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Original/*Otros*

Effectiveness of nutritional treatment assessed by the quality of the diet in patients with chronic coronary artery disease

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Abstract

The effectiveness of nutritional treatment is important protective factor for the prevention of recurrences of cardiovascular diseases. The goal of this study was to assess the effectiveness of nutritional treatment and to know the eating pattern and the quality of an adjuvant diet for optimized clinical treatment in patients with chronic coronary artery disease (CCAD). This is a clinical trial with a three-month duration conducted with 116 patients of both sexes with (CCAD) in secondary prevention. The patients underwent nutritional treatment and blood pressure, anthropometric, biochemical and dietetic (24-hour recall) measures were collected. The Brazilian Healthy Eating Index (BHEI-R) was calculated for assessing diet quality. The average age was 62.5 ± 7.8 years. The nutritional treatment reduced: weight -1.5 ± 2.3 kg; p < 0.01; body mass index -0.5 ± 0.9 kg/m2; p < 0.01; waist circumference -2.0 ± 0.1cm; p < 0.01; neck circumference -0.8 ± 0.1; p < 0.01 cm; concentrations of plasma insulin -1.3 ± 0.5mU/mL p < 0.03, glycated hemoglobin -0.4 ± 0.1 mg/dL; p < 0.01 (- 0,004 mmol/L), and HOMA-IR (-0.8 ± 3.9; p < 0.03); and increased insulin sensitivity 6.64 ± 23,9 x10-3; p < 0.01.

The nutritional treatment increased HDL-cholesterol concentrations in patients who adhered to the diet after BHEI-R control 1.7 ± 1.4 mg/dL; p = 0.04 (0,04 mmol/L). Three-month nutritional treatment promoted reduction of saturated fats consumption (-1.9 ± 0.5%; p=<0.01), cholesterol (-67.7 ± 18.6 mg/d; p < 0.01), and sodium (815.2 ± 146.5 mg/d; p < 0.01); and 20.7% of the patients finished the study with a healthy diet. The intensive nutritional treatment was effective in reducing anthropometric measures and improving glycemic control.

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EFICACIA DEL TRATAMIENTO NUTRICIONAL SEGÚN LA EVALUACIÓN DE CALIDAD DE LA DIETA EN PACIENTES CON ENFERMEDAD ARTERIAL CORONARIA CRÓNICA

Resumen

La eficacia del tratamiento nutricional es un factor de protección importante para la prevención de la enfermedad cardiovascular recurrente. El objetivo del estudio fue evaluar la eficacia del tratamiento nutricional y para cumplir con el estándar de la comida y la calidad de la dieta adyuvante para el tratamiento médico óptimo en pacientes con enfermedad de la arteria coronaria crónica (EACC). Esta es una prueba que dura tres meses realizado con 116 pacientes de ambos sexos (EACC) en la prevención secundaria. Los pacientes fueron sometidos a tratamiento nutricional y se recogieron la presión arterial, las mediciones antropométricas, (24 horas, recuerdo) y las medidas bioquímicas y dietéticas. Se utilizó el índice Brasileño de Calidad de la Dieta (ICD-R) para evaluar la calidad de esta. La edad media fue de 62,5 ± 7,8 años. El tratamiento nutricional baja: -1,5 ± 2,3 kg; p < 0,01; índice de masa corporal -0,5 ± 0,9 kg/m2; p < 0,01; circunferencia de la cintura -2,0 ± 0,1 cm; p < 0,01; circunferencia del cuello -0,8 ± 0,1cm; p < 0,01; concentraciones de insulina en plasma -1,3 ± 0.5mU/ml; p < 0,03, hemoglobina glucosilada 0,4 ± 0,1 mg/dl; p < 0,01 (-0,004 mmol/L) HOMA-IR (-0,8 ± 3,9; p < 0,03) y una mayor sensibilidad a la insulina 23,9 ± 6,64x10-3; p < 0,01. El tratamiento nutricional aumentó las concentraciones de colesterol HDL en los pacientes que se adhirieron a la dieta después de ICD-R 1,7 ± 1,4 mg/dl; p = 0,04 (0,04 mmol/L). Tres meses de tratamiento redujeron la ingesta nutricional de grasas saturadas (-1,9 ± 0,5%, p=<0,01), colesterol (-67,7 ± 18,6 mg/d; p < 0,01) y sodio (815,2 ± 146,5 mg/d; p < 0,01); y el 20,7% de los pacientes completó el estudio con una dieta saludable. El tratamiento nutricional intensivo fue eficaz en la reducción de las medidas antropométricas y a la hora de conseguir un mejor control glucémico.

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Palabras clave: *Prevención secundaria. Enfermedad arterial coronaria crónica. Índice revisado de calidad de la dieta. Tratamiento nutricional intensivo y tratamiento clínico optimizado.*

List of abbreviations

BMI: Body mass index.
CVD: Cardiovascular disease.
CCAD: Chronic coronary artery disease
DBP: Diastolic blood pressure.
BHEI: Brazilian Healthy Eating Index
HDL: High-density lipoprotein.
HbA1C: Hemoglobin glicad
HD: Healthy diet
HOMA-IR: Homeostatic Model Assessment-Insulin Resistance.
IR: Insulin resistance.
LDL: Low-density lipoprotein.
ND: Need of improvement diet
PD: Poor diet
SBP: Systolic blood pressure.
WC: Waist circumference

Introduction

According to the INTERHEART study, unhealthy eating pattern was associated with increased global risk of acute myocardial infarction and it was responsible for approximately 30% of the risk attributable to the population[1].

A healthy eating pattern is considered one of the most important protective factors for cardiovascular disease (CVD)[2]. Studies have shown 3-4 that the Mediterranean diet has been effective in preventing the recurrence of cardiovascular events and reducing mortality rates caused by CAD.

Healthy eating habits are associated with lower risk of recurrent cardiovascular events[5]and cardiac death 4 Tang et al. (2013)[6] showed that only 14% of patients with CAD had followed the recommendations for the reduction of risk factors The good quality of the diet and adherence to healthy eating patterns are important factors for treatment and reduction of non-fatal CVD mortality rates[7].

The goal of this study was to assess the effectiveness of the adjuvant intensive dietetic treatment and to assess the adherence to dietetic treatment and the quality of the diet in patients with chronic CAD.

Methods

Study participants

The experimental protocol was approved by the Research Ethics Committee of the National Institute of Cardiology - RJ, No. 0303/07-12-2010. All research volunteers were duly informed about the procedures of the research and signed an informed consent form.

This study is a clinical trial involving 136 eligible patients selected from the analysis of 360 medical charts of patients cared for in a cardiology outpatient clinic of a tertiary hospital from January to September 2012. The selection criterion regarded patients of both sexes aged ≥20 years in secondary prevention for CAD and who had stable angina and acute myocardial infarction. Patients excluded from the research were those who: had undergone angioplasty and/or myocardial revascularization; had suffered prior cardiovascular events (≤6 months); had chronic renal insufficiency with creatinine values of ≥ to 1,2 mg/dL and liver diseases. Patients had undergone intensive dietetic treatment with telephone calls in order to encourage adherence to the treatment. In addition, all patients had a phone number they could call in case of eventual doubts about diet.

Study design

A 3-month clinical trial was performed. Study visits occurred at baseline (week 0) and at 3 months. The data collected included demographic data, information about previous pathological history and the present illness, drug therapy, physical activity[8], smoking, and alcohol consumption[9]. Blood collections were performed after 12-hour fasting, applying a 24-hour recall, anthropometric assessment and blood pressure measurement. Patients received a meal plan and they came back monthly for dietary, anthropometric and biochemical assessment.

Anthropometric measurements, blood pressure and Physical activity evaluation

Body weight (kg), and height (m) were measured. The body mass index (BMI) was calculated 10 being classified according WHO[10] for adults and second Lipschitz11 for elderly.

Waist circumference (WC) was measured at the midpoint between the last rib and the iliac crest with an inelastic tape. The neck circunference (NC) was measured with the subject standing with the head positioned in the Frankfurt horizontal plane, the upper edge of the tape was placed under the cricoid cartilage and applied perpendicularly around the neck[12].

The blood pressure measurement was performed only once with the subject seated using a sphygmomanometer (adult cuff 38 x 16 cm model) and stethoscope (Littman Cardiology)[13]

To evaluate the physical activity we used a questionnaire validated in the Brazilian population[14]. Were considered physically active patients who performed at least 150 min. of moderate intensity exercise per week, according to the international recommendation[15]

Nutritional Treatment

Study visits occurred at baseline (week 0) and at 3 months. All patients received an individualized and

balanced meal plan, according to the nutritional status. Proteins accounted for 15 to 20% of the total energy value (TEV), lipids for 25 to 30% and carbohydrates for 50 to 60%[16].

Assessment of dietary adherence and quality of the diet

Study participants completed the 24-hour recalls were analyzed at the beginning (basal) and after three months. Diets were analyzed using a program based on US Department of Agriculture data (ESHA Food Processor SQL version 10.1.1; ESHA, Salem, Oregon) with addition of data on foods relevant to ongoing studies. The dietary quality and adherence to the nutritional treatment before and after 3 months were assessed using the Brazilian Healthy Eating Index (BHEI), adapted for the Brazilian population[17]. In short, the BHEI-R is an indicator developed in accordance to current references for a healthy diet. The index is composed of 12 components, nine of which are based on the food groups of the Dietary Guidelines for the Brazilian Population, expressed in energy density, with a maximum score of five points for Total fruits, Whole fruits, Total vegetables, Dark Green and Orange vegetables and Legumes, Total grains and Whole grains; the remaining components present a maximum score of ten points: Milk and dairy products, Meats, eggs and legumes and Oils. Two other components, based exclusively on nutrients, Sodium and Saturated fat, have a maximum score of ten points. Lastly, there is total calories derived from solid fat, alcohol and added sugar (SoFAAS) with a maximum score of 20 points. The intermediate scores for all components were calculated proportionately to the quantity consumed, therefore the total index score varies between zero and 100 points. We used the BHEI-Rclassification recommended by Bowman et al. (1998)[18] they are: healthy diet (≥81 points), need for improvement (between 51 and 80 points), and poor diet (<51 points).

Laboratory assessment

The blood samples were collected after 12-hour fasting and commercial kits (Abbott ARQUITETO c8000®, Abbott Park, IL, USA). Serum concentrations of total cholesterol, triglycerides, high-density lipoprotein (HDL) cholesterol, glucose and uric acid were determined by enzymatic colorimetric assay (commercial kit BioSystems S.A, Barcelona, Spain), using an A15 Automatic Analyzer (BioSystems S.A., Barcelona, Spain). Low-density lipoprotein (LDL) was calculated[19] Serum glucose were measured by spectrophotometry using the glucose oxidase/peroxidase (A15 Automatic Analyzer, BioSystems S.A., Barcelona, Spain) 20. Serum insulin was measured by a radioimmunoassay (RIA) kit (ImmuChemTM Coated Tube, MP Biomedicals®, LLC, USA)[21], with an assay sensitivity of 4.6 μU/mL and 12.2% of intra-assay coefficients of variation. The apolipoproteins A and B by imunoturbidimetry; glucose by the oxidase method; glycated hemoglobin (HbA1c) by tubirdimetric immunoassay; insulin by chemiluminescence microparticle immunoassay; C-reactive protein by chemiluminescence; and uric acid by the colorimetric method.

Homeostasis Model Assessment for insulin resistance (HOMA-IR) and Quantitative Insulin-Sensitivity Check Index (QUICKI) were calculated[22-23]

Statistical analyses

All the statistical analyses were conducted using Statistical Package for Social Sciences (SPSS), version 20.0 (SPSS Inc, Chicago, IL). The results were expressed as percentages, average and standard deviation. Through the analysis of variance test for repeated data, the anthropometric and biochemical variables were set according for sex, age (I ≥60/ <60 a), nutritional status (eutrophic/overweight), and DQI-R. Student's *t*-test was used for independent samples in order to compare the averages between groups (poor diet and need for improvement (PD/NI) *vs* healthy diet (HD)) and the paired Student's *t*-test was used to assess changes in the basal and final periods (three months) in each group. A p value of <0.05 was considered statistically significant.

Results

A total of 136 patients were included in the study and only 116 completed the three months, with a loss of 14.7% (20 withdrawals). Most of the participants that did not follow the study did not return after the first consultation and as a difficulty they mentioned that complying with the scheduled consultations was the main reason. The general characteristics of the population are presented in table I. The average age of the patients was 62.5±7.8 years, 65.5% were older adults, 77.6% had acute myocardial infarction and 51.7% stable angina; 100% used antihypertensive drugs regularly and 94.9% used statins made for more than 6 months. There was no report of change of medications during the study. With respect to the nutritional status, 67.2% were overweight, with BMI = 29.9±5.67 kg/m2 and 65.5% had a sedentary lifestyle.

The nutritional treatment promoted reduction of weight, BMI, NC and WC, regardless after adjust of sex, age, nutritional status and diet quality. Those parameters improve in both groups HD and PD/NI without difference in between (Table II). Table III shows the results of the nutritional treatment effect during three months regarding the biomarkers studied.

It is noteworthy that patients who completed the study with healthy diet tended to increase HDL-chol, while who do not adhere to the treatment achieved a

Table I
General data of the population[1]

Demographic	N=116 n (%)
Men	73 (62.9)
Color: white	70(60.3)
Marital status: married	76 (65.5)
Family income - MW[1] (2-5)	76 (65.5)
Education - 9 years of schooling	34 (29.3)
Social History	
Smoking	6 (5.2)
Alcohol	34 (29.3)
Sedentary	77 (67.5)
History of current disease	
Overweight/obesity	78 (67.2)
Systemic arterial hypertension	87 (75)
Type 2 diabetes	56 (48.3)
Dyslipidemia	116 (100)
Interventionist treatment	
Myocardial revascularization surgery	55 (47.4)
Angioplasty	30 (25.9)
Medicines	
Statins	111 (94.9)
Hypoglicemiants	55 (47.4)
Diuretics	32 (27.3)
Adrenergic inhibitors	59 (50.4)
Direct vasodilators	31 (26.5)
Angiotensin II (AT1) receptor antagonist	39 (33.3)

1 MW = Minimum wage = 1MW=$724,00

significant reduction in HDL-cholesterol. Sensitivity to insulin also improved in group (HD), table III.

The evaluations of the 24-hour recalls are presented in table IV. The dietary data showed that, before the intervention, 56% of the patients had cholesterol consumption and 62.9% inadequate saturated fat. There was a reduction of these percentages to 34.5% of cholesterol and 37% of saturated fat after the intensive nutritional treatment. There was no improvement in polyunsaturated fats consumption which remained low (3.7±2.3 *vs*. 3.3±2.6%) even after the intervention. When adjusting the dietary data of the 24-hour recalls with the classification of BHEI-R considering poor diet and need for improvements compared with healthy diet, no significant difference was found between the dietary intakes of these patients (Table IV). Also, the concentrations of HDL-C in patients who finished the trial with healthy diet showed increase significative (Table V), (PD/NI=38,5 ± 0,9 to 36,9 ±0,8 mg/dL, p= 0,03) vs (HD=37,2±1,8 to 38,9±2,2 mg/dL, p=0,25). This result is shown in figure 1.

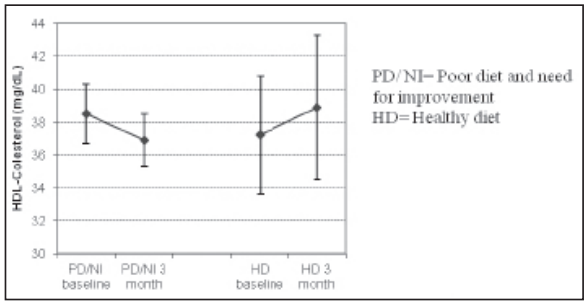

Fig. 1.—Evolution of HDL-C vs BHEI-R during basal time and after 3 months.

The BHEI-R average score was 67.9±12.4 points. After 3 months of nutritional treatment, BHEI-R score increased and the percentage of patients classified health diet. 58,6% to 9.6%; 40,5 to 69.6%; 0,9 to 20.7%, PD, NI and HD, respectively.

Discussion

This is the first study that has assessed the effects of intensive nutritional treatment associated with optimized clinical treatment in secondary prevention for patients with CAD.In the present study, we found that intensive nutritional treatment resulted in improvement of anthropometric data after 3 months after dietary intervention. Other researchers that have assessed the effects of short-term nutritional intervention in weight loss showed benefits in patients with previous coronary events[24] and patients with CAD[25]. A clinical trial that has been recently published compared the effects of dietary advice with the Brazilian program of cardioprotective diet for three months in patients with atherothrombotic disease and did not find any difference in weight loss between the groups studied[26]

Besides the improvement in anthropometric data our study also showed that three months of intensive nutritional treatment was effective for the improvement of glycemic important markers. Intensive nutritional treatment promoted a significant reduction in HbA1c and insulin concentrations, as well as insulin sensitivity improvement, with a tendency to HOMA-IR reduction. HbA1c reduction was a clinically important finding, because this marker points to the decrease in the incidence of diabetes-related complications and mortality[27] Other studies also showed HbA1c reduction after intervention using the Mediterranean diet[28] lifestyle changes and encouragement for weight loss in obese and diabetic patients[29].

The results in the improvement of anthropometric data and glycemic profile is in line with the already

Table II
Anthropometric and clinical data during nutritional intervention[1]

	Baseline (116)	Δ *3 month-basal*	*P2*	Δ *HD (24)*	Δ *PD/NI (91)*	*P*[2] *HD*	*P*[2] *PD/NI*
Weight (Kg)	79.7±15.9	-1.5±2.3	**<0.01**	-1,5±2,2	-1,4±2,5	**<0.01**	**<0.01**
Body mass index (Kg/m2)	29.9±5.7	-0.5±0.9	**<0.01**	-0,6±0,8	-0,5±0,9	**<0.01**	**<0.01**
Neck circumference (cm)	38.7±3.9	-0.8±0.1	**<0.01**	-0,8±1,1	-0,8±1,3	**<0.01**	**<0.01**
Waist circumference (cm)	102.1±12.7	-2.0±0.3	**<0.01**	-2,1±2,5	-2,1±3,7	**<0.01**	**<0.01**
Systolic blood pressure (mm Hg)	130.3±18.5	-1.5±1.8	0.34	-3,5±19,1	0,3±20,1	0,16	0,89
Diastolic blood pressure (mm Hg)	80.1±10.7	-1.9±1.2	0.19	-3,5±12,1	-0,2±13,4	0,02	0,92

[1]Values expressed as average ± SD; ;
[2]Paired Student's *t*-test - Statistically significant = **p<0,05;**
HD/NI=healthy diet/need improvement, PD=Poor diet;
Δ: mean difference three months compared to the baseline.

Table III
Biochemical data during the study[1]

	Baseline (116)	Δ *3 month-basal*	*P2*	Δ *HD (24)*	Δ *PD/NI (91)*	*P*[2] *HD*	*P*[2] *PD/NI*
Total Cholesterol (mg/dL)	183,3±58,3	-5,4±4,6	0.64	-10,6±54,5	0,8±40,8	0,14	0,87
HDL Cholesterol (mg/dL)	38,2±8,8	-1,0±0,6	0.15	0,45±7,3	-2,3±6,6	0,64	0,01
LDL Cholesterol (mg/dL)	109,4±42,9	0,8±4,2	0.80	-1,9±49,2	3,7±40,2	0,77	0,49
Triglycerides (mg/dL)	162,9±78,0	-7,2±65,0	0.11	-15,3±68,5	0,3±61,0	0,09	0,96
Apoprotein A (mg/dL)	138,0±20,4	-0,9±1,6	0.70	-0,0±18,5	-1,0±16,5	0,99	0,63
Apopoprotein B(mg/dL)	95,1±24,3	0,4±2,0	0.23	-2,1±25,5	3,2±17,2	0,54	0,17
HbA1c (mg/dL)	120,9±41,8	-0,4±0,1	**<0,01**	-0,5±1,3	-0,2±0,6	**<0,01**	**<0,01**
Insulin (mU/mL)	6,1±1,3	-1,3±0,5	**0,01**	-1,8±6,6	-2,1±6,2	**0,03**	**0,02**
Glucose (mg/dL)	11,3±6,0	-3,4±30,7	0,23	-6,7±30,7	0,5±30,6	0,10	0,90
HOMA-IR	3,8±4,1	-0,2±0,2	**0,03**	-0,8±4,2	-0,7±3,6	0,13	0,14
Quick[2] (10^{-3})	327,4±30,5	334,1±27,3	**<0,01**	7,7±21,5	4,8±26,1	**<0,01**	0,18
C-reactive protein (mg/dL)	0,3±1,2	-0,0±0,1	0.57	-0,2±1,5	0,3±1,9	0,16	0,17
Uric acid (mg/dL)	5,2±1,4	-0,1±1,1	0.16	0,2±1,2	0,0±1,1	0,10	0,70

[1]Values expressed as average ± SD;
HDL= high density lipoprotein; LDL= Low density lipoprotein; HbA1C= glycated hemoglobin.
HD/NI=healthy diet/need improvement, PD=Poor diet; HOMA-IR = insulin resistance index; Quick = insulin sensitivity.
[2]Paired Student's *t*-test - Statistically significant = p<0,05
Δ: mean difference three months compared to the baseline,

seen in the literature as the levels of these parameters are associated with changes in eating habits through nutritionally balanced diets in macro and micronutrients[30-31].

Whereas foods are not consumed in isolation, there was a steady increase in interest in studying general dietary patterns, addressing the complexity of the diet and the potential synergistic or antagonistic effects of the individual components of the diet[32].In Brazil, Fisberg et al.[33] adapted and validated for Brazilian Healthy Eating Index (BHEI), adapted for the Brazilian population. The BHEI estimated dietary adequacy and detects changes in eating patterns, as they consider the recommendations for a healthy diet, taking into account the dietary characteristics of Brazilian and permits evaluation and diet monitoring individuals and populations[17]. Our study was able to evaluate the BHEI-R of patients at the beginning and end of the intensive nutritional intervention and what caught our attention was patients who joined the nutritional treatment, ie, who completed

Table IV
Dietary data during the study and in accordance with the Brazilian Healthy Eating Index

	Basal (n=116)	Δ *3 months -Basal*	*P2*	*Poor diet and Need for improvement (n=91)*[4]	*Healthy diet (n=24)*[3]
				Δ[2] *(3 months –Basal)*	
Energy (kcal)	2285.3±1020.5	-766.8±105.7	**<0.01**	-838.5±1208.9	-522.9±810.3
Protein (%)	20.0±6.9	4.2±0.9	**<0.01**	4.1±10.3	5.5±7.8
Carbohydrate (%)	55.4±10.0	-0.1±1.2	0.69	-0.7±13.6	2.1±11.2
Lipids (%)	24.4±8.8	-4.2±1.0	**<0.01**	-3.2±10.7	-7.6±12.9
Saturated fat (%)	8.4±4.2	-1.9±0.5	**<0.01**	-1.5±5.0	-3.4±5.9
MUFA (%)	8.9±4.1	-2.5±0.5	**<0.01**	-2.2±5.2	-3.9±6.4
PUFA (%)	3.7±2.3	-0.4±0.3	0.76	-0.3±3.7	-0.8±3.0
Cholesterol (mg/day)	254.0±162.1	-67.7±18.6	**<0.01**	-75.7±219.1	-56.6±116.5
Total fibers (mg/day)	30.3±16.4	-4.3±2.1	0,11	-5.5±23.5	-0,2±13.0
Sodium (mg/day)	2110.1±1441.0	-815.2±146.5	**<0.01**	-933.9±1723.5	-565,0±1137.1

[1]Results expressed as average ± SD; MUFA = monounsaturated fatty acid; PUFA = polyunsaturated fatty acid.
[2]Paired Student's t-test.
[3]Unpaired Student's t-test between dietary data and BHEI-R (poor diet and need for improvement vs. healthy diet)
Statistically significant = p<0.05.
Δ: mean difference three months compared to the baseline,

the study with healthy diet to increase HDL-chol different from the diet group and in need of improvements that were significantly reduced for this parameter. This finding makes our study quite interesting as the population studied generally have low HDL-chol. And shows us the importance of always encourage patients to adhere better nutritional management to prevent futures events cardiovasculares[34-35].According to the BHEI-R evaluated we found that about 20,7% of the population showed healthy diet then at the end of treatment 79,3% of patients still need the same improvements of these. A study conducted with patients that had had a recent coronary event found poor diet[36] and other research with healthy Brazilian workers showed that less than 5% had a proper diet [37-38]. The average BHEI-R of the population in this study was larger than the average found in other studies conducted on healthy populations (67.9 *vs* 63.0 points, respectively)[39-40]. And our study showed average diet quality higher than study in dyslipidemic elderly in southern Brazil (66.63 ± 10.97)[41].

The need to improve the diet was also found in studies with different populations of ours. In the study of Galiot 2015[42], on elderly people above 80 years without cardiovascular changes.In Morales-Talk 2015[43] study conducted people presenting overweight and study Ceccatto V, 2014[44] post people diagnosed with breast cancer.

Another study that evaluated the quality of diet in patients who were being treated for lipid control found the average index investigated and lower than that found in the present study (30.8 ± 13). At the time, the study evaluated the alternative diet quality indexwhich evaluates only 9 components of a healthy diet of different BHEI-R evaluated in this study evaluating 12 components[45].

A recent study examined time trends in the quality of general diet for CAD prevention over the last two decades (1980-1982 to 2000-2002) and used diet quality indices similar to BHEI-R, the authors found improvement in the quality of diet during the last two decades[46].

Morimoto et al[47], in assessing adults with no coronary disease found 96% of patients with poor diet and in need of improvement, a percentage much higher than that found in the present study. Our results should have been better for him to deal with patients being treated for secondary prevention of coronary artery disease.

Nutritional monitoring was effective in improving the eating pattern with decreased cholesterol, saturated fat and sodium consumption. However, with regard to the quality of fats consumed, there was a reduction in the consumption of monounsaturated fat with maintenance of polyunsatured fat intake. Feart C et al. (2012)[48] found a more adequate consumption of these fats in populations that follow the Mediterranean pattern; although studies that used the Mediterranean diet only demonstrated increased monounsaturated fatty acids (MUFA) consumption, without changing the consumption of polyunsaturated fatty acids (PUFA)[24]. A study conducted in Brazil showed that the stimulus to Mediterranean food intake did not show improvement in the consump-

Table V
Comparison of HDL Cholesterol averages with diet scores (poor and need for improvement vs. healthy)[1]

	Comparison of the averages HDL cholesterol within the groups				
	PD/NI *(n=91)*[2]	**HD** *(n=24)*[2]	*Difference between groups (PD/NI – HD)*		
	Average ± Standard error	*Average ± Standard error*	*Average ± Standard error*	*95% CI*	*P*[3]
Basal	38.5 ± 0.9	37.2 ± 1.8	1.3 ± 2.0	-2.6 – 5.3	0.492
3 months	36.9 ± 0.8	38.9 ± 2.2			
(Δt)	-1.6 ± 0.7	1.7 ± 1.4	3.3 ± 1.6	-6.4- (-0.1)	0.044
95% CI	-3.0 – (-0.1)	-1.3-4.6			
P[2]	0.031	0.259			

[1] Data expressed as Average and Standard deviation; NI = Need for improvement; HD = Healthy diet; CI confidence interval
[2] Paired Student's *t*-test.
[3] Unpaired Student's *t*-test.
Statistically significant = p<0.05,

tion of these fats, probably because it is not part of the eating habits of the Brazilian population[26]. Studies on secondary prevention have reported that good adherence to a healthy diet is associated with lower rates of mortality and the prevention of new cardiovascular events e[3-4]. Guimarães et al. (2005)[49] found that regardless of the type of dietary advice, whether in group or individual consultations, the change in eating habits is still very limited and suggests that motivation is required for treatment adherence. The findings observed in this study reinforce the importance of intensive nutritional treatment associated with optimized clinical treatment in secondary prevention of atherothrombotic disease.

According to the discussion presented studies which refer to BHEI-R relating studies across the board[45-48] which makes a limitation for comparison with our results. And, no study has examined the BHEI-R in longitudinal studies and in patients in secondary prevention as in our study, which makes us a groundbreaking study. Evaluate the BHEI-R in our study was important because it was able to estimate dietary adequacy and detect changes in eating habits, taking into account food characteristics of patients, allowing the assessment and monitoring thereof.

Thus, our study becomes innovative because the alert BHEI-R analysis, we evaluate and monitor the population studied, better recognizing their diets and allow us to work more intensely on strengthening adherence to treatment in order to prevent future cardiovascular events.

Conclusion

Our study showed that the improvement in diet quality index is important for the quality of life of patients with chronic coronary disease as a positive influence in improving anthropometric and biochemical data which may have an impact in the prevention of future events.

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