Int J Cardiovasc Sci. 2023; 36:e20200323

ORIGINAL ARTICLE

Diet Quality and Associated Factors in Atherosclerotic Cardiovascular Disease Patients with and without Diabetes at a Specialized Outpatient Clinic in the City of Pelotas, Brazil

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Abstract

Background: In most cases, atherosclerotic cardiovascular disease (ACVD) is preventable through primary prevention and control of traditional risk factors, such as smoking cessation, regular physical activity, and adherence to healthy dietary patterns. The assessment of diet quality of ACVD patients would be important for a dietary intervention.

Objectives: This study aimed to evaluate diet quality of ACVD patients and its association with clinical conditions.

Methods: This cross-sectional study was nested within a randomized clinical trial entitled "Programa Alimentar Cardioprotetor Brasileiro." Baseline data of 80 patients from Pelotas, Brazil, were obtained. Food consumption was assessed using 24-h food recall and the Revised Diet Quality Index (IQD-R). Data on smoking status and comorbidities were reported by the patients during medical history taking. To analyze the associations between IQD-R and clinical variables, unpaired Student's t-test or the analysis of variance was performed. The significance level was 5%.

Results: Most of the sample consisted of men (66.5%), elderly individuals (52.50%), patients with hypertension (78.75%), dyslipidemia (58.75%), and overweight (73.75%). The average IQD-R score was 56.7 ± 12.6 points. Better quality of diet was observed for patients with diabetes compared to those without diabetes (61.1 ± 11.8 *versus* 54.0 ± 12.6 points; p=0.014).

Conclusion: There is a need to improve diet quality of ACVD patients. Patients ACVD and diabetes had better diet quality compared to those without diabetes.

Keywords: Cardiovascular Diseases, mortality; Atherosclerose; Risk Factors; Prevention and Control; Epidemiology; Diet Surveys; Eating; Diabetes Mellitus; Hypertension.

Introduction

In most cases, atherosclerotic cardiovascular disease (ACVD) is preventable through primary prevention and control of traditional risk factors. Smoking cessation, regular physical activity, and adherence to healthy dietary patterns, such as a diet rich in fruits and vegetables and low in salt, may decrease the risk of ACVD.[1] Moreover, healthy dietary habits include the consumption of fish, vegetables, and poultry as the main protein sources, combined with decreased intake of trans fats, added sugar, red meats, sodium, and saturated fatty acids.[2] Even in patients with established ACVD, adherence to nutritional treatment that improves diet quality can provide numerous health benefits.[3]

The assessment of diet quality of patients with or at risk of ACVD has been important for dietary intervention.[3] The Revised Diet Quality Index (IQD-R) was developed for the Brazilian population[4] and is used to simultaneously analyze several components of the diet, considering energy density and quality, regardless of the

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DOI: https://doi.org/10.36660/ijcs.20200323

Manuscript received October 6, 2020; revised manuscript May 25, 2022; accepted June 11, 2022.

amount of food consumed. A population-based study conducted in São Paulo[5] showed significant differences in IQD-R between adult men and women. Furthermore, it demonstrated that some sociodemographic and lifestyle factors can affect the quality of diet. The same research group showed the need to improve the quality of the diet of the elderly population and highlighted that some factors, such as physical activity and diabetes, may be correlated with better IQD-R scores.[6]

Recently, our group showed that Brazilian patients with ACVD who consume sugary drinks had higher body mass index (BMI), waist circumference (WC), and serum triglyceride levels, which are important risk factors for ACVD.[7] It has also been shown that patients with ACVD in the southern region of Brazil consume more sodium than recommended.[8] Our group also demonstrated that more than 80% of patients with ACVD from Pelotas/RS had metabolic syndrome,[9] and the food groups with the highest energy contribution to their diets were meats, cereals, breads, and sweets.[10] The present study aimed to evaluate dietary quality of ACVD patients and associated clinical factors.

Methods

This is a cross-sectional substudy of a randomized clinical trial entitled "*Efeito do Programa Alimentar Brasileiro Cardioprotetor (DICA Br) na redução de eventos e fatores de risco na prevenção secundária para doença cardiovascular: Um Ensaio Clínico Randomizado*",[11] coordinated by the Hospital do Coração de São Paulo (HCor) in partnership with the national program for support and development of the Brazilian Unified Health System (*Programa de Apoio ao Desenvolvimento Institucional do Sistema Único de Saúde*, PROADI-SUS). The data presented refer to patients from a collaborating center in the HCor and were collected from August 2013 to December 2014.

Clinical and sociodemographic variables

The study included patients of both sexes aged ≥ 45 years who presented with current atherosclerosis (coronary artery disease, cerebrovascular disease, or peripheral artery disease) or evidence of the disease in the past 10 years. The exclusion criteria were refusal to provide written informed consent, psychiatric or neurocognitive condition that prevented obtaining reliable clinical data, life expectancy < six months, pregnancy or lactation, liver failure, previous organ transplants, wheelchair use, and difficulty receiving a diet orally.

Patients were recruited from the Cardiology Service of the Federal University of Pelotas (UFPel) and seen at the Nutrition Outpatient Clinic of the university. This study was approved by the Research Ethics Committee of the UFPel (no. 287.722-0). All participants provided written informed consent before inclusion in the study.

Sex and age of patients were collected from the anamnesis obtained in the main study. The socioeconomic profile was evaluated using a specific tool proposed by the Brazilian Association of Research Companies,[12] which classifies patients into five categories, from the highest (A) to the lowest (E) purchasing power. Education was self-reported in years of study and classified as follows: illiterate, elementary school (some or completed), high school (some or completed), and higher education (some or completed).

For anthropometric assessment, participants were weighed on a digital scale *Welmy*® with a capacity of 200 kg and precision of 50 g. Standing height was measured to the nearest 0.1cm using a stadiometer attached to the scale. BMI was calculated and categorized according to the World Health Organization (WHO),[13] and the Pan American Health Organization[14] criteria for adults and the elderly, respectively. WC was measured at the nearest 0.1 cm using a flexible tape measure at the midpoint between the lower edge of the costal arch and the superior border of the iliac crest in the midaxillary line. The risk for metabolic complications was classified according to the WHO cutoff points;[15] i.e., a WC ≥ 80 cm for women and a WC ≥ 94 cm for men.

Data on current smoking, presence of systemic arterial hypertension, diabetes, and dyslipidemia were reported by the patients during medical history taking.

Food consumption and diet quality

Food consumption was assessed using a 24-h recall, which was performed by a previously trained nutritionist. A photographic album with standardized household measurements was used.[16] Then, data were processed using a nutritional program, *Nutriquanti*®.[17]

For assessment of diet quality, we used the IQD-R,[4] whose scores were assigned to the components of the diet. Briefly, IQD-R is composed of 12 items – nine food groups (total fruits; whole fruits; total vegetables; dark green and orange vegetables; total cereals; whole grains; milk and dairy products; meats, eggs and pulses; and fats

and oils), two nutrients (saturated fats and sodium) and one item that represents the sum of the energy intake from solid fats, alcohol, and added sugar ("GORD_AA" component). For each item, the scores ranged from 0 (minimum), 5, 10, to 20 (maximum). The minimum score represents zero consumption of the component or a consumption below the recommendations, whereas the maximum score is attributed to a consumption equal to or exceeding the recommended daily intake. Intakes between the minimum and maximum standards were scored proportionately. The IQD-R score was calculated as the sum of all items, and presented as a maximum of 100 points.[4]

Statistical analysis

Data were entered into *Microsoft Excel*® spreadsheets, and statistical analyses were performed using the *Stata*® version 12.1. A descriptive analysis was performed to characterize the population studied, using absolute and relative frequencies for categorical variables. The Kolmogorov–Smirnov test was used to verify normality. The IQD-R scores of each item was presented as mean and standard deviation. Unpaired Student's t- test or the one-way analysis of variance was performed for to assess associations between IQD-R and clinical variable. The adopted significance level was 5%.

Results

Eighty patients were included in the study, of whom 76 patients were assessed for economic level and education. Mean age of patients was 60 years; most patients were male, had a low socioeconomic status, elementary education, and had hypertension, dyslipidemia, increased WC, and were overweight (Table 1).

The average global IQD-R score was 56.70 ± 12.56 points, ranging from 25.00 to 78.70 points. The IQD-R items with the lowest scores were "whole grains," "dark green and orange vegetables," "total fruits," and "whole fruits," and those with the highest scores were "meats, eggs and pulses" and "total cereals" (Table 2). Approximately 80% of patients scored zero for "whole grains," and 50% of patients scored zero for "whole fruits," and "dark green and orange vegetables."

As shown in Table 3, patients with diabetes presented significantly higher IQD-R scores than those without diabetes (61.14 versus 53.97 points; p = 0.014). Of the

Table 1 – Description of the sample according to demographic, socioeconomic, anthropometric, health, and biochemical characteristics: Pelotas, Brazil, 2013–2014

Variable	N (%)
Sex	
Male	53 (66.25)
Female	27 (33.75)
Age	
Adults	38 (47.50)
Elderly individuals	42 (52.50)
Socioeconomic status *	
A/B	13 (17.11)
C	51 (67.10)
D/E	12 (15.79)
Education*	
Illiterate	20 (26.32)
Elementary school	47 (61.84)
High school	7 (9.21)
College	2 (2.63)
Current smoking	
No	68 (85.00)
Yes	12 (15.00)
Nutritional status (BMI)	
Underweight	3 (3.75)
Normal weight	18 (22.50)
Overweight	27 (33.75)
Obesity	32 (40.00)
Abdominal obesity	
No	13 (16.25)
Yes	67 (83.75)
Hypertension	
No	17 (21.25)
Yes	63 (78.75)
Diabetes	
No	50 (62.50)
Yes	30 (37.50)
Dyslipidemia	
No	33 (41.25)
Yes	47 (58.75)

** Four patients with missing data; BMI: body mass index*

Table 2 – Mean IQD-R scores of patients with atherosclerotic cardiovascular disease: Pelotas, Brazil, 2013–2014

IQD-R components	Highest score	Mean (points)	Standard deviation
Total fruits	5	0.55	1.41
Whole fruits	5	2.47	2.41
Total vegetables	5	3.16	2.15
Dark green and orange vegetables	5	2.44	2.48
Total cereals	5	4.28	1.21
Whole grains	5	0.98	1.81
Milk and dairy products	10	4.20	3.56
Meats, eggs, and pulses	10	8.53	2.57
Oils	10	6.20	2.68
Saturated fat	10	7.35	2.97
Sodium	10	3.63	3.10
Gord_AA	20	12.71	7.10
Total IQD-R	**100**	**56.70**	**12.56**

Gord_AA: calories from solid fats (saturated and trans fats), alcohol, and added sugar; IQD-R: Revised Diet Quality Index

patients with diabetes, 23 had hypertension, 20 had dyslipidemia, and 17 had both hypertension and dyslipidemia. There was no statistical difference in IQD-R score (data not shown) or in any of the other variables analyzed between patients with and without diabetes.

Discussion

The main finding of this study was that patients with ACVD with diabetes had higher IQD-R scores than those without diabetes. This result corroborates the findings of another population-based study conducted in Campinas, Brazil, which found a higher diet quality score among elderly patients with diabetes compared to those who did not have the comorbidity.[6] In Australia, a survey on 9,435 adults[18] used a diet quality index similar to that of the IQD-R and found better diet quality among patients with diabetes. In North America, another population-based study, which included 4,356 adults, highlighted better quality of diet in patients with chronic disease compared to healthy individuals.[19] However, a study on 295 elderly individuals from São Caetano, Brazil, who were users of public health centers, did not detect a significant difference in IQD-R scores between patients with and without diabetes.[20]

A better diet quality can decrease mortality risk by 40% and prolong life expectancy by 2.5 years in elderly patients with cardiovascular disease.[21] However, this association was not statistically significant in healthy subjects. Moreover, a higher diet quality score was found in elderly patients with cardiovascular disease than in healthy elderly individuals.[21] These findings were attributed to the fact that 17% of healthy elderly patients *versus* more than half (54%) of the elderly patients with cardiovascular disease followed a prescribed eating plan. In our sample, all patients had cardiovascular disease; however, when stratified by the presence or absence of diabetes, there was a difference in diet quality. This suggests that cardiovascular disease patients with diabetes are more concerned about their diet, especially due to glycemic control, and that they had even received dietary advice. However, this information was not analyzed in this study.

Another relevant finding of the current study was the global IQD-R score, which was 56 points. Although there is no cutoff point, it is valid to compare the scores obtained from other samples. A study[4] with 949 adults (mean age of 37 years), conducted in Sao Paulo, Brazil, showed an overall IQD-R score of 52.7, which was significantly higher in women. Our sample consisted of older patients (mean

Table 3 – Mean IQD-R scores according to demographic, socioeconomic, and health variables: Pelotas-RS. 2013–2014

Variables	Mean	Standard deviation	*p*
Sex			0.386*
Male	54.92	13.28	
Female	57.54	12.46	
Age			0.549*
Adults	55.75	13.28	
Elderly individuals	57.47	12.30	
Economic levels			0.608†
A/B	59.62	14.60	
C	56.78	12.30	
D/E	54.51	13.07	
Education			0.143†
Illiterate	57.77	10.55	
Elementary/high school	55.97	13.33	
College	73.76	1.12	
Current smoking			0.229*
No	57.38	12.57	
Yes	52.57	13.34	
Hypertension			0.732*
No	55.71	13.81	
Yes	56.91	12.52	
Diabetes			0.014*
No	53.97	12.58	
Yes	61.14	11.83	
Dyslipidemia			0.484*
No	55.46	11.85	
Yes	57.50	13.36	

**Student's t-test; †ANOVA; IQD-R: Revised Diet Quality Index*

age of 60 years), who showed a slightly higher IQD-R score. Furthermore, we found no significant differences between sexes. Another survey[6] also conducted in Sao Paulo, Brazil, whose sample consisted of 1,509 elderly individuals with a mean age of 69.9 years, showed a higher IQD-R score (62.4 points) than our study. In this same study,[6] the IQD-R items with the lowest scores were "whole grains," "sodium," "milk and dairy products," "total fruits," and "whole fruits," which was similar to our results. The items with the lowest contributions to the IQD-R score were "whole grains," "dark green and orange vegetables," "pulses," "total fruits," and "whole fruits."

A Swedish survey[22] that enrolled more than 17,000 individuals aged 44–74 years concluded that a dietary pattern rich in fiber, fruits, and vegetables (> 400 g/day) was associated with a decrease in cardiovascular events in both men and women. In the present study,

we found a low consumption of these food groups, and half of the sample did not consume these foods daily. These data corroborate the food intake pattern in the Brazilian population, evaluated in 27 cities in Brazil by the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (VIGITEL 2018).[23] The survey revealed that only 23% of the sample consumed the recommended servings of fruits and vegetables, and that consumption was lower in men (18.4%) than in women (27.2%).[23]

Another component worth mentioning is sodium. In the present study, most patients had hypertension and a high consumption of sodium, and only 1.2% of participants reached the maximum daily recommendation of up to 2 g/day.[24] However, approximately 60% of patients reached the recommendations for "meat, eggs, and pulses" and "total cereals," with the highest scores. It is important to emphasize that IQD-R adds pulses to the meat group, and this may contribute to a high score for this component, since the consumption of beans is part of the traditional Brazilian culture. Moreover, it is important to consider the high consumption of meat in the state of Rio Grande do Sul, as confirmed by a study conducted in Pelotas, where 99.1% of adults reported having consumed some type of meat in the past year and approximately 32% reported daily meat consumption.[25]

We did not find an association between diet quality and sociodemographic variables, such as age, sex, purchasing power, and education, corroborating the results of other studies on the elderly population.[6,20] There was also no association between diet quality and smoking, which is different from other studies.[6,18]

The main limitation of this study was the sample size. Furthermore, the method used to assess food consumption may not reflect habitual consumption because it was applied in only one day. Despite these limitations, the present study is one of the first to assess diet quality of cardiovascular disease patients using the IQD-R in Brazil, thus contributing to a better understanding of the dietary pattern of this population, which can guide future nutritional interventions.

Conclusions

Based on the IQD-R results obtained in this study, there is a need to improve diet quality among ACVD patients in Brazil, especially regarding the consumption of fiber, fruits, and vegetables, in addition to reducing sodium consumption. Patients with cardiovascular disease and diabetes had better diet quality than those without diabetes. No association was found between diet quality score and other factors tested. More studies that provide additional details of dietary patterns of ACVD patients are needed to guide more specific dietary interventions.

Acknowledgements

We thank the Coordination for the Improvement of Higher Education Personnel (CAPES, *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior*) for a research scholarship,, and DICA Br, the Brazilian Cardioprotective Diet Program, for all the support.

Author contributions

Conception and design of the research: Dobke FV, Borges LR, Bertacco RTA. Acquisition of data: Dobke FV, Longo A, Ribas BLP. Analysis and interpretation of the data: Dobke FV, Longo A, Borges LR, Bertacco RTA. Statistical analysis:Longo A, Bertacco RTA. Writing of the manuscript: Dobke FV, Longo A, Ribas BLP, Bertacco RTA. Critical revision of the manuscript for intellectual content: Dobke FV, Longo A, Weber B, Bertoldi EG, Borges LR, Bertacco RTA. Supervision / as the major investigador: Weber B.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Sources of Funding

There were no external funding sources for this study.

Study Association

This article is part of the thesis of master submitted by Fernanda Vighi Dobke, from Federal University of Pelotas (UFPel).

Ethics approval and consent to participate

This study was approved by the Ethics Committee of the CEP da Faculdade de Medicina da Universidade Federal de Pelotas (UFPel) under the protocol number 287.722-0. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

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