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Review Article

Cardioprotective Diet: A Possibility of Diet Therapy Treatment

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Abstract:

The Brazilian Cardioprotective Diet is a diet for patients with heart disease, but it provides health benefits when used as an adjuvant in the prevention and treatment of diseases that have food as one of the factors for their development. It was developed by Hcor in partnership with the Ministry of Health in 2018. It classifies and recommends the consumption of foods by groups: green, yellow, and blue, using the Food Guide for the Brazilian Population as a referência. The objective of this study was, through a literature review, to find scientific data on the cardioprotective diet. This diet indicates the inclusion or exclusion of food from the values of food density (kcal, saturated fat, cholesterol, and sodium).Studies have pointed out that the excessive intake of ultra-processed foods is associated with practicality of eating, afforda prices, and easy availability of products, and therefore these foods have become cheaper compared to fresh, minimally processed foods, and the ultra-processed foods are the main responsible for the increase in non-transmissible chronic diseases. The cardioprotective diet shows the significant effect on the modulation of inflammatory response, through the intake of several nutrients and bioactive compounds from food, which act by activating the signaling pathways involved in the synthesis of inflammatory biomarkers. Therefore, although there are few published studies on cardioprotective food and being it effective in the secondary treatment of chronic noncommunicable diseases, it is necessary to conduct research among nutritionists to know the difficulties of assistance within the Public Health System.

Keywords: DICA-Br, cardioprotective nutrition, density calculation, food education

Introduction

In view of the cultural and dietary differences existing in the five major regions of Brazil, researcher Bernadete Weber decided to develop the first Brazilian diet, since Brazil used the guidelines that recommended the Mediterranean and DASH (Dietary Approaches to Stop Hypertension) diets as a coadjuvant treatment for cardiovascular diseases, however, many foods were not accessible to the great majority of the population. The research on cardioprotective food was carried out based on foods that presented the same characteristics as the diets previously mentioned, but it tried to include regional foods due to the large territorial extension that Brazil has, in order to meet the recommendations of the Food Guide for the Brazilian Population, which recommends the use of regional foods, either fresh or minimally processed, as the basis for food. The data for classification of the groups are extracted from the Brazilian Table of Food Composition, according to the densities: energy, saturated fat, cholesterol, and sodium, having from then on the stratification of the cardioprotective diet in groups: green, yellow, and blue, representing the colors of the Brazilian flag. The green group is the basis for calculating the other groups (Brasil, 2018).

The Cardioprotective Diet is a type of food, for a specific public, in order to improve the quality of life of these individuals. It can and should be used as a tool for Food and Nutrition Education (EAN) actions, being one of the ways to prevent the evolution of cardiovascular diseases and other diseases such as obesity, hypertension, diabetes, and dyslipidemia, also reducing overweight (Lyrio *et al*., 2022).

It was observed after a 6-month randomized clinical trial that cardioprotective diet reduces weight, Body Mass Index (BMI), waist circumference, and clinical parameters. The diet shows a significant effect in modulating the inflammatory response, through the ingestion of several nutrients and bioactive compounds from food, which act activating the signaling pathways involved in the synthesis of inflammatory biomarkers. The nutritional intervention suggested by the Brazilian Cardioprotective Food Program (Tip BR) is not only about conducting or limiting the intake of a nutrient or food, but also reflects the recommendation for adherence to a dietary pattern that portrays the nutritional composition recommended by Brazilian guidelines (Ferreira, 2017).

The Food Guide for the Brazilian Population was developed to be an effective tool to help programs and actions in health promotion with conducts and guidelines for proper and healthy eating. In the 2014 edition, the Guide brings as a golden rule that the basis of food should be fresh or minimally processed foods and home cooking, in addition to encouraging

the avoidance of consumption of ultra-processed foods. It also brings recommendations on the act of eating, addressing several conditions that lead to the best benefit of food and the pleasure caused by eating (Brasil, 2014).

According to data from the Brazilian Institute of Geography and Statistics (IBGE), in Brazil the proportion of people with obesity aged 20 years and older, more than doubled from 2003 to 2019, rising from 12.2% to 26.8%. The evidence brings worrying data, more than half of the Brazilian population is overweight or obese (Agência Brasil, 2020).

In an epidemiological study conducted in 2021 by the SBC (Brazilian Society of Cardiology), which obtained data from the Mortality Information System (SIM) and the Hospital Admission Authorization Information System released by the IBGE. In Brazil 72% of deaths result from NCDs, with 30% having cardiovascular diseases as the main cause of CVD in the country (SBC, 2021).

The diet involves many aspects that need to be carefully evaluated, so an investigation of the habits of the population, within the context of a cardioprotective diet, can bring an understanding of the factor that is leading these people to increased body fat, as well as blood pressure, uncontrolled blood glucose, cholesterol, and triglycerides (Lyrio *et al*., 2022).

The graduation in the health area, and especially Nutrition, needs to reflect on methodologies used by professionals who receive training focused on social needs within their scope of competence, the intersectoral and interinstitutional articulation necessary for the implementation of the guidelines of the National Food and Nutrition Policy (PNAN) and the articulation of the Unified Health System (SUS) with the National System of Food and Nutrition Security (SISAN) at the state level, as well as enable and establish partnerships with international organizations, governmental and non-governmental organizations, and the private sector, guided by the needs of the population of the region and by the public interest, evaluating the risks for the common good, with autonomy and respect for ethical precepts, for the guarantee of the rights to health and food, with a view to food and nutritional security (Brasil, 2013).

In light of the above, the objective of this study was, through a literature review, to find scientific data on cardioprotective eating.

Materials and Methods

An exploratory qualitative study was carried out. The scientific articles were obtained from internet databases such as BVS, Scielo, Medline, and Lilacs, whose publications were made in the last 10 years, in Portuguese and English. Duplicate articles and those not related to the theme were used as exclusion criteria. The research was carried out from February to November 2022. Due to the reduced number of publications, we used five articles that addressed the cardioprotective diet and another 18 articles that can be correlated with food, bringing statistical data or addressing relevant information that justify the use of cardioprotective diet as adjuvant not only for treatment of cardiovascular diseases, but also as prevention of triggering factors of noncommunicable chronic diseases.

Results and discussion

The cardioprotective foods have characteristics of the Mediterranean diet and the DASH diet prescribed for hypertensive patients, and its use recommends higher consumption of fruits, vegetables, wholefiber, such as cereals, and lower consumption of dairy products, fats, and even lean meats. The cardioprotective diet is based on the calculation of the densities: of food energy (kcal/g), saturated fat (g/g), cholesterol (mg/g), and sodium (mg/g) per 100g of food. This diet also recommends the presence of nutrients (antioxidants and dietary fiber), excluding the ultra-processed foods as recommended in the Food Guide. For the calculations, we established cut-off points for the green group: energy density ≤ 1.11 kcal/g; saturated fat density ≤0.01g/g; cholesterol density ≤ 0.04mg/g; sodium density ≤ 2.01 mg/g. From the green group classification, the yellow and blue groups were created. Foods and preparations that exceed one to two densities at the cut-off points of the green group are classified as the "yellow" group, and should be eaten in moderation. Foods that exceed three or four densities of the green cut-off points are classified as the "blue" group, and should be eaten in small quantities. For the calculations the Nutrition Composition Table (TACO) is used as a basis. There is also the fourth group, the "red" that is not recommended, because part of this group are the ultra-processed foods, better named ultra-processed foods, which contain large amounts of additives, preservatives and also have high amounts of sodium, sugars and trans fats (Brasil, 2018).

Table 1: Parameters and values of the cardioprotective diet green group.

GREEN GROUP CUT-OFF POINTS	
Energy Density	≤ 1,11 kcal/g
Saturated fat density	≤ 0,01g/g
Cholesterol density	≤ 0,04mg/g
Sodium density	≤ 2,01 mg/g

Source: Brasil (2018).

Table 2 compares and exemplifies how the classification by groups is performed. Note that the value of cow's milk is 0.37kcal/g, so the calculations for the other items were performed successively, both for skim milk and whole milk, as described in the table. After these steps the following conclusion was reached: the skim milk is less than or equal to the reference values of the cut point of the green group, not exceeding any of the reference densities, therefore it belongs to the green group. Whole milk, on the other hand, exceeded the densities of saturated fat and cholesterol, being greater than 0.01 and 0.04, respectively, thus belonging to the yellow group according to the classification criteria shown in the image below, which when one or two items are greater than the cutoff points classify in this group (Brasil, 2018)

Table 2: Food densities with cutoff point of the green group

CHEMICAL COMPOSITION 100g		ENERGY AND NUTRIENT DENSITY		CARDIOPROTECTIVE ENERGY AND NUTRIENT DENSITY	
Food	**Fluid skimmed cow's milk**	**Fluid whole cow's milk**	**Fluid skimmed cow's milk**	**Fluid whole cow's milk**	**Green Group Cutting Points**
Energetic value kcal	37 kcal	64 kcal	0,37 kcal/g	0,64 kcal/g	≤ 1,11 kcal/g
Saturated fat	0,25	2,01	0,00	0,02	≤ 0,01 g/g
Cholesterol (mg)	3,75	12,4	0,04	0,12	≤0,04 mg/g
Sodium (mg)	51,1	63,8	0,51	0,63	≤ 2,01 mg/g

Source: adapted from Brasil (2018)

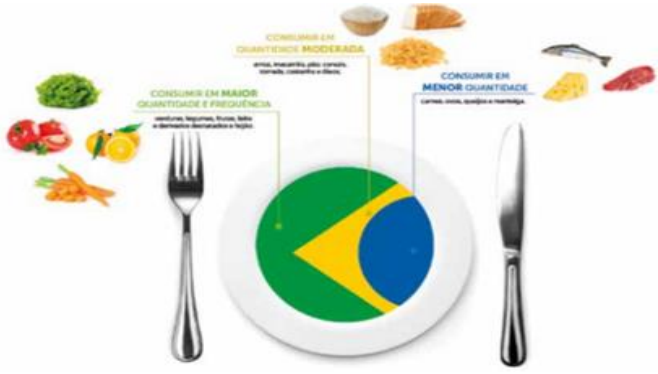
The search for ways to reduce the risk factors for cardiovascular events as a form of secondary prevention leads the scientific community to develop research on the possible causes, which have food as a determining factor, such as the work of Ribas a project of DICA BR (2020), it was found that the level of school education, especially those of elementary level and the difference between the sexes showed higher rates of consumption of sugary foods. These foods with glycemic loads of rapid absorption and do not offer satiety, causing individuals to be in constant search for food and as a consequence leading them to weight gain, predisposing to insulin resistance and changes in lipid profiles such as cholesterol and triglycerides (Ribas *et al*., 2020).

In the research on the investigation of consumption of cardioprotective food in overweight and obese patients, developed by Lyrio, Cintra and Câmara (2021), it was observed that there are differences in consumption between men and women for foods classified in the GREEN GROUP, such as vegetables, legumes, legumes, fruits, and skimmed milk and derivatives. In this case, consumption is higher among women. In the YELLOW GROUP consumption, which exceeds one to two densities of the green group, are classified as: olive oil, cereals, flours, among others, which must be used and consumed with moderation. There were differences - women consumed more foods rich in omega 3, which shows a greater concern with the quality of the diet, while men consumed more bread and other sources of carbohydrates. In the BLUE GROUP consumption survey, it was found that men consume more beef than women, who in turn consume more fish. The RED GROUP, which includes ultra-processed foods, consumption by men and women is apparently similar.

Table 3: Cut-off points for classification of the groups according to densities.

	Green Group	**Grupo Amarelo**	**Grupo Azul**
Classification Density	Includes densities with reduced value	1 or 2 items with densities higher than the cut-off point of the green group	3 or 4 items with densities higher than the cut-off point of the green group

Image 1: Orientation regarding the concept of proportionality of food group consumption.



Source: Brasil (2018).

Table 4: Nutritional recommendations from major guidelines for treatment or prevention of risk factors for cardiovascular disease

Nutrients	Recommendations
Carbohydrates	50 to 60% of the total energy value of the diet
Protein	10 to 15% of the total value of the diet
Fat	25 to 35% of total dietary value
Saturated fatty acids	up to 7% of the total value of the diet
Monounsaturated fatty acids	up to 20% of the total value of the diet
Polyunsaturated fatty acids	up to 10% of the total value of the diet
Dietary cholesterol	up to 200mg/day
Salt	up to 5g/day

Source: Brasil (2018).

The epidemiological studies carried out by the Brazilian Society of Cardiology (SBC), point out that 18 million deaths worldwide were due to cardiovascular diseases (CVD) and that in Brazil it is the main cause of death and still estimates that by 2040, there may be an increase of 250% in the country. He emphasized the existing link with dyslipidemia, since 70% of cholesterol is produced by the body and the other 30% comes from the diet. Reinforcing the need to contain the increase in consumption of ultra-processed products (SBC, 2021).

Tada, Takamura, and Kawashiri (2022) evidence that even if there is a genetic predisposition to develop metabolic syndrome, the consumption of omega-3 polyunsaturated fatty acids (n-3 PUFA) found in deepwater fish, flaxseed, olive oil, chia, soy milk, dark green leafy vegetables (cabbage) among others, pointed out to be able to decrease the dyslipidemia picture with reduced serum levels of triglycerides, occurring cardioprotective effect, influenced by the reverse transport of cholesterol that is when cholesterol from peripheral tissues returns to the liver to be reused or excreted by bile, and in the same study reports that the consumption of trans fatty acids were correlated with increased metabolic diseases such as type

2 diabetes, hypertension, obesity, and cardiovascular disease.

According to Maia *et al*. (2020) based on the Family Budget Surveys (POF), in the periods from 1995 to 2017, it was identified that the average prices of unprocessed or minimally processed foods increased significantly until 2017, while the ultra-processed foods also followed this increase until the year 2000 and that after this period did not accumulate so many price increases. For the author, if these predictions are confirmed, the trend is that by 2030 ultra-processed foods will become more accessible compared to healthy and natural foods, and the culinary ingredients will become minimally processed, making it difficult to comply with the Food Guide for the Brazilian Population, which sets as a golden rule the consumption of natural and minimally processed foods, as measures to combat the growth of chronic non-transmissible diseases (NCDs).

Although research shows that there was increased consumption of raw vegetables from 16% to 21.8% between 2008-2018, it showed a drop in fruit consumption by 25% of respondents (Agência Brasil, 2020).

The act of eating is also cultural, access and information about food influence their choices, but usually the family offers food passed down for generations, which does not provide an opportunity for these dietary changes. These behaviors allied to the new work model, which does not demand so much energy expenditure, brings as a consequence overweight and obesity. What has been found is that the delimitation of daily amounts of fruits, vegetables, and legumes are not enough, because when consumption is associated with high dietary intake such as high glycemic index carbohydrates, saturated fat, and fried food, there are consequences that trigger cardiovascular diseases and as for the consumption of processed food, the problem lies in the addition of hydrogenated fats, sugars, salt, and other preservatives, passing to be classified as ultra-processed. Still for the author, the eating behavior can be evaluated through the Dutch Questionnaire that evaluates the stimuli, being the psychosomatic that places the emotions in excessive eating, as a counterpoint to food restriction is not sustained for long periods. The external environment, the environment and the sensory system override the real needs of the organism (Oliveira, 2021).

The study by Menegassi *et al*. (2020) conducted within a university, in the city of Dourados-MS, verified the level of knowledge about the NOVA classification, the basis of the Food Guide for the Brazilian Population that: students confuse unprocessed or minimally processed foods with processed foods.

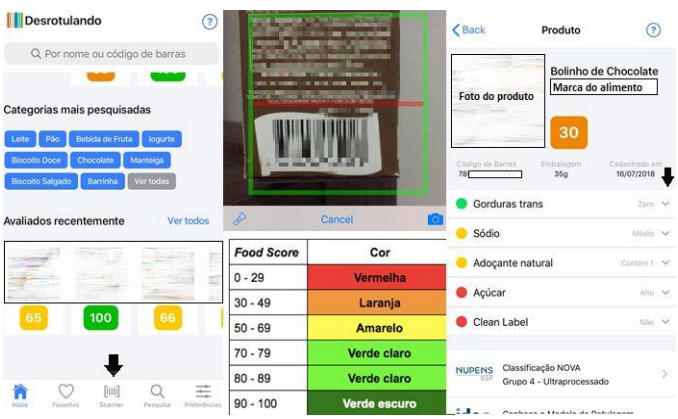
The incentive to use native genres of the region demonstrates the concern in the cultural food rescue as a way to follow the Food Guide for the Brazilian Population, since studies have indicated an increase in the consumption of processed and ultra-processed foods, which for the Brazilian Society of Cardiology is a reason for alert due to the consequences that may occur due to the use of excess salt, sugars, hydrogenated fats, trans fat, and industrialized additives that are used to increase the shelf life. The fact that the individual prepares his or her own food there is a reduction of these excesses that should be restricted from the usual diet. In clinical studies applied in randomly chosen groups, it was observed that the inclusion of fruits and vegetables was able to alter biochemical tests that when they are outside the reference values can trigger metabolic syndrome, which is a risk factor for coronary heart disease. That is why Brazil and other countries have been seeking to encourage the consumption of regional and affordable cardioprotective foods (BEPPU, 2019).

According to the Ministry of Health (2018), the beginning of many diseases such as cancer, allergic responses (asthma, bronchitis) and others, may also be related to the consumption of ultraprocessed foods. These hypotheses were raised after the descriptions of studies published in Brazil and other countries, regarding the health impacts of ultraprocessed foods in the periods (2012 to 2018). In these studies it was observed that in addition to diseases that are correlated with excessive consumption of foods with high energy density, it was found that those with possible causes, high consumption of additives, preservatives and food coloring, such as those that use nitrites and nitrates, added to meat products to slow microbiological growth, this mixture results in nitrosamines, which in research were able to induce malignant cancer. Also dyes such as red cochineal and tartrazine, can stimulate inflammatory response, causing hemodynamic instability, triggering crises such as asthma and bronchitis.

Access to reliable information about the composition of foods is a determination of the Codex Alimentarius, and must be clear, and cannot contain false information, and even lay people can have autonomy to make choices of healthier foods (Luz, 2022).

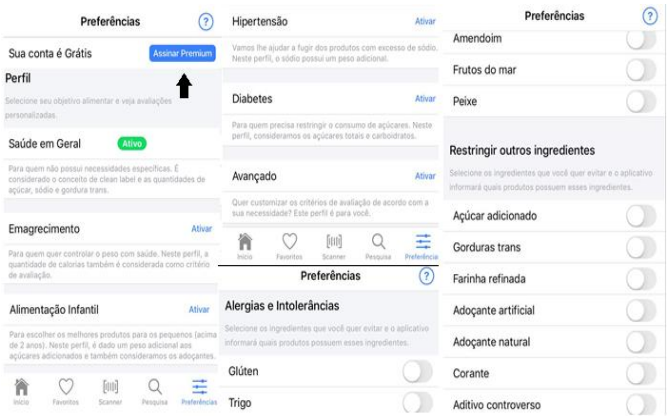
The new frontal nutritional labeling regulated by (Normative Instruction) IN 75/2020, which came into effect on October 9, 2022, obliges the food industry to use the magnifying glass on the top front of the package when exceeding acceptable limits for added sugars, saturated fats, and sodium. For public health it will have a positive impact, as consumers are expected to make better food choices. There is also the fact that industries, to adapt to the new rules have been reducing the amounts of these ingredients to not need to use the alert and as strategies not to expose their products, even because they can reflect on the sale (Brasil, 2022).

Image 2: Free demo version of Desrotulando.



Source: Gabrielle Lancellott/ Tecnoblog (2020).

Image 3: Paid version of the Desrotulando application.



Source: Gabrielle Lancellott/ Tecnoblog (2020).

The use of technologies capable of guiding consumers to choose foods that have labels, is already a reality. In 2016, businessman Gustavo Haertel Grehs and nutritionist Carolina Grehs developed the Desrotulando app (Image 2 and 3 respectively) shows free and paid version for IOS system in Brazil, with the purpose of sharing information contained in food labels. Products were registered by categories in the app's database, which can be accessed by name or packaging barcodes, with the help of the app's own scan (Zocchio, 2019).

The Desrotulando shows the list of ingredients that are usually in small fonts on package labels, which makes reading difficult and still makes an assessment of the quality of food, assigning colors and a score that can range from zero to one hundred, according to the amounts of additives is classified its processing following guidelines of the Food Guide for the Brazilian population, created by the Ministry of Health. The closer to zero, the less it is indicated, and the closer to one hundred, the healthier it is and at the same time suggests similar products with better scores. When you choose by category, not needing a scanner, the food is presented from the highest score to the lowest score of all products registered, but the paid version can be customized, as shown in image 3 (ZOCCHIO, 2019).

Martins, Isaia, Sezini (2021) presented a prototype of the Smart List, an application for mobile devices on Android and IOS platforms similar to the Desrotulando application, both scan the barcode and use the Food Guide for the Brazilian Population, but there are some differences in the information. The Smart List explains that on the label there are other nomenclatures for the ingredient sugar.

The Clean Label movement, translated "clean label", is free of food additives, and should contain ingredients like those used in homes, minimally processed, being in accordance with the Food Guide for the Brazilian Population. The manifest that fights for clean label is national and international, in Brazil is seeking the regularization with ANVISA (National Health Surveillance Agency) of vegetable products that can perform the same function of food additives, but are natural, examples are carrot, celery, spices (clove, cinnamon, garlic, oregano, mustard, saffron, paprika, turmeric (paprika) and others. These are different from those synthesized in laboratories by means of chemical reactions and that are still harmful to health. Moreover present scientific names on the labels, which for most consumers ends up being ignored, for not being of the knowledge of those who read it (Martins, 2019).

In summary, the cardioprotective diet is composed of natural or minimally processed foods, meeting the recommendations of the Food Guide for the Brazilian Population. The DICA-Br establishes that the daily diet should be of low energy density. However, the studies reviewed showed a strong tendency to consume foods better called ultra-processed, with high energy density, but attractive to the palate, easy to consume, and may even be cheaper compared to the price of ingredients for a cardioprotective meal, which for many households even replace a healthy meal (Brasil, 2018).

Moreover, according to the authors studied, the consumption of ultra-processed foods is even higher in the population with low education and among those who experience food insecurity and job instability. They also scored differences in consumption by men and women, including that women are more concerned about health, which is why they make better food choices (Brasil, 2018).

Furthermore, the survey showed that the increase in consumption of ultra-processed foods occurs similarly in Brazil and in other countries, which is worrying for the scientific community, since statistical data show the influence that food exerts on the onset of diseases and deaths caused by NCDs (non-transmissible chronic diseases), especially cardiovascular diseases and that is related to metabolic disorders such as diabetes, hypertension, to which food is considered adjuvant for prevention and treatment (Brasil, 2018).

Given the relevance, the research with this theme that will address the action of the cardioprotective diet among nutritionists of the state of MS (Mato Grosso do Sul), was prepared and approved by the CEP (Research Ethics Committee) CAAE: 58086122.5.0000.5159, and will be continued in 2023. It is also noteworthy that the research in question was developed with a questionnaire validated by the cardioprotection team of HCor/MS.

Conclusion

It can be concluded that, due to the scarcity of studies that point to the use of the cardioprotective diet as a tool for education and guidance, more research is needed to identify the use and implementation of the cardioprotective diet in the Unified Health System (SUS), with a greater approach to population health care.

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