CHAPTER
18

Impact of nutritional status on the emergence of coronary obstructive diseases: Integrative review

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ABSTRACT
Introduction: The change in the nutritional profile of the Brazilian population brought about by changes in the structure of the diet of individuals, which correlates with economic, social, demographic and health-related changes, has led to the worsening of nutritional problems, since the state of malnutrition to obesity, which corroborates the increase in non-transmissible chronic diseases. Objective: To describe the effect of nutritional status on the occurrence of coronary artery disease. Methodology: integrative review, carried out through a bibliographic survey, in July and August 2022, in the Virtual Health Library (VHL), Scientific Electronic Library Online (SciELO), ScienceDirect, Scopus (Elsevier), U.S. National Library of Medicine National Institute of Health (PubMED) and Web of Science, with the Health Science Descriptors (DeCS) and their correspondents in Spanish and Portuguese: "Coronary Stenosis", "Coronary Disease", "Coronary Artery Disease", "Coronary Occlusion" and "Nutritional Status", for crossing the DeCS, the Boolean operators "OR" and "AND" were used. With regard to ethical aspects, all authors of the articles were respected. Results: 433 potentially eligible publications were identified, of which 13 were selected. These came from nine different nationalities. Of which 23.07% were published in the year 2021. Regarding the level of evidence of the studies, most (53.84%) were level III. Conclusion: In relation to this work, it was shown that the low intake of proteins, fibers, vitamins, minerals and high intake of carbohydrates and fats were associated with the increase and severity of CAD. Thus, the most prudent and scientifically viable thing is for the general population to consume a balanced diet rich in antioxidants from fresh fruits, vegetables and whole grains.

Keywords: Nutritional status, cardiovascular diseases, food, diet and nutrition.

1 INTODUCTION

Cardiovascular diseases (CVD) are the main cause of death in the world population, and more people die from this disease than from any other cause. It is estimated that 17.9 million people died from cardiovascular diseases in 2019, which represented 32% of all deaths globally (WHO, 2021).

In Brazil, the largest country in terms of territory in Latin America and the fifth largest in the world, with a population of approximately 214 million people, CVDs also represented the number one cause of death, and among these, coronary artery disease (CAD) was the main cause of death between 1990 and 2019 (IBGE, 2022; OLIVEIRA et al., 2022). It is estimated that the prevalence of CAD is 6.1% in the Brazilian population, increasing since 1990 due to population growth and aging (OLIVEIRA et al., 2022).

It is pointed out that the number of patients with CAD, including acute myocardial infarction, stable angina and ischemic heart failure, increased by 3.52 million in a period of 29 years (1990-2019).

In a similar period, the crude prevalence of CAD increased by 0.86%, from 0.99% in 1990 to 1.85% in 2019, representing 12% of deaths in Brazil in 2019, totaling 171,246 deaths in the country, the which represents 43% of all CVD deaths (OLIVEIRA et al., 2022).

The risk factors that contribute to the development of CVD can be classified as intrinsic or extrinsic to humans. Among the intrinsic factors, systemic arterial hypertension (SAH), diabetes mellitus (DM), obesity, sedentary lifestyle, dyslipidemia (DLSP), age, biological sex, genetic factors and family history can be mentioned. Among the extrinsic factors are environmental and behavioral factors such as smoking and alcohol consumption (MASSAROLI et al., 2018; SILVA et al., 2018).

The change in the nutritional profile of the Brazilian population caused by changes in the structure of the diet of individuals, which correlates with economic, social, demographic and health-related changes (ABREU et al., 2001; LEE; LEE; JEON, 2020), led to to the worsening of nutritional problems, since they went from a state of malnutrition to a state of obesity, which corroborates the increase in chronic non-communicable diseases (NCDs) (FERREIRA et al, 2005; MEDEIROS et al., 2018).

The changes that occurred in eating habits, from the accelerated industrialization and the current state policies, affected the quality of food of the Brazilian population, since the variety of foods consumed is smaller, with less nutritional value and consequently worsens in the quality of the diet (OLIVEIRA et al. al., 2022)

The consumption of saturated fats is strongly associated with the occurrence of CAD, and sedentary lifestyle and overweight/obesity in contemporary society, due to unhealthy habits and the lipid composition of the diet, have a great contribution in this scenario of CVD (ABREU et al., 2001; LEE; LEE; JEON, 2020).

A balanced diet, with the presence of macro and micronutrients, in addition to being important for maintaining life and promoting health, is directly related to the nutritional status of individuals. An inversely proportional relationship is pointed out, where the less balanced the diet, the greater the risks of occurrence of CNCD, especially those of metabolic origin (SAMUEL et al., 2018).

In this context, it is highlighted that the main interventions in relation to CVD are clinical/surgical and nutritional/behavioral. Regarding the latter, which have slower results, attention is drawn to the contributions of the professional nutritionist, aiming at changes/improvements in the population's eating and living habits (SALAS-SALVADÓ et al., 2019; LEE; LEE; JEON, 2020).

The nutritionist's strategic role is to provide assistance to individuals/families/communities, undertaking actions ranging from health promotion to disease prevention, in relation to eating and behavioral habits (SALAS-SALVADÓ et al., 2019). For the proper assessment of patients, the nutritionist makes use of technical procedures, which aim to analyze the physical state of patients,

(LEE; LEE; JEON, 2020), with the aim of structuring interventions that minimize the impact caused by some diseases and maintain the nutritional status in good parameters from the nutritional intervention (SALAS-SALVADÓ et al., 2019; FELICE et al., 2020).

Nutrition is the science that studies the effect of food on the body in order to obtain the necessary knowledge to contribute to the health of the population, as it is known that food has the capacity to treat various diseases or provide their appearance, when considered. inadequate (CJR et al., 2017). Given this, this work proposes to describe the effect of nutritional status on the occurrence of CAD.

2 OBJECTIVES

2.1 MAIN GOAL

To describe the effect of nutritional status on the occurrence of CAD.

2.2 SPECIFIC OBJECTIVES

1. Identify the technical procedures used to assess the nutritional status of patients with CAD.
2. Outline how life habits and nutritional status impact the onset of CAD.
3. Explain the nutritionist's role in the prevention/treatment of CAD.
4. Demonstrate how dietary habits and supplements impact CAD.

3 METHODOLOGIES

3.1 NATURE OF STUDY

This is a qualitative, descriptive study, with an integrative literature review design. This method is intended to systematically analyze works on a given topic, previously published. It is noteworthy that the Integrative Review is characterized in a method that allows the synthesis of evidence from several studies on a given topic through a fragmented process in six stages, being, I) definition of the guiding question, II) search and selection of studies, III) observation of the main data, IV) evaluation of these studies, V) synthesis of results and VI) presentation of the post-analysis corpus (MENDES; SILVEIRA; GALVÃO, 2019).

3.2 SEARCH STRATEGY AND DATA COLLECTION

To guide the integrative review, the following question was formulated: “What is the effect of nutritional status on the occurrence of CAD?” The bibliographic survey was carried out in the following databases: Virtual Health Library (VHL), Scientific Electronic Library Online (SciELO),

ScienceDirect, Scopus (Elsevier), U.S. National Library of Medicine National Institute of Health (PubMED) and Web off Science, in the period of July and August 2022.

The PICOT strategy was used to delimit the integrative review (MENDES; SILVEIRA; GALVÃO, 2019). Being an acronym, representing in the present study: P) Population (adult individuals); I) Intervention (nutritional status); C) Comparison (not applicable); O) Outcome or results (occurrence of) and T) Time (studies published in the last decade 2012/2022).

The search was carried out interdependently by two researchers, using the controlled descriptors available in Descriptors in Health Science (DeCS) and their correspondents in Spanish and Portuguese from the Virtual Health Library: “Coronary Stenosis”, “Coronary Disease”, “coronary artery disease”, “Coronary Occlusion” and “Nutritional Status”, for crossing the DeCS, Boolean operators “OR” and “AND” were used. Thus, the search strategy used was: (“Coronary Stenosis” OR “Coronary Disease” OR “coronary artery disease” OR “Coronary Occlusion”) AND (“Nutritional Status”).

The Preferred Reporting Items for Systematic Reviews and Meta - Analyzes (PRISMA) guide was adapted for reporting this review (SARKIS-ONOFRE et al., 2021). For the characterization of the selected studies, an adapted data entry instrument was used, containing the following items: author, year, article title, country where the research was carried out, study objectives, method, sample, conclusion and level of evidence (GALVÃO, 2006).

The studies were selected by carefully reading the titles, abstracts and later the full articles. The defined inclusion criteria were similar scientific articles with the theme of this study, productions available in full, in Portuguese, English and Spanish, which dealt with the subject: impact of nutritional status on the onset of CAD. Articles that were repeated in the databases or that did not cover the main theme were not included in the analysis.

3.3 DATA ANALYSIS

Data analysis was done by reading the articles. The presentation of the results and discussion of the data obtained was done in a descriptive way, allowing the reader to assess the applicability of the integrative review prepared, in order to achieve the objective of this method.

3.4 ETHICAL ASPECTS

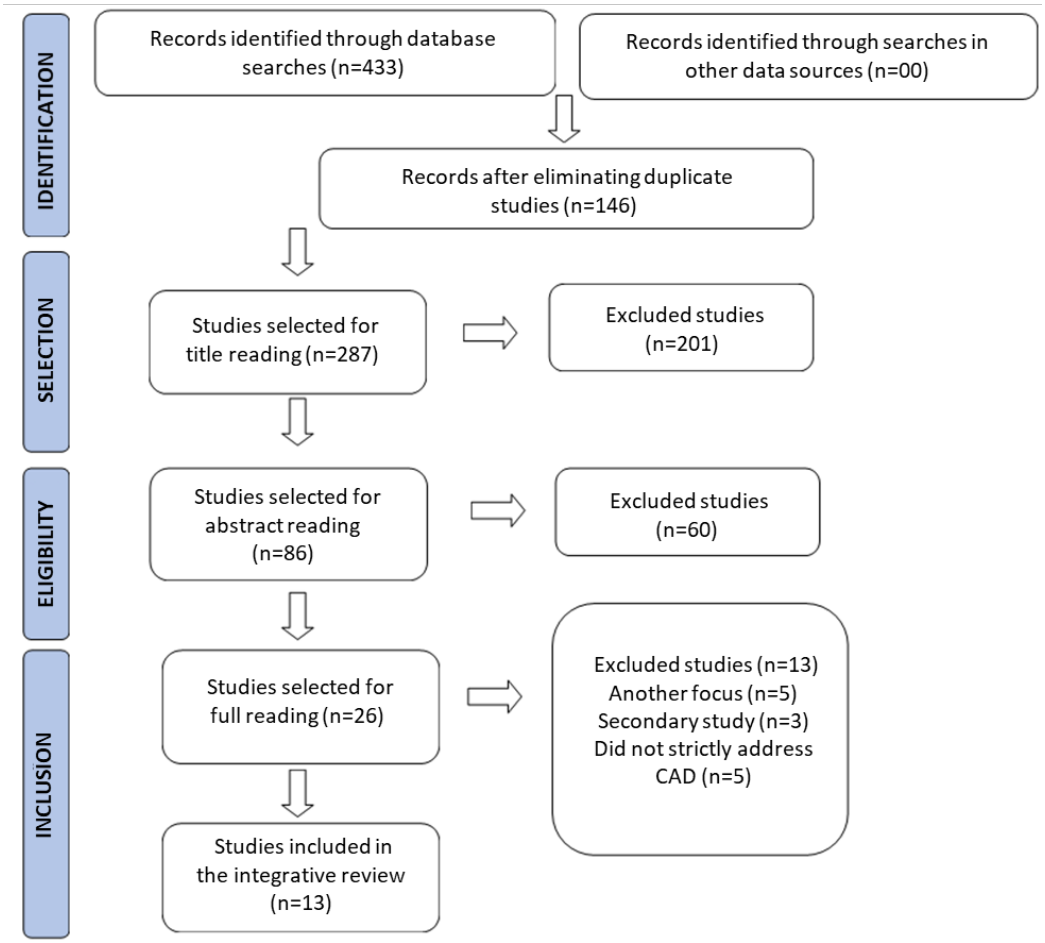
Literature reviews, as they are secondary studies, constructed with data already available in the public domain, do not need approval from the Research Ethics Committee.

4 RESULTS

In the search carried out in the databases, 433 potentially eligible publications were identified: VHL (n=4), SciELO (n=0), Science Direct (n=20), Scopus (n=172), Pub MED (n= 131) and Web of Science (n=106).

In an initial analysis by title, 146 articles were excluded because they were duplicated. Regarding the objective of the present study, 201 articles were excluded for not being related to the objective. The abstracts were then read, and after this, 60 publications were excluded for not addressing the subject under study in detail. Finally, 26 studies were read in full, of which 5 were excluded because they dealt with another disease/subject, 3 because they were secondary studies of an integrative or systematic review, and 5 because they addressed other diseases, and not strictly the DAC. Remaining 13 studies, which were selected to compose the sample of this review, as shown in Figure 1.

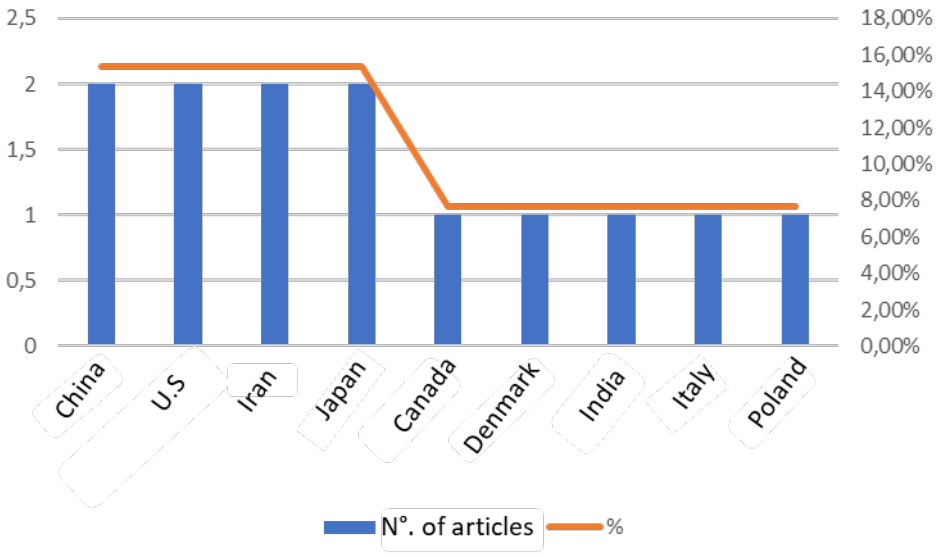
Figure 1: Flowchart of the strategy carried out for searching and including articles, according to the PRISMA model.



Regarding the year of publication of the studies, there were three (23.07%) studies published in the year 2021, two studies (15.4%) in each of the respective years 2014, 2016, 2017 and 2019. one article (7.7%) in the following years: 2015 and 2018.

Regarding the countries where the research was carried out, Figure 2 shows the origin of the countries where the studies come from.

Figure 2: Countries where the studies were carried out.



Regarding the level of evidence of the studies, seven (53.84%) studies are level III, three (23.07%) studies are level IV, two (15.4%) are level I and one (7 .7%) study is level V.

Table 1 presents the description of the characteristics analyzed in the 13 selected articles.

Table 1: Identification data of articles included in this review, 2022.

Author [Year]	**Title [Country]**	**Objective [Study type]**	**Conclusion [Sample]**	**NE***
GHANBARI et al. [2014]	Nutritional status and CAD: a cross-sectional study [Iran]	To study the nutritional status of patients with and without CAD [Transversal]	White mean and type of tea were the most important predictors of CAD. Dietary prevention strategies from childhood can prevent early CAD. [600 patients]	IV
VEDTOFTE et al. [2014]	Association between α-linolenic acid intake and risk of CAD [Denmark]	To investigate the association between ALA intake and risk of coronary heart disease in populations with different diets and across a wide range of ALA intakes. [Prospective Cohort]	There was a trend towards an inverse association between dietary ALA and CD risk among men, but it was not significant. No consistent associations were observed among women. The authors consider it to be the largest and most powerful study	III

			evaluating the association of ALA and CAD risk to date. Although there is no significant association, the authors suggest intake of food sources of ALA (eg canola oil, walnuts and flaxseeds) [229,043 patients]	
CHEN et al. [2015]	Effect of almond consumption on vascular function in patients with CAD: a randomized, controlled, crossover study [U.S]	To determine whether adding 85 g of almonds daily to a National Cholesterol Education Program (NCEP) Step 1 (ALM) diet for 6 weeks would improve vascular function and inflammation in patients with CAD. [Randomized, Controlled Clinical Trial]	This randomized, controlled, crossover study did not reveal a significant impact of adding 85 g/day of almonds to an NCEP Step 1 diet on foot-and-mouth disease and other measures of vascular reactivity. Adherence to the almond intervention was good, confirmed by an elevation of α-tocopherol level, and was associated with an improvement in diet quality reflected by increased intake of fiber, amino acids (especially arginine), the minerals calcium and magnesium, choline and proanthocyanins [45 usuários]	I
HUANG et al. [2016]	Nutritional status predicts all-cause death independent of comorbidities in geriatric patients with CAD [China]	Explore whether nutritional risk is associated with poor outcomes regardless of complicated clinical picture in elderly patients with CAD [Retrospective cohort]	Nutritional status is independently associated with the risk of death from all causes in geriatric patients with CAD. Whether nutritional support in appropriate patients [1772 patients]	III
MAHALLE et al. [2016]	Association of dietary factors with CAD severity [India]	To analyze the association of dietary factors with CAD severity in Indian patients. [Transversal]	Dietary factors are associated with CAD severity. Low intake of protein, fiber, vitamins, minerals and high intake of carbohydrates and fat were associated with increased CAD	IV

			severity. This association was independent of age, BMI, insulin resistance and inflammation, except for dietary fiber. [300 patients]	
MOGHADAM et al. [2017]	Nutritional factors and metabolic variables in relation to the risk of coronary heart disease: a case-control study in Armenian adults [Iran]	To evaluate the association between nutritional factors and CHD among Armenians in Yerevan [Prospective Cohort]	The intake of vitamins E, B6 and B12, folic acid, PUFA, MUFA and fiber seem to be predictors of CAD, regardless of other risk factors. [640 patients]	III
WADA et al. [2017]	Prognostic significance of nutritional status for cardiovascular outcome in patients with stable CAD [Japan]	To evaluate the prognostic value of malnutrition assessed by the CONUT score among patients with CAD undergoing elective percutaneous coronary intervention. [Retrospective cohort]	Nutritional status assessed by the CONUT score was significantly associated with long-term clinical outcomes in patients with CAD. Pre-PCI assessment of the CONUT score can provide useful prognostic information. [1,987 patients]	III
KOLARZYK et al. [2018]	Dietary intake of antioxidants and fats in the context of CAD prevention in the elderly [Poland]	Evaluate the estimation of the total antioxidant capacity of the food intake based on the Dietary Antioxidant Index (DAI), together with an evaluation of the contribution of certain food products in the DAI, and the evaluation of the consumption of all dietary fats and frequency of consumption of products which are a source of fat. [Transversal] When you put it transversal, you already understand that it is quantitative	Most seniors made mistakes in eating. The enrichment of natural antioxidants in the diet of the elderly and the normalization of their consumption of fats should become an important element in the primary and secondary prophylaxis of cardiovascular diseases. [143 patients]	IV

YEHLE et al. [2019]	A qualitative analysis of CAD patients' views on diet adherence and web- and mobile-based nutrition tools [U.S]	To examine the dietary challenges faced by patients with coronary heart disease, [Qualitative Description]	Web-based and mobile-based nutrition tools may be tools that CAD patients would value when making dietary choices and adhering to dietary recommendations, especially if additional resources are added to assist patients with changes. [20 patients and 7 informal caregivers]	V
FORMENTINI et al. [2019]	CAD and body mass index (BMI): what is the relationship? [Canada]	To verify the association between BMI and CAD severity, its risk factors and surgical and percutaneous treatment in patients admitted to cardiac units. [Prospective Cohort]	Obesity proved to be an independent risk factor for the early incidence of CAD, which is strongly associated with the presence of comorbidities such as DM, SAH and DLSP. [703 patients]	III
GIROLI, et al. [2021]	Effects of Mediterranean diet or low-fat diet on blood fatty acids in patients with CAD. A randomized intervention study [Italy]	To assess whether the Mediterranean diet, compared to a low-fat diet, favorably modifies the blood fatty acid profile in patients with CAD undergoing polytherapy. [Randomized Clinical Trial]	In polytherapy patients with CAD, both the Mediterranean diet and a low-fat diet alter the composition of blood fatty acids towards a healthier profile, with a more favorable effect of the Mediterranean diet on omega-3 levels. [130 patients]	I
WANG et al. [2021]	Malnutrition affects the cholesterol paradox in CAD: a Chinese cohort study of 41,229 [China]	To investigate the cholesterol paradox in patients with CAD and the effects of malnutrition. [Retrospective Cohort]	This study demonstrated that the cholesterol paradox existed in patients with CAD, but disappeared after accounting for the effects of malnutrition. [41,229 patients]	III
MARUYAMA et al. [2021]	Impact of nutritional index on long-term outcomes of	To evaluate the effectiveness of the nutritional index, Triglycerides × Total	The TCBI is a useful index for predicting long-term outcomes	III

	elderly patients with CAD: 5-year SHINANO registry subanalysis [Japan]	Cholesterol × Body Weight Index (TCBI) in elderly patients enrolled in the 5-year SHINANO registry [Prospective Cohort]	in elderly patients with CAD. [597 patients]	

* Evidence Level.

5 DISCUSSIONS

From the analyzed articles, it was found in relation to lifestyle habits that smoking, sedentary lifestyle, altered cholesterol, overweight, and SAH are directly linked to the onset and worsening of CAD (WADA et al., 2017; YEHLE et al., 2019; RIBEIRO et al., 2020; MARUYAMA et al., 2021; WANG et al., 2021).

Therefore, the importance of structuring and strengthening strategies that stimulate healthy lifestyles in the general population is highlighted. Since healthy lifestyle habits enable health promotion and disease prevention, including CAD (PRÉCOMA et al., 2019; PERES, 2022).

Regarding nutritional assessment in CAD, the literature is still scarce, and the clinical applicability of assessment instruments is still quite difficult, due to the complexity of most instruments/constructs used (MARUYAMA et al., 2021). Therefore, studies such as the present one is indispensable for grouping the literature and systematizing the "state of the art" regarding the subject.

The instruments/constructs cited for assessing nutritional status in the analyzed studies were: BMI (HUANG et al., 2016; FORMENTINI et al., 2019), Geriatric Nutritional Risk Index (GNRI) (HUANG et al., 2016), o Serum triglycerides (TG) (mg/dL) × serum total cholesterol (TC) (mg/dL) × body weight (BW) (kg) / 1000 (TCBI) (MARUYAMA et al., 2021), o Control Score of Nutritional Status (CONUT) (WADA et al., 2017), eating habits (YEHLE et al., 2019) and lipid levels measured in blood samples (WANG et al., 2021).

Regarding the applicability of the Body Mass Index (BMI), since it allows the use of both the patient's estimated weight and height, it is more feasible to use. And according to Formentini et al., (2019), both in adults and in the elderly, the increase in BMI is positively associated with the presence of DM, DLSP and SAH, that is, aggravating factors of CAD. However, the authors state that they did not find a direct association with the occurrence of CAD or its severity (FORMENTINI et al., 2019).

In turn, Huang et al., (2016) when conducting a cohort study for about six years in the city of Chengdu in China, analyzed nutritional status as a predictor of mortality in geriatric patients with CAD, and concluded that patients who had a higher nutritional risk, were smokers, were older (70 years or older) and had lower BMI (18.5 kg/m2 or less). This demonstrates the association of smoking, old age

and low weight/malnutrition with worse prognoses/outcomes in relation to CAD, as well as general mortality (RIBEIRO et al., 2020).

Thus, since BMI is related to height and body weight, it is relevant in the occurrence of CAD, but it is indicated that its association with CAD still needs to be better elucidated, especially with regard to which BMI value is most unfavorable for the occurrence of CAD. This, as a result of the BMI only making the ratio of weight to height. It does not correlate with life habits. This is even one of the criticisms made to the BMI. It does not distinguish whether the individual's weight has a high percentage of lean or fat mass. So, regardless of healthy habits, if the individual is active and sedentary, the BMI value will be the same (REZENDE, F. et al., 2007).

Aligned with the relevance of malnutrition in the outcome of CAD, Maruyama et al. (2021), in a study carried out in Nagano, Japan, with 1,665 consecutive patients undergoing percutaneous coronary intervention for CAD, found that a low TCBI index was an independent predictor of poor prognosis. Therefore, these findings reinforce the importance of nutritional monitoring, both to avoid overweight and to avoid malnutrition. In addition, the findings explain the importance of nutritional monitoring for the patient, so that he can maintain/reestablish his health globally (CUNHA, 2018).

In another study conducted by Wada et al. (2017) carried out in Tokyo, Japan, involving 1,987 patients with stable CAD undergoing percutaneous coronary intervention, used the Controlling Nutritional Status (CONUT) score, where the score is derived from serum albumin, total cholesterol and lymphocyte count values, to to evaluate the immunonutritional status of patients with stable CAD. It was observed that patients with a high CONUT score, that is, worse current disease condition, were significantly older, had a higher prevalence of SAH, lower levels of BMI, low-density lipoproteins (LDL-C), high-density lipoprotein -density (HDL-C) and triglycerides.

Wang et al. (2021) observed in a study carried out in Guangzhou, China, involving 41,229 patients aged over 18 years, of which 30,897 were male, that the “cholesterol paradox” occurs in CAD, that is, there is a paradoxical association of low levels of LDL-C with poor prognosis in patients with CAD. According to the authors, this is related to malnutrition, which was significantly higher in the group with low LDL-C concentration. The importance of having different forms of evaluation is evident, in order to avoid errors and unfavorable outcomes.

There is no consensus in the literature on the standard protocol regarding nutritional assessment in patients with CAD, therefore, each of the studies used in this review explains a direction for such an assessment. The lack of a standard protocol for assessing the nutritional status of patients with CAD means that each service applies what is most convenient for assessing the nutritional status of patients, which may imply empirical practices and cause harm to health. of the patient (CUNHA, 2018).

In this perspective, the importance of developing protocols related to nutritional assistance in patients with CAD, and of studies that validate and analyze these protocols, should be highlighted. This would contribute to advances in nutritional care in CAD, especially due to the fact that the analysis and monitoring of the nutritional level is an important clinical predictor (YEHLE et al., 2019; MARUYAMA et al., 2021; WANG et al., 2021).

It should be noted that most of the studies that make up this review evaluated the effects of supplementation and specific foods on the course of the disease, especially wine, coffee, herbal tea, legumes, vegetables, dairy products, fruits, meats and seafood. , nuts (GHANBARI et al., 2014; KOLARZYK et al., 2018; GIROLI et al., 2021), almonds (CHEN et al., 2015), oils, sauces and sweets (KOLARZYK et al., 2018), also the effect of macro and micronutrients was assessed (MAHALLE et al., 2016; MOGHADAM et al., 2017) and specifically alpha-linolenic acid (VEDTOFTE et al., 2014).

Ghanbari et al., (2014), pointed out in a cross-sectional study carried out in Tehran, Iran, involving 600 patients referred to a cardiology clinic with signs of acute coronary syndrome, that no significant difference was found between the groups studied in relation to the pattern of foods they consumed, emphasizing only that green tea constitutes a protective factor in CAD. It is noteworthy that it was well-marked by the authors as a limitation of the study, that its nature makes it impossible to determine direct causality (GHANBARI et al., 2014). Thus, the importance of studies with more robust methodologies, such as cohorts and clinical trials, is reinforced, being suggested as future possibilities for analyzing the effect of food on CAD.

Vedtofte et al. (2014) when conducting a study with a multicenter approach, led in Denmark, involving the United States, Finland, Sweden and other countries, with a population of 229,043 people aged 35 years or over (65% female), on diet style, and with the specific analysis of alpha-linolenic acid (essential acid from the Omega 3 group, which contains 18 carbons and three unsaturations). The authors found that increased consumption of alpha-linolenic acid is a protective factor for CAD in males. As for females, no association was found, the authors associate this with the fact that the female sample size was low. Thus, it is suggested that future studies build more robust methods with larger samples in the prevention/treatment of CAD.

Chen et al. (2015), in a study carried out in Boston in the United States with 45 patients with CAD, when evaluating the effects of almond consumption on the vascular function of patients with CAD in a clinical trial, pointed out gains, since almonds are rich in monounsaturated fat, fiber, α-tocopherol, copper and magnesium, and other nutrients that help modulate vascular function, which leads to beneficial actions on serum cholesterol, body weight, glucose homeostasis, inflammation and oxidative stress.

In other analyzed studies, low intake of protein, fiber, vitamins, minerals and high intake of carbohydrates and fat were associated with increased CAD severity (MAHALLE et al., 2016; MOGHADAM et al., 2017; KOLARZYK et al., 2018; GIROLI et al., 2021). In this perspective, Mahalle et al. (2016) through a study carried out in Pune, India, involving 300 patients with CAD, over 25 years old, signaled that this association is independent of age, BMI, insulin resistance and inflammatory factors.

Kolarzyk et al. (2018), through a study carried out in Kraków, Poland, with 143 people (73 women and 70 men) aged between 65 and 80 healthy years, reinforce the arguments above, by explaining that individuals who consumed few antioxidant foods, such as fruits, vegetables and vegetable oils, as well as low-fat foods, such as grains and cereals, fresh herbs and beverages, showed greater chances of developing/worsening CAD. Thus, the most prudent and scientifically viable thing is for the general population to consume a balanced diet rich in antioxidants from fresh fruits, vegetables and whole grains. It is also pointed out that the diet should contain adequate nutritional components, especially fats and fatty acids (both in quantity and quality) (MAHALLE et al., 2016; MOGHADAM et al., 2017; KOLARZYK et al., 2018).

In a clinical trial, Giroli et al. (2021) when evaluating 130 Caucasian patients of Italian origin, aged between 30 and 75 years, in Milan, Italy, explained that both a Mediterranean diet (with an antioxidant profile and low-fat content) and a diet with only a low-fat content of fat, produced some equivalent changes, which can be understood as "heart friendly" in blood fat. The authors also point out that the Mediterranean diet can add other beneficial effects, favoring a change in the composition of fatty acids in the blood towards a healthier profile in patients with CAD.

Nutritional interventions are necessary, not only in the hospital environment, but also in other instances of health care (primary and secondary care). Thus, reinforcing the need for the inclusion of nutritionists in all points of the Health Care Network (PEREIRA; NASCIMENTO; BANDONI, 2016).

It also appears that the expansion and reformulation of health care services is necessary, aiming at improving and expanding nutritional care, given its importance (CUNHA, 2018; YEHLE et al., 2019; MARUYAMA et al., 2021). In this perspective, Yehle et al. (2019) in a study carried out in West Lafayette in the United States, involving 20 patients with CAD and 7 informal caregivers of patients with CAD, regarding their perception of mobile applications that enable the selection of healthier products with detailed nutritional information, draw attention to a new possibility, that of developing interventions through applications, as well as in social networks.

The literature indicates that with the strengthening of nutritional care at the points of the health care network and with this (technological) adaptation, it is possible to envision a reduction in the risks of late complications resulting from unhealthy lifestyle habits (YEHLE et al., 2019; ARAÚJO, A. S.

B. et al., 2022). Finally, it should be noted that the nutritional status, as it directly influences the immune system and body functioning, is essential for better prognosis in relation to the disease, having a strong relationship with the reduction of hospitalization time, readmissions and health costs (CORREIA; PERMAN; WAITZBERG, 2017; FORMISANO et al., 2021).

The findings in the present study were mostly articles with a moderate level of evidence, which indicates a significant effectiveness of the actions mentioned above to improve dietary factors in CAD. In addition, with the present work, it is evident that the performance of the nutritionist is necessary, since only this professional has the support and technical-scientific knowledge to prescribe and monitor the effectiveness of the diet (BARROS et al., 2019).

It is noteworthy that despite the systematization in the search and selection of articles, it is recognized that it is impossible to exhaust the available literature on this subject. Therefore, among the limitations of the method, we highlight the search limited to six databases, the limitation of ten years referring to the search period, as well as the limitation of the author's domain languages (Portuguese, English and Spanish).

Despite these limitations, the present study synthesized evidence from 13 scientific articles, most of which were cohorts. It was clearly demonstrated that nutritional interventions help in the prevention/treatment of CAD, assuming that the absence of these interventions can compromise the health of individuals, culminating in poor outcomes. In view of this, this study contributed to the advancement of scientific knowledge and ratified the importance of the nutritionist, aiming at supporting patients/family members in the hospital, outpatient and/or home environment, both nationally and worldwide.

6 CONCLUSIONS

In this work, it was possible to conclude that the nutritional status influences the occurrence of CAD, since overweight and obese individuals, carriers of SAH, smokers, are more likely to develop it, it is emphasized that the nutritional status by influencing directly on the immune system and body functioning, it is essential for better prognosis in relation to the disease.

There was no consensus regarding the instruments/constructs used to assess nutritional status in CAD, but it is important to use these, as well as the development of protocols and studies that test their effectiveness in the nutritionist's practice.

Protective factors are linked to a good lifestyle, therefore adequate consumption of monounsaturated fat, fiber and supplementation of α-tocopherol, copper and magnesium, and other nutrients that help modulate vascular function, which leads to beneficial actions in the serum

cholesterol, body weight, glucose homeostasis, inflammation and oxidative stress, consequently leading to a timely nutritional status.

Analyzed studies brought as evidence the ingestion of foods with an antioxidant profile and with low fat content in the prevention/treatment of CAD. Therefore, the action/performance of the nutritionist is essential, since he is the professional who has mastery of this theme, and can therefore help in improving eating habits.

In relation to this work, it was shown that the low intake of proteins, fibers, vitamins, minerals and high intake of carbohydrates and fats were associated with the increase and severity of CAD. Thus, the most prudent and scientifically viable thing is for the general population to consume a balanced diet rich in antioxidants from fresh fruits, vegetables and whole grains.

The effects of supplementation and specific foods on disease progression were evaluated, including: wine, coffee, herbal teas, legumes, vegetables, dairy products, fruits, meats, seafood, nuts and oils. Macro and micronutrients were also evaluated, especially alpha-linolenic acid. Emphasizing only that green tea constitutes a protective factor for CAD.

Finally, further studies are needed to validate some of the results that have not been proven to have a significant impact on CAD, in order to deepen the theme and improve nutritional support strategies, since they play a fundamental role in maintaining health and preventing disease.

REFERENCES

Abreu, e. S. Et al. Alimentação mundial: uma reflexão sobre a história. Saúde e sociedade, v. 10, p. 3-14, 2001.

Araújo, a. S. B. Et al. Percepções sobre o atendimento nutricional on-line: uma revisão. Research, society and development, v. 11, n. 13, p. E587111335858-e587111335858, 2022.

Baggio, m. A. Et al. Production of nursing thesis and dissertations in portugal, 2000-2010: a bibliometric study.texto & contexto - enfermagem. V. 23, n. 2, p.250-260, 2014.

Barros, d. M. Et al. A atuação e importância do nutricionista no âmbito da saúde pública. Brazilian journal of development, v. 5, n. 10, p. 17715-17728, 2019.

Brasil. Resolução nº 510, de 07 de abril de 2016. Conselho nacional de saúde. Disponível em: http://conselho.saude.gov.br/resolucoes/2016/reso510.pdf

Bussab, w. O; morettin, p. A. Estatística básica. 5ª edi. São paulo: editora saraiva, 2006.

Cembranel, f. Et al. Relação entre consumo alimentar de vitaminas e minerais, índice de massa corporal e circunferência da cintura: um estudo de base populacional com adultos no sul do brasil. Cadernos de saúde pública, v. 33, n. 12, p. 18. 2017.

Chen, c. Y. Et al. Effect of almond consumption on vascular function in patients with coronary artery disease: a randomized, controlled, cross-over trial. Nutrition journal, v. 14, n. 1, p. 1-11, 2015.

Correia, m. I. T. D.; perman, m. I.; waitzberg, d. L. Hospital malnutrition in latin america: a systematic review. Clinical nutrition, v. 36, n. 4, p. 958-967, 2017.

Cunha, w. A. Avaliação nutricional do adulto de 2008 a 2018: revisão integrativa. Monografia (bacharelado) – universidade do estado de mato grosso, departamento de enfermagem, cáceres-mt, 2018. 31 p.

Felice, f. G. Et al. Severe acute respiratory syndrome coronavirus 2 (sars-cov-2) and the central nervous system. Trends in neurosciences, v. 43, n. 6, p. 355-357, 2020.

Ferreira, h. S. Et al. Hipertensão, obesidade abdominal e baixa estatura: aspectos da transição nutricional em uma população favelada. Revista de nutrição, v. 18, p. 209-218, 2005.

Figueiredo, f. S. F. Et al. Decrease of hospital intervention fees for cardiovascular diseases in adults in brazil. Cogitare enfermagem, v. 26, 2021.

Formentini, f. S. Et al. Coronary artery disease and body mass index: what is the relationship? Clinical nutrition espen, v. 34, p. 87-93, 2019.

Formisano, e. *Et al.* Nutritional therapy for patients with coronavirus disease 2019 (covid-19): practical protocol from a single center highly affected by an outbreak of the novel severe acute respiratory syndrome coronavirus 2 (sars-cov-2) infection. Nutrition, v. 82, p. 111048, 2021.

Galvao, c. M. Níveis de evidência. Acta paulista de enfermagem, v. 19, n. 2, p. 5, 2006.

Ghanbari, b. Et al. Nutritional status and coronary artery disease: a cross sectional study. Iranian red crescent medical journal, v. 16, n. 3, 2014.

Giroli, m. G. Et al. Effects of mediterranean diet or low-fat diet on blood fatty acids in patients with coronary heart disease. A randomized intervention studies. Nutrients, v. 13, n. 7, p. 2389, 2021.

Huang, b. T. Et al. Nutritional state predicts all-cause death independent of comorbidities in geriatric patients with coronary artery disease. The journal of nutrition, health & aging, v. 20, n. 2, p. 199-204, 2016.

Ibge - instituto brasileiro de geografia e estatística. Diretoria de pesquisas, coordenação de população e indicadores sociais. Projeção da população do brasil e das unidades da federação, 2022. [online] disponível em: https://www.ibge.gov.br/apps/populacao/projecao/

Intervenção nutricional em grupo de funcionários com sobrepeso ou obesidade praticantes de atividade física: um ensaio clínico randomizado. Revista hcpa., serviço de nutrição e dietética, centro de estudos em alimentação e nutrição, hospital de clínicas de porto alegre., p. 406-411, 4 abril 2012. Disponível em: https://www.lume.ufrgs.br/handle/10183/158410. Acesso em: 4 maio 2022.

Kolarzyk, e. Et al. Dietary intake of antioxidants and fats in the context of coronary heart disease prevention among elderly people. Annals of agricultural and environmental medicine, v. 25, n. 1, 2018.

Lakatos, e. M.; marconi, m. A. Fundamentos de metodologia científica. 5. Ed. São Paulo: atlas, 2003.

Lee, s. J.; lee, i.; jeon, j. Vascular calcification—new insights into its mechanism. International journal of molecular sciences, v. 21, n. 8, p. 2685, 2020.

Magalhães, m. N; lima, a. C. P. Noções de probabilidade e estatística. 6ª edi. São Paulo: edusp, 2008.

Mahalle, n. Et al. Association of dietary factors with severity of coronary artery disease. Clinical nutrition espen, v. 15, p. 75-79, 2016.

Maruyama, s. Et al. Impact of nutritional index on long-term outcomes of elderly patients with coronary artery disease: sub-analysis of the shinano 5-year registry. Heart and vessels, v. 36, n. 1, p. 7-13, 2021.

Massaroli, l. C. Et al. Qualidade de vida e o imc alto como fator de risco para doenças cardiovasculares: revisão sistemática. Revista da universidade vale do rio verde, v. 16, n. 1, 2018.

Medeiros, t. L. F. Et al. Mortalidade por infarto agudo do miocárdio. Rev. Enferm. Ufpe on line, p. 565-573, 2018.

Mendes, k. D. S.; silveira, r. C. C. P.; galvão, c. M. Uso de gerenciador de referências bibliográficas na seleção dos estudos primários em revisão integrativa. Texto & contexto-enfermagem, v. 28, 2019.

Milanlouei, s. Et al. A systematic comprehensive longitudinal evaluation of dietary factors associated with acute myocardial infarction and fatal coronary heart disease. Nature communications, v. 11, n. 1, p. 1-14, 2020.

Moghadam, e. F. Et al. Nutritional factors and metabolic variables in relation to the risk of coronary heart disease: a case control study in armenian adults. Diabetes & metabolic syndrome: clinical research & reviews, v. 11, n. 1, p. 7-11, 2017.

Oliveira, g. M. M. Et al. Estatística cardiovascular–brasil 2021. Arquivos brasileiros de cardiologia, v. 118, p. 115-373, 2022.

Oms - organização mundial da saúde. Doenças cardiovasculares, 2021. Disponível em: https://www.paho.org/pt/topicos/doencas-cardiovasculares

Pereira, t. N.; nascimento, f. A.; bandoni, d. H. Conflito de interesses na formação e prática do nutricionista: regulamentar é preciso. Ciência & saúde coletiva, v. 21, p. 3833-3844, 2016.

Peres, m. C. Ácidos graxo omega-3 na prevenção de doenças cardiovasculares: uma revisão da literatura. Revista farol, v. 16, n. 16, p. 78-93, 2022.

Précoma, d. B. Et al. Atualização da diretriz de prevenção cardiovascular da sociedade brasileira de cardiologia-2019. Arquivos brasileiros de cardiologia, v. 113, p. 787-891, 2019.

Rezende, f. Et al. Revisão crítica dos métodos disponíveis para avaliar a composição corporal em grandes estudos populacionais e clínicos. Archivos latinoamericanos de nutricion, v. 57, n. 4, p. 327-334, 2007.

Ribeiro, k. R. A. Et al. Fatores associados a síndrome coronariana aguda e sua prevalência entre os gêneros: revisão integrativa. Revista de enfermagem e atenção à saúde, v. 9, n. 1, 2020.

Salas-salvadó, j. Et al. (ed.). Nutrición y dietética clínica. Amsterdã: elsevier health sciences, 2019.

Samuel, t. M. Et al. A narrative review of childhood picky eating and its relationship to food intakes, nutritional status, and growth. Nutrients, v. 10, n. 12, p. 1992, 2018.

Sarkis-onofre, r. Et al. How to properly use the prisma statement. Systematic reviews. V. 10, n. 1, p. 1-3, 2021.

Silva, p. L. N. Et al. Perfil nutricional de portadores de doenças cardiovasculares internados em um hospital: estudo prospectivo. Revista de pesquisa: cuidado é fundamental, v. 10, n. 3, p. 626-631, 2018.

Vedtofte, m. S. Et al. Association between the intake of α-linolenic acid and the risk of chd. British journal of nutrition, v. 112, n. 5, p. 735-743, 2014.

Wada, h. Et al. Prognostic impact of nutritional status assessed by the controlling nutritional status score in patients with stable coronary artery disease undergoing percutaneous coronary intervention. Clinical research in cardiology, v. 106, n. 11, p. 875-883, 2017.

Wang, b. Et al. Malnutrition affects cholesterol paradox in coronary artery disease: a 41,229 chinese cohort study. Lipids in health and disease, v. 20, n. 1, p. 1-8, 2021.

Yehle, k. S. Et al. A qualitative analysis of coronary heart disease patient views of dietary adherence and web-based and mobile-based nutrition tools. Journal of cardiopulmonary rehabilitation and prevention, v. 32, n. 4, p. 203, 2012.