instruments for evaluating habitual food intake such as food frequency questionnaires (FFQ) becomes particularly important[8]. In 2002, Fornés et al.[9] proposed a new way of interpreting the results of FFQs called the "scoring method", which scores the frequency of consumption of given food groups or items over time. The method is particularly appropriate for the purposes of this study, since it allows an assessment of the intake of specific nutrients or food groups that contribute to or protect against CV risk[9].

Given the association between dietary patterns and CVD and the resulting importance of dietary assessment instruments, using the scoring method, this study aims to assess the intake of foods that contribute to or protect against CV risk and determine the association between the consumption of these foods and CVRFs among a sample of people with high blood pressure in the State of Alagoas, Brazil.

Methods

A cross-sectional study of food intake among a sample of adults with high blood pressure receiving treatment in primary care facilities in 12 municipalities in the State of Alagoas was conducted between September 2013 and February 2016. The study was undertaken as part of the Unified Health System Research Program (PPSUS, acronym in Portuguese), funded under a call for proposals issued by the Ministry of Health/CNPq/SESAU-AL//FAPEAL entitled "Food consumption and eating habits - modifiable risk factors for chronic diseases and prognosis of patients with high blood pressures in the State of Alagoas" (application number: 60030000737/2013).

The ideal sample size was calculated using the software package Epi Info® version 7 (CVDC/WHO, Atlanta, GE, USA), based on a frequency of consumption of fruit and vegetable among adults living in the State of Maceio of 32.1%[10], the total number of people with high blood pressure registered in the Primary Health Care Information System (SIAB, acronym in Portuguese) for Alagoas in 2013 (n = 113,346), and a margin of error of 5% and 99% confidence interval, resulting in a sample of 576 individuals. The sample of the present study comprised 655 individuals, which is considered representative of the total number of people with high blood pressure receiving treatment in primary care facilities in the State of Alagoas.

The sample selection process comprised three stages: 1) random selection of municipalities by state health region; 2) random selection of people with SH receiving treatment in primary health care facilities in the municipalities selected in stage 1 based on SIAB data; 3) in cases where municipalities and/or individuals were unable to or declined to participate in the study, another municipality from the same health region was randomly selected and other service users from the same health facility who fulfilled the inclusion criteria were invited to participate.

Five of the 12 municipalities and 61 of the health service users selected in stage one were substituted. It is important to note that municipalities from the same health region and service users from the same health care facility have similar characteristics.

The following inclusion criteria were adopted: participants had to be diagnosed with SH, aged between 18 and 59 years, and registered in the SIAB. Patients diagnosed with diabetes mellitus or other diseases associated with SH were excluded from the study.

Information was collected from the study participants using a questionnaire tested during a pilot study that contained questions in the following categories: (a) socioeconomic status (age group, schooling, number of family members, monthly family income, self-reported skin color, and socioeconomic classification, based on

the Criteria of Economic Classification Brazil, version 2013[11]); (b) lifestyle (physical activity, smoking, and alcohol consumption, regardless of frequency); (c) anthropometric data (weight, height, waist circumference – WC, and neck circumference - NC); (d) biochemical data (total cholesterol - TC and triglycerides - TG); and (e) clinical data (blood pressure and individual and family history).

Based on Lohman et al.[12], weight was measured using a Marte LC200® digital scale with 180 kg capacity and 100g sensitivity, while height was measured using a Seca® portable stadiometer. Weight and height were used to calculate body mass index (BMI), adopting cutoff points established by the World Health Organization[13]. WC and NC were measured using a 200 cm inextensible tape measure with 0.1 cm variation. WC was measured at the midpoint between costal margin and the iliac crest and evaluated in accordance with International Diabetes Federation (IDF) criteria[14]. NC Neck circumference is measured at the level of the cricoid cartilage, which corresponds to the midpoint of the neck, and classified according criteria established by Ben-Noun et al.[15]. The conicity index (C index) was calculated to determine coronary risk and interpreted in accordance with the cutoff points proposed by Pitanga and Lessa[16].

Arterial pressure was measured by a team of trained researchers in accordance with the procedures laid out in the Brazilian Guidelines on Hypertension VI[17] using a Omron® HEM 705 NC automated blood pressure monitor, whereby the participant was instructed to rest for at least 5 minutes prior to measurement. The results were analyzed using the 7th Brazilian Guidelines on Arterial Hypertension[3].

TC and TG levels were determined using blood samples taken using disposable micro cuvettes analyzed immediately using a ROCHE® Accutrend GTC portable tester, which has a measuring range of 150mg/dl to 300 mg/dl for cholesterol and 70mg/dl to 600 mg/dl for triglycerides. TC and TG levels of over 200mg/dl and 150 mg/dl, respectively, were considered high[18].

Information about food consumption was collected using a quantitative FFQ developed and validated for use with people with high blood pressure by the study research team[19]. The questionnaire encompasses 126 food items divided into 14 groups: fruit and fruit juice, vegetables, tubers and derivatives, cereals and pasta, condiments, oils and fats, milk and dairy products, legumes, meat, cured meats, sweet foods, soups, and drinks. Frequency of consumption was measured on a daily, weekly, monthly, and annual basis, based on the number of times the food was habitually consumed in each period (zero to >10).

The intake score was analyzed using a model proposed by Fornés et al.[9]. The definitions of food groups that contribute to or protect against CV risk were adapted from the Dietary Guidelines for the Brazilian Population[6] as follows: Group I - processed foods that contribute to CV risk: dried meats (*charque*, sun-dried meat), cheeses, tinned sardines, fried meat (beef, chicken and fish) and eggs; Group II - ultra-processed foods that contribute greatly to CV risk: biscuits, bread, popcorn, industrialized seasoning, cured meats, ice-cream, cake, instant noodles, soda, industrialized juice, sweet foods and chocolate drinks; and Group III - fresh or minimally processed foods that protect against CV risk: fruit, fruit juice or pulp, vegetables, tubers (sweet potato, yam, cassava) and derivatives, legumes, fresh eggs, skimmed milk, and fresh meat (beef, chicken and fish).

In the method proposed by Fornés et al.[9], each intake category is given a score (S: score), whereby a maximum score is determined for foods consumed on a daily basis ($S_7 = 1$) and other scores are calculated using equations.

For the purposes of this study, we adopted a 365 day score (S_{365}) so that the intake of each food over the previous year could be treated as a quantitative variable, using the following equation: $S_{365} = (1/365)(a \times p)$, where "S" is the score, "a" is the number of times that the food was consumed, and "p" is the period in which the food was consumed (0 - not consumed; 1 - consumed annually; 12 – consumed monthly; 48 – consumed weekly; and 365 – consumed daily.

An intake score was therefore determined for each of the food items in each of the above three groups. The total intake score for each of the three group was then calculated based on the sum of the scores for each item.

Mixed food preparations were not broken down into their relevant constituents. In such cases, the group was defined based on the main ingredient of each preparation.

Statistical analysis was performed using the software package Epi Info version 7 (CVDC/WHO, Atlanta, GE, USA). The proportions and their respective 95% confidence intervals were also calculated ($CI_{95\%}$). The normality of the continuous variables was tested using the Kolmogorov–Smirnov test. Normal distribution was

represented by the mean and the standard deviation. Given that the intake scores reflect an ordinal scale, each score was described using median and interquartile range (IQR) and associations with the explanatory variables were tested using the Mann-Whitney U test (used to compare two sample means) and the Kruskal-Wallis test (used to compare more than two medians). Spearman's rank correlation coefficient was used to determine the association between scores and anthropometric variables, smoking, alcohol consumption, blood pressure levels, physical activity, and TC and TG levels. A 5% significance level was adopted.

The study was approved by the Research Ethics Committee of the Federal University of Alagoas.

Results

The age of the sample varied between 19 and 60 years. Average age was 47.9 ± 8.3 years. The sample was predominantly female (86.1%), non-white (75.9%), and sedentary (64.0%). Almost half the sample (47.8%) was from the socioeconomic class C, while 40.3% was from group D. Despite having high blood pressure, 10.5% and 26.6% of participants, respectively, smoked and consumed alcohol (Table 1).

With respect to health status, 65.2% of participants had a family history of CVD, 11% had previous history of renal disease, 58.5% had experienced alterations in systolic pressure and 31.3% alterations in diastolic pressure. Almost half of the sample (48.2%) had high levels of TG (Table 2), while the majority of the sample were at cardiovascular risk based on their WC (87.2%), C index (85.5%), and NC (57.5%). The majority of the sample had excess weight (84.3%), 35.2% were overweight, and 49.1% obese (Table 3).

Median intake scores for Group I, II and III were 0.11, 0.13, and 0.24, respectively ($p < 0.05$), while the median score for Groups I and II together was 0.25.

The findings show that intake scores for processed foods that contribute to CV risk tended to be higher among individuals aged between 30 and 49 years, with high levels of blood cholesterol, who were obese, and who had high NC ($p < 0.05$), while the intake of ultra-processed foods that contribute greatly to CV risk was significantly higher in sedentary individuals ($p = 0.01$). No significant difference in median intake scores was found for the other variables (Table 4).

Table 1. Demographic, socioeconomic and lifestyle characteristics of hypertensive patients attended at the Basic Health Units of the State of Alagoas, Brazil, 2013-2016.

Variables	n	%	95% CI
Sex			
Female	564	86.1	83.2 - 88.6
Male	91	13.9	11.4 - 16.8
Age group (years) *			
19 |-| 29	18	2.8	1.7 - 4.4
30 |-| 49	316	48.5	44.6 - 52.4
50 |-| 60	317	48.7	44.8 - 52.6
Ethnicity *			
White	157	24.1	20.9 - 27.6
Not white	494	75.9	72.4 - 79.1
Monthly family income (R$)*			
< 1 minimum wage	119	20.4	17.3 - 24.0
≥ 1 minimum wage	463	79.6	76.0 - 82.7
Education			
≥ 4 years of study	383	58.5	54.6 - 62.3
< 4 years of study	272	41.5	37.7 - 45.4
Economic class *			
B	33	5.9	4.1 - 8.2
C	268	47.8	43.6 - 52.0
D	226	40.3	36.2 - 44.9
E	34	6.1	4.3 - 8.4
Number of members in the family *			
< 5 members	551	88.4	85.6 - 90.8
≥ 5 members	72	11.6	9.2 - 14.4
Smoking *			
Yes	68	10.5	8.3 - 13.2
No	580	89.5	86.8 - 91.7
Alcohol consumption *			
Yes	173	26.6	23.2 - 30.2
No	478	73.4	69.8 - 76.7
Sedentary *			
Yes	414	64.0	60.1 - 67.7
No	233	36.0	32.3 - 39.9

n - number of individuals; 95% CI - 95% confidence interval;
* n total is different according to the number of respondents.

A positive correlation was found between consumption of processed foods and high levels of blood cholesterol (rho = 0.13; $p = 0.045$) and a negative correlation was found with age (rho = -0.12; $p = 0.001$). There was also a positive correlation between the consumption of ultra-processed foods and sedentary behavior (rho = 0.10; $p = 0.01$) (Table 5).

Table 2. Clinical, biochemical and anthropometric conditions of hypertensive patients attended at the Basic Health Units of the State of Alagoas, Brazil, 2013-2016.

Variables	n	%	95% CI
Family history of CVD *			
Yes	422	65.2	61.4 - 68.9
No	225	34.8	31.1 - 38.6
Personal history of stroke			
Yes	60	9.2	7.1 - 11.7
No	595	90.8	88.3 - 92.9
Personal history of kidney disease *			
Yes	72	11.0	8.7 - 13.7
No	583	89.0	86.3 - 91.2
Personal history of AMI *			
Yes	29	4.5	3.1 - 6.4
No	616	95.5	93.5 - 96.9
Personal history of other CVD *			
Yes	73	11.3	9.0 - 14.0
No	573	88.7	85.9 - 91.0
Systolic blood pressure			
High	383	58.5	54.6 - 62.3
Normal	272	41.5	37.7 - 45.4
Mean (95% CI)		143.1 (129.0 – 159.0)	
Diastolic blood pressure			
High	205	31.3	27.8 - 35.0
Normal	450	68.7	65.0 - 72.2
Mean (95% CI)		89.3 (80.0 – 97.0)	
Serum cholesterol			
High	33	15.9	11.3 - 21.7
Normal	175	84.1	78.3 - 88.7
Mean (95% CI)		199.6 (167 – 231.0)	
Serum triglycerides			
High	93	48.2	41.0 - 55.4
Normal	100	51.8	44.5 - 59.0
Mean (95% CI)		190.3 (109.5 – 234.5)	

CVD - cardiovascular diseases; Stroke - stroke; AMI - acute myocardial infarction.

Table 3. Anthropometric characteristics of hypertensive patients attended at the Basic Health Units of the State of Alagoas, Brazil, 2013-2016.

Variables	N	%	95% CI
Body mass index*			
Low weight	3	0.5	0.1 - 1.5
Eutrophy	96	15.2	12.6 - 18.3
Overweight	222	35.2	31.5 - 39.1
Obesity	309	49.1	45.1 - 53.0
Mean (95% CI)		30.3 (26.6 – 33.9)	
Waist circumference*			
High	484	87.2	84.1 - 89.8
Normal	71	12.8	10.2 - 15.9
Mean (95% CI)		96.5 (89.0 – 104.0)	
Neck circumference*			
High	252	57.5	52.7 - 62.2
Normal	187	42.5	37.8 - 47.3
Mean (95% CI)		35.4 (33.0 – 37.1)	
Conicity index*			
High	464	85.5	82.1 - 88.2
Normal	79	14.5	11.7 - 17.9
Mean (95% CI)		1.26 (1.23 – 1.34)	

n - number of individuals; 95% CI - 95% confidence interval; * n total is different according to the number of respondents.

When Groups I and II (foods that contribute to CV risk) where analyzed together, a positive association was found between the consumption of these foods and NC (rho = 0.11; p = 0.035).

Discussion

The findings show a high prevalence of obesity and sedentary behavior and a relatively high frequency of smoking and alcohol consumption. The results also show that processed and ultra-processed foods are part of the daily diet of people with high blood pressure in the State of Alagoas and that the consumption of these foods is associated with higher levels of blood cholesterol and sedentary behavior.

Despite the fact that the sample was made up of individuals with SH, the prevalence of smoking was similar to that found by the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil, acronym in Portuguese)[20], which showed that the frequency of smoking was approximately 13%. A telephone survey of risk and protective factors for chronic diseases (VIGITEL, acronym in Portuguese)[10] reported that rates of sedentary behavior and excessive consumption of alcohol varied between 10.3 and 18.1% and 14.5 and 24.9%, respectively, which is lower than the rates observed by the present study.

According to the World Health Organization, the majority of deaths due to NCDs and a substantial proportion of the disease burden caused by these diseases can be put down to lifestyle risk factors [21], including excessive consumption of alcohol, inadequate diet, and lack of physical activity, which in turn aggravate high blood pressure

Table 4. Food consumption scores by food groups (in median and interquartile ranges - IQ), according to socio-demographic, biochemical and anthropometric variables of hypertensive patients attended at the Basic Health Units of the State of Alagoas, Brazil, 2013-2016.

Variables	Score I[1]		Score II[2]		Score III[3]	
	Median	IQ	Median	IQ	Median	IQ
Sex						
Male	0.11	0.06-0.19	0.13	0.07-0.21	0.24	0.17-0.33
Female	0.12	0.07-0.21	0.14	0.07-0.24	0.26	0.17-0.31
p- value		0.328		0.281		0.552
Age group (years)						
19 |-| 29	0.10	0.05-0.18	0.14	0.08-0.26	0.28	0.16-0.36
30 |-| 49	0.14	0.08-0.21	0.15	0.07-0.26	0.25	0.19-0.34
50 |-| 60	0.12	0.07-0.21	0.13	0.07-0.21	0.24	0.18-0.31
p- value		0.003		0.139		0.303
Ethnicity						
White	0.12	0.06-0.21	0.13	0.06-0.21	0.25	0.17-0.33
Not white	0.13	0.06-0.20	0.11	0.07-0.20	0.24	0.17-0.32
p- value		0.262		0.992		0.914
Education						
< 4 years of study	0.11	0.05-0.17	0.12	0.06-0.20	0.24	0.17-0.32
≥ 4 years of study	0.12	0.06-0.21	0.13	0.06-0.22	0.24	0.16-0.32
p- value		0.116		0.488		0.454
Number of members in the family						
≥ 5 members	0.11	0.07-0.22	0.13	0.08-0.21	0.23	0.18-0.30
< 5 members	0.1	0.06-0.19	0.13	0.07-0.21	0.24	0.17-0.33
p- value		0.301		0.491		0.699
Monthly family income (R$)						
< 1 minimum wage	0.10	0.06-0.17	0.13	0.08-0.22	0.23	0.16-0.32
≥ 1 minimum wage	0.12	0.06-0.20	0.13	0.07-0.21	0.24	0.17-0.33
p- value		0.488		0.637		0.253
High serum cholesterol						
Yes	0.12	0.06-0.20	0.12	0.07-0.18	0.22	0.17-0.27
No	0.08	0.05-0.14	0.13	0.07-0.21	0.25	0.18-0.33
p- value		0.045		0.388		0.166
High serum triglycerides						
Yes	0.12	0.06-0.20	0.14	0.08-0.21	0.25	0.18-0.32
No	0.11	0.05-0.16	0.14	0.07-0.22	0.24	0.17-0.34
p- value		0.342		0.873		0.978
BMI						
Low weight	0.06	0.02*	0.05	0.02*	0.18	0.15*
Eutrophy	0.12	0.07-0.23	0.15	0.09-0.23	0.23	0.15-0.33
Overweight	0.11	0.05-0.18	0.11	0.06-0.19	0.25	0.17-0.34
Obesity	0.15	0.08-0.34	0.16	0.12-0.21	0.28	0.17-0.33
p- value		0.016		0.055		0.835
High conicity index						
Yes	0.11	0.05-0.19	0.12	0.06-0.20	0.24	0.17-0.32
No	0.11	0.05-0.20	0.15	0.06-0.22	0.24	0.16-0.32
p- value	0.116		0.488		0.454	
High neck circumference						
Yes	0.12	0.06-0.20	0.13	0.07-0.20	0.24	0.17-0.31
No	0.10	0.05-0.16	0.13	0.07-0.19	0.24	0.17-0.33

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Table 4. Food consumption scores by food groups (in median and interquartile ranges - IQ), according to sociodemographic, biochemical and anthropometric variables of hypertensive patients attended at the Basic Health Units of the State of Alagoas, Brazil, 2013-2016.

Variables	Score I[1]		Score II[2]		Score III[3]	
	Median	IQ	Median	IQ	Median	IQ
p- value	0.014		0.656		0.742	
Family history of CVD						
Yes	0.12	0.06-0.20	0.13	0.07-0.22	0.24	0.17-0.32
No	0.11	0.06-0.19	0.12	0.07-0.19	0.23	0.17-0.32
p- value		0.756		0.273		0.696
Smoking						
Yes	0.13	0.05-0.22	0.15	0.09-0.22	0.22	0.16-0.32
No	0.11	0.06-0.19	0.13	0.07-0.21	0.24	0.17-0.32
p- value		0.598		0.062		0.324
Alcohol consumption						
Yes	0.10	0.06-0.38	0.16	0.06-0.27	0.23	0.20-0.28
No	0.12	0.06-0.20	0.13	0.07-0.21	0.24	0.17-0.32
p- value		0.878		0.717		0.543
Sedentary						
Yes	0.12	0.06-0.20	0.13	0.08-0.22	0.24	0.17-0.33
No	0.11	0.06-0.20	0.12	0.06-0.20	0.24	0.18-0.31
p- value		0.767		0.010		0.987

[1] Scores I - Group I: processed food products / predictors of cardiovascular risk (CV); 2 Scores II - Group II: ultraprocessed food products / major CV risk predictors; 3 Scores III - Group III: in natura or minimally processed foods / risk protectors CV; Mann Whitney's "U" Test; Krukal Wallis test; TG - triglycerides; BMI - body mass index; CVD: cardiovascular disease.

and negatively affect the outcome of treatment [3,22,23]. The prevalence of the CVRFs identified by the present study reflect nonadherence to treatments for SH that do not involve medication and has a significant negative impact on the health status of these individuals.

The high prevalence of overweight and obesity found by this study reflects a worrying national and global trend[24,25]. These results are in line with the findings of the most recent VIGITEL[10] and the latest Household Budget Surveys (POF, acronym in Portuguese)[26] conducted by the Brazilian Institute of Geography and Statistics (IBGE, acronym in Portuguese), which reported rates of excess weight and obesity of 53.8%/18.9% and 49%/14.8%, respectively.

Obesity is associated with an increase in overall mortality and the emergence of NCDs[27]. People who are obese are three to four times more likely to be exposed to cardiometabolic risk factors than people of normal weight[28] and the rate of mortality due to CVD is up to three times greater[29], particularly when there is an accumulation of fat in the abdominal area[30].

The findings also show that processed and ultra-processed foods are part of the daily diet of the study participants. It is known that dietary habits play an important role in maintaining good health and that different foods may contribute to or protect against CVD[31,32], and therefore such foods should be excluded from the diet[3].

Corroborating the findings of the present study, Pinho et al.[33] also found that the score for cardioprotective foods was greater than that of foods that contribute to CV risk among patients with metabolic syndrome, while Azevedo et al.[30] observed similar median intake scores for both foods that contribute to and protect against NCDs among adults.

It is important to highlight that the population sample investigated by the present study is from the Northeast, where fresh foods or minimally processed foods are readily available and whose consumption is part of the dietary habits of the region. However, the fact that these foods are consumed more than others does not necessarily mean that the diet is adequate in quanti-

Table 5. Correlation between cardiovascular risk factors and food consumption frequency scores of hypertensive patients attended at the Basic Health Units of the State of Alagoas, Brazil, 2013-2016.

Variables	Score I[1]		Score II[2]		Score III[3]	
	rho*	p	rho*	p	rho*	p
Age	-0.12**	<0.001	-0.07	0.06	-0.07	0.07
Economic class	-0.06	0.14	-0.03	0.46	0.05	0.25
Body mass index	-0.09	0.81	-0.12	0.78	0.02	0.61
Waist circumference	0.01	0.77	0.01	0.90	-0.01	0.85
Neck circumference	0.08	0.10	0.09	0.07	0.02	0.68
Conicity index	-0.07	0.11	-0.03	0.46	0.00	0.93
Systolic blood pressure	-0.03	0.47	-0.01	0.85	-0.01	0.90
Diastolic blood pressure	0.04	0.28	-0.03	0.45	0.02	0.71
High serum cholesterol	0.13**	0.04	0.06	0.39	0.10	0.17
High serum triglycerides	-0.07	0.34	0.01	0.87	0.00	0.98
Excessive consumption of alcohol	0.01	0.72	-0.04	0,35	-0.03	0.46
Smoking	-0.03	0.51	0.01	0.81	-0.03	0.48
Sedentary	0.01	0.77	0.10**	0.01	0.00	0.99

* Spearman correlation coefficient; ** Statistically significant difference; 1 Score I - Group I: processed food products / cardiovascular risk predictors (CV); 2 Score II - Group II: ultraprocessed food products / major CV risk predictors; 3 Score III - Group III: in natura or minimally processed foods / risk protectors CV.

tative terms[33], given a nutritional profile of the population that is possibly the result of an inadequate diet and the fact that results of the last POF showed a levelling off or reduction in the consumption of legumes, vegetables and natural fruit juice[26]. It is therefore possible that the consumption of processed and ultra-processed foods was underreported.

On the other hand, the majority of the sample were older adults, who tend to consume more fruit and vegetables[34]. As such, the inverse relationship between the consumption of processed foods and age may be due to the fact that older individuals were less exposed to modern foods, including processed foods.

The direct relationship between the consumption of processed foods and high levels of blood cholesterol and the consumption of ultra-processed foods and sedentary behavior was expected based on the findings of Fornés et al.[9].

When Group I and Group II were analyzed together, a positive correlation was found between the consumption of these foods, which contribute to CV risk, and NC. Studies involving adults have recommended NC as the anthropometric indicator of choice because it is easy to measure, practical, not influenced by postprandial abdominal distension or respiratory movements, and provides a consistent measure of the accumulation of upper body subcutaneous fat[35,36] and abdominal (visceral) fat[36], associated with cardiometabolic risk and insulin resistance[35,36].

The findings show that there is a need for improved communication between health care professionals and service users with a view to promoting the adoption of healthy lifestyles and the resulting prevention of NCDs in people with high blood pressure, who have a greater predisposition to other diseases. In this context, it is important to note that effective health policy and government initiatives are essential.

This study may be subject to selection bias given the fact that the sample included only people with high blood pressure registered in the SIAB and due to the substitution to some of the randomly selected municipalities and service users. However, this sampling approach aimed to ensure a representative sample of people with high blood pressure without diabetes receiving treatment in primary care facilities in Alagoas and the substitutions were made based on specific criteria, using municipalities from the same health region and service users from the same health facility with similar characteristics.

Another limitation of this study may be the bias inherent in the use of food frequency questionnaires, such as the underreporting of food consumption and the fact that the scoring method reflects diet quality but does not allow for the classification of consumption of each food group

into "adequate" or "inadequate", due to the lack of cutoff points in the literature[9,37]. As a result, it was not possible to use association tests. However, this method provided a simple and differentiated analysis of the dietary patterns of people with high blood pressure receiving treatment in primary care facilities in the State of Alagoas and enabled statistical analysis to determine the association between diet quality and variables considered predictors of CV risk.

Conclusion

The findings of this study show that the consumption of foods that protect against CV risk (fresh or minimally processed foods) was greater than that of foods that contribute to CV risk among a representative sample of people with high blood pressure in the State of Alagoas. However, a significant portion of study participants were shown to have high exposure to CVRFs and the results show that there was an association between the consumption of processed/ultra-processed foods and sedentary behavior and high levels of cholesterol. Based on these findings, measures should be taken to promote the adoption of healthy lifestyles among this population group.

Collaborations

RC Ferreira participated in all stages of the article. SML Vasconcelos participated in the writing of the article, the relevant critical revision of the intellectual content and the final approval of the version to be published. EA Santos collaborated with the analysis and interpretation of data interpretation data. BM Padilha worked on the final essay.

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