Artículo Original / Original Article

Weight loss-what's the most effective diet type?: A scoping review

Pérdida de peso-¿cuál es el tipo de dieta más eficaz?: una revisión sistemática exploratoria

ABSTRACT

Objective: To evaluate which type of diet is most effective for weight loss. **Methods:** Relevant studies for this type of review were identified from March to May 2018 by several sources, in the electronic databases PubMed, CINAHL, Scielo, SCOPUS, Web of Science, BVS Portal, EMBASE and Cochrane Library. For gray literature, Open Green and Base search and hand search repositories, which is a free search for materials that address the subject were searched. **Results:** The selected publications totaled 537, of which 104 were from the electronic databases and 433 records identified through other databases. After the removal of duplicates, 113 titles and abstracts and 37 complete texts were selected, after reading the articles in full, 14 articles were selected for inclusion in this review. Out of the 14 articles analyzed, relevant results were presented for a diet rich in fruits and vegetables; oleaginous, especially nuts; a Mediterranean diet was noted in three studies; dietary guidelines based on guides was mentioned in two studies and a high-protein diet was cited four times. **Conclusion:** The most effective diet for weight loss was the high fiber diet, although it contributes with small percentage value. **Keywords:** Changes in body weight; Diet; Nutritional status; Obesity.

RESUMEN

Objetivo: evaluar qué tipo de dieta es la más efectiva para perder peso. **Métodos:** los estudios relevantes para este tipo de revisión fueron identificados de marzo a mayo de 2018 por varias fuentes, en las bases de datos electrónicas PubMed, CINAHL, Scielo, SCOPUS, Web of Science, BVS Portal, EMBASE y Cochrane Library en la literatura gris Open Green y Base de búsqueda y repositorios de búsqueda manual, que es una búsqueda gratuita de materiales que tratan el tema. **Resultados:** Las publicaciones seleccionadas totalizaron 537, de las cuales 104 eran de las bases de datos electrónicas y 433 registros identificados a través de otras bases de datos. Después de la eliminación de los artículos duplicados, se seleccionaron 113 títulos y resúmenes y 37 textos completos; después de leer los artículos completos, se seleccionaron 14 artículos para su

Diana Vaz^{1*}, Anne Rumiato², Inês Monteiro¹.

1. Faculdade de Enfermagem da Universidade Estadual de Campinas (UNICAMP). Campinas, Brasil.
2. Hospital Universitário da Universidade Estadual de Londrina, PR. Londrina, Brasil.

*Corresponding autor: Diana Vaz.
Faculdade de Enfermagem da Universidade Estadual de Campinas (UNICAMP). Bolsista CAPES. Rua Tessália Vieira de Camargo, 126 - Cidade Universitária Zeferino Vaz.
CEP: 13083-887, Campinas, São Paulo, Brasil.
Telefone: (043) 99920-8903
E-mail: nutridianavaz@gmail.com

Este trabajo fue recibido el 05 de diciembre de 2018.
Aceptado con modificaciones: 16 de marzo de 2019.
Aceptado para ser publicado: 29 de agosto de 2019.

inclusión en esta revisión. De los 14 artículos analizados se presentaron resultados relevantes para una dieta rica en frutas y verduras; oleaginoso, especialmente los frutos secos; Dieta mediterránea en tres estudios; Pautas dietéticas basadas en guías dietéticas, presentes en dos estudios y dieta hiperproteica, citadas cuatro veces. **Conclusión:** la dieta más efectiva para perder peso es la dieta alta en fibra, aunque contribuye con un pequeño valor porcentual. **Palabras clave:** Cambios en el peso corporal; Dieta; Estado nutricional; Obesidad.

INTRODUCTION

According to the Global Nutrition Report¹ the world's nutritional status is severe, as two billion people lack essential micronutrients such as iron and vitamin A. Two billion adults are overweight or obese, 41 million children are overweight, 88% of countries face two or three problems related to malnutrition (overweight in adult women, anemia in women of reproductive age and child malnutrition), and one in three people is malnourished. Overweight and obesity is a worldwide epidemic and, in Brazil, it affects 53.8% of adults and has become a public health problem justified by their increasing prevalence^{2,3}. In this context, studies^{4,5,6} and guidelines have been developed with the purpose of providing attention to problems related to food issues⁷.

In the last decades, cohort studies have been carried out in the European Union, which will be presented as follows:

European Prospective Investigation into Cancer and Nutrition (EPIC)⁸ is a prospective cohort study, with more than 521.000 participants, studied in 23 centers in Western Europe. From 1992 to 1999 information on diet, lifestyle characteristics, anthropometric measures and medical history was collected, as well as a biological sample of plasma, serum, leukocytes and erythrocytes⁸.

In 2005, an innovative and multicenter multidisciplinary research project developed in the European Union called Diet, Obesity and Genes (DIOGenes) was started, which sought to understand how obesity can be prevented and treated, focusing on the food perspective. It covers studies of dietary, genetic, physiological and psychological/behavioral factors, and involved 34 European partners, as well as four large food industries and five small companies, lasting for five years^{9,10}.

Supplementation in Vitamins and Minerals Antioxidants (SU.VI.MAX)¹¹ is a study of 13,017 adults (7,876 women between 35 and 60 years of age and 5,141 men between 45 and 60 years), using a randomized, double-blind study, placebo-controlled, primary prevention with an average duration of 7.5 years. All participants took 120 mg of ascorbic acid, 30 mg of vitamin E, 6 mg of beta-carotene, 100 mg of selenium and 20 mg of zinc, or placebo¹¹.

The guidelines developed by each country are important for guiding healthy eating. These guidelines are established on the basis of scientific evidence of the relationship between food, nutrition and health and data on food production, consumption, composition, cost, and accessibility. Thus, recommendations are provided regarding food groups, quantity of portions to be consumed, lifestyle messages, physical activity practice and attention to alcohol consumption^{12,13}.

The World Health Organization (WHO, 2015)¹⁴ advises adults that total fat consumption be less than 30%. In addition, changes in food preparation are recommended, including: the removal of the visible fat from the meat, replacing fried with baked, cooked and grilled preparations, using vegetable instead of animal oil, as well as avoiding ultra-processed foods containing trans-fat. Limiting the consumption of free sugar (added or naturally present sugar

in honey, syrups, fruit juices and concentrated juices) to less than 10%, i.e. preferring fruit and vegetable snacks instead of sugary snacks. Sodium intake should not exceed 5 g/day. Thus, recommendations include not adding salt, soy sauce, industrialized sauces in food preparation, removing the salt shaker from the table, avoiding ultra-processed and paying attention to the food labels. As for fruits and vegetables, the recommendation for daily consumption is 400 g and it is important that fruits and vegetables be included in meals, favoring those of the season and valuing variety. Finally, fiber consumption of 25-30 g per day is recommended¹⁴.

Obesity has reached pandemic levels and is related to increased risk for type 2 diabetes mellitus, fatty liver disease, hypertension, stroke, dementia, osteoarthritis, apnea obstructive sleep and various types of cancer. In addition, it has been related to unemployment, social disadvantage and a reduction in economic productivity¹⁵. In view of the above, the nutritional situation of the population is of great concern. The purpose of this scoping review was to evaluate the type of diet most effective for weight loss.

METHODOLOGY

A scoping review is designed on the basis of scientific evidence that seeks to identify new situations in which no research has been previously conducted, as well as to detail findings and the range of subjects in specific areas of study. The current study was based on PRISMA¹⁶, since no checklist for a scoping review separate from a systematic review has been elaborated. For this type of review, the research question is not limited to a specific problem but addresses different topics. To better understand/organize the methods for this type of study is divided into five stages^{17,18,19,20,21}.

Stage 1: Identify the research question

To identify the research question, it is important to delimit the study population, the type of intervention and the results. The current work had the following research question: What is the most effective type of diet for weight loss?

Stage 2: Identify relevant studies

The relevant studies for this type of review were identified from March to May of 2018 by several electronic databases: US National Library of Medicine National Institute of Health (PubMed), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scientific Electronic Library On Line (SciELO), SCOPUS®, Web of Science®, Virtual Health Library (BVS Portal), EMBASE® and Cochrane Library. We used the following descriptors: nutritional status, diet, body weight change, obesity. The grey literature was identified via the Open Green repositories, Bielefeld Academic Search Engine (BASE search) and hand search, which is a free search for materials that address the subject. The research strategy was sensitive and flexible, in order to capture the relevant findings.

Stage 3: Selection of studies

The selected studies were publications from the last ten years, carried out among adults (≥ 18 years to 64 years) and Body Mass Index (BMI) ≤ 40 kg/m². Exclusion criteria were gastroplasty or intragastric balloon insertion, stroke patients, chronic non-communicable diseases without treatment, use of any type of supplement or diet medicine, pilot study, and articles with no abstract available. The eligibility criteria were: randomized, non-randomized intervention studies, dissertations and theses, systematic reviews with or without meta-analysis, integrative and scoping reviews. After reading the articles in full, 14 articles were selected for inclusion in this review out of 537 original references. For the selection of articles, two reviewers performed the independent search and a third reviewer was consulted when there was no agreement among the reviewers.

Stage 4: Creation / Organization of data

For data extraction, a standard form was prepared by the reviewers, which consisted of authors name, year of publication, country of origin, journal in which the article was published, sample, objective, design, intervention, follow-up time, main results and financing.

Stage 5: Data collection, summary and reporting

Data extraction was performed in the months of May and June of 2018, one reviewer performed the data extraction by filling in form items and the other was responsible for analyzing the way the findings were organized. To evaluate results, diets mentioned in the studies were selected and interpreted in light of data provided and explanations given by authors.

RESULTS

Selection of studies

The publications were selected in June 2018 and totaled 537 articles, 104 from the electronic databases, 27 from the hand search and 406 from the gray literature. After the removal of duplicate articles, the title and summary of 113 articles were read, from which 37 were selected and read in their entirety. At the end, 14 publications were included (Figure 1).

Characteristics of the study

Out of the 14 articles included, all were published in English, including three reviews, twelve cohort studies, three on the SU.VI.MAX13, five on the DIOGenes study^{9,10} and three on the EPIC⁸, a study developed in 23 European countries. The study sample ranged from 122 to 373,293 individuals and presented relevant results for a diet rich in fruits and vegetables; oleaginous, especially nuts. The Mediterranean diet was mentioned in three studies, two studies recommended dietary habits based on dietary guides, and a hyperproteic diet was mentioned cited four times. Table 1 includes detailed results on the characteristics of these studies.

Figure 1: Prisma Diagram

Findings

It was observed in this review that the studies^{22,23,24,25,26} presented clinically satisfactory values of weight reduction. Research developed in European countries with the use of the Mediterranean diet for five years resulted in the reduction of 16 to 20 kg²². A study carried out in Spain, which used the Mediterranean diet, associated with physical activity and consumption of bread or did not result in a reduction of 4.9 and 5.6 kg, respectively²³. Research developed in France identified a reduction of 4.6 kg in men and 5.2 kg in women with a high score for the diets of the French Food Guide and Mediterranean Diet in a 13-year follow-up²⁴. Another French study reported that increased adherence to the French Food Guide resulted in the loss of 2 kg by women in a six-year period²⁵. Finally, the use of a diet of 1500 kcal, with 55% carbohydrate, 21% protein and 24% lipids, without bread and with nutritional guidance based on the Food Guides (oil seeds at five meals / day) reduced weight by 2.5% over eight years²⁶. It is important to add that all diets were based on a high consumption of cereal fibers and those from fruits and vegetables (Table 2).

According to the studies analyzed, it was observed that the diet capable of assisting in weight loss and/or maintenance was rich in fiber, followed dietary guidelines and also the Mediterranean diet.

Dietary fiber from cereals, fruits, vegetables and Mediterranean dietary patterns are positively related to weight and abdominal adiposity, as presented in a review of the EPIC and DIOGenes studies. Authors^{27,28} observed that an average intake of fruits and vegetables from 515 to 600 g/day in men and women was related to lower weight gain, when compared to a mean consumption of 265 g/day. Authors^{26,27} note that consumption of cereal fiber has

Table 1. Characterization of the included articles.

AUTHOR, YEAR, COUNTRY OF ORIGIN	JOURNAL	OBJECTIVES/PARTICIPANTS	DESIGN
Assmann; Lassale; Galan; Hercberg; Kesse-Guyot (2014)-France	Plos One	To evaluate the effect of daily supplementation with antioxidant vitamins and minerals on the incidence of cardiovascular disease, cancer and general mortality. 1,479 subjects. 1,029 men (45–60 years), 450 women (35–60 year)	SU.VI.MAX, double blind, placebo controlled, RCT, cohort study, prospective, observational. 24-hour reminder applied every two months as of 1994. Anthropometric evaluation: weight, height, BMI, waist circumference (WC) performed in 1995-1996 and 2001-2002.
Buijsse et al (2009) - Denmark, Germany, UK, Italy and the Netherlands.	American Journal Clinical Nutrition	To evaluate large-scale weight change with consumption of fruits and vegetables. 89,432 subjects, 52,307 (58%) were women. Age between 20 – 78 years.	DIOGenes (European Prospective Investigation into Cancer and Nutrition). Observational study.
Du et al (2010 real 2009) - eight cities of European countries	American Journal Clinical Nutrition	To verify the association of fiber and vegetable consumption with changes of weight and waist circumference. 89,432 participants, 42% men and 58% women, age between 20 - 78 years.	Part of the DIOGenes study Prospective, observational (diet, obesity and genes). cohort study.
Feskens; Sluik e Du (2010) - 23 European countries, review	Current Obesity Reports	To analyze the change of weight and waist circumference of the participants of the DIOGenes and EPIC-PANACEA study. DIOGenes: 89,432 participants (35 to 70 years old) 58% women. EPIC- PANACEA 373.803 participants 103,455 men and 270,348 women.	Review of 12 DIOGenes publications and 6 EPIC-PANACEA publications.
Fogelhom; Anderssen; Gunnarsdottir; Lahti-Koski (2012) - Finland, review	Food & Nutrition Research	To examine the role of macronutrient composition, food consumption, and dietary patterns in predicting weight or changing waist circumference. 1,517 abstracts and after the whole analysis process 43 articles were included.	Literature review. Inclusion criteria: prospective cohort studies, case control studies and interventions. Adults 18 to 70 years.
Freisling et al (2017)-10 European countries	European Journal of Nutrition	To investigate the relationship between nut intake and weight changes. 373,293 participants (103,303 men and 269,990 women).	European Prospective Research on Cancer and Nutrition (EPIC), an observational study.
Halkjaer et al (2010)-5 European countries	International Journal of Obesity	To evaluate the association between quantity and type of dietary protein and subsequent changes in weight and waist circumference. 89,432 participants (52,307 women).	European Prospective Research on Cancer and Nutrition (EPIC). Prospective, observational cohort study.
Kesse –Guyot et al (2009), France	American Journal of Epidemiology	To evaluate the impact of the French National Nutrition Sante' (PNNS) - Guideline Score (GS) (maximum score, 15 points) on anthropometric alterations. 3,531 participants (1,600 women, 1,931 men - 45 to 60 years old). Participants of the SU.VI.MAX that had been given according to the PNNS.	Cohort study, prospective, observational.

...continuation table 1.

AUTHOR, YEAR, COUNTRY OF ORIGIN	JOURNAL	OBJECTIVES/PARTICIPANTS	DESIGN
Lassale et al (2012)-France	International Journal of Obesity	To evaluate six scores reflecting adherence to different nutritional recommendations PNNS-GS, DGAII, DQI-I, MDS, rMED, MSMDPS * regarding weight change and the risk of obesity after 13 years of follow-up in adults aged 45 years or older. 3,151 participants, women (35 to 60 years old), men (45 to 60 years old), 1,680 men and 1,471 women. Participants of SU.VI.MAX.	Cohort study, prospective, observational.
Loria-Kohen et al (2012)-Spain	Clinical Nutrition	To compare two nutritional strategies (with or without bread) designed to promote weight loss in overweight / obese women. 122 women - 18 years and over.	Prospective, randomized clinical study.
Papadaki et al (2014)-9 European cities	Nutrition - Elsevier	To investigate the effects of weight loss and maintenance on diets that varied in protein content and glycemic index (GI) in the status of the metabolic syndrome (MS). Ages 18 and 65 and with at least one child between the ages of 5 and 18 years. 938 participants.	Secondary analysis of the DIOGenes study. Observational study.
Romaguera et al (2010)-10 European countries	American Journal Clinical Nutrition	To evaluate the association between adherence to the Mediterranean dietary pattern, weight change and the incidence of overweight or obesity. 373,803 participants (103,455 men and 270,348 women).	Prospective study of multicentric cohort - Prospective Investigation on Cancer and Nutrition - Physical Activity, Nutrition, Alcohol Consumption, Cessation of Smoking, Eating Out of Home, and Obesity (EPIC - PANACEA).
Roswall et al (2014)-5 4 European countries	American Journal Clinical Nutrition	To investigate if FTO genes rs9939609 and TCF7L2 rs7903146 modify the association between the Mediterranean Diet and the Nordic diet scores and changes in weight, waist circumference and body fat percentage. 11,048 participants.	Control case study, RCT.
Schwingshackl et al (2016)-Meta analysis .	Plos One	Explain the relationship between dairy consumption in relation to changes in anthropometric measures / adiposity by a meta-analytic approach. 22 studies.	Meta-analysis using PubMed, and Google scholar databases researched by two authors. Protocol PROSPERO - International Prospective Register of Systematic Reviews. No language restriction, ie anywhere

Source: Authors

*The French Nutrition Score-National Sante Guide (PNNS-GS), the American Index Food Index (DGAII), the Diet International (DQI-I), the Mediterranean Diet Scale (MDS), the Mediterranean Diet Index (rMED) and the Mediterranean Standard Food Score Style (MSDPS).

Table 2. Description of type of intervention and results from included articles.

AUTHOR AND YEAR	TYPE OF INTERVENTION / TIME	RESULTS OBTAINED
Assmann; Lassale; Galan; Hercberg; Kesse-Guyot (2014)	Supplementation of antioxidant vitamins and minerals. Recommendation of 30 minutes of physical activity in five days of the week. 1994 to 2002.	1497 overweight and obese subjects. Low adherence to the recommendations of the French guideline is associated with greater weight gain in men.
Buijsse et al (2009)	Not applicable. 1992 to 1998	Significant inverse association between fruit/vegetable intake and weight gain. Consumption of 100g of fruits or vegetables: reduction of 14 g per year.
Du et al (2010 real 2009)	Not applicable. 1998 to 2005.	Consumption of fiber, especially cereal fiber, is associated with the prevention of abdominal obesity and weight gain.
Feskens; Sluik e Du (2010)	Not applicable. 1998 to 2005.	High fiber diet, especially coming from cereals, fruits and vegetables and Mediterranean diet are associated with weight reduction and waist circumference.
Fogelhom; Anderssen; Gunnarsdottir; Lahti-Koski (2012)	Not applicable. Analysis of articles from 2000 onwards.	Whole grains, cereal fiber, dairy products with high fat content and appropriate dietary pattern, have a protective role against weight gain. However, for macronutrients the results were inconclusive.
Freisling et al (2017)	Not applicable. 2012 to 2017.	The higher nut intake is associated with lower weight gain and lower risk of overweight or obesity.
Halkjaer et al (2010)	Not applicable. 6,5 years.	Protein intake from red meat is associated with weight gain, especially in women. There was no association between the type of protein consumed, weight loss and waist circumference.
Kesse –Guyot et al (2009)	Not applicable. 6 years.	Significant negative association between PNNS-GS and changes in anthropometry markers. Higher adherence to Guideline French Food is related to lower weight gain in women.
Lassale et al (2012)	Not applicable.13 years of follow-up.	The use of dietary score is positively associated with the prevention of weight gain and may also help contain metabolic diseases and cancer.
Loria-Kohen et al (2012)	Nutritional orientation and/ or Mediterranean diet, consumption/ not of bread and physical activity. 16 weeks.	The inclusion of the bread in a hypocaloric diet for weight loss favored a better evolution of dietary parameters and greater adherence to the diet with fewer withdrawals. Both groups significantly reduced body weight, waist circumference, BMI and fat percentage.
Papadaki et al (2014)	Initial loss of 8% of body weight in eight weeks. Low-calorie diet (1500 kcal, 55% carbohydrates, 21% protein and 24% lipid), without bread and nutrition education guidelines (prefer whole grains, four to five meals a day) and physical activity (30 minutes a day). Follow up for 6 months.	Initial weight loss successfully improved the status of metabolic syndrome

...continuation table 2.

AUTHOR AND YEAR	TYPE OF INTERVENTION / TIME	RESULTS OBTAINED
		in European adults. During the maintenance period of 6 months, neither protein nor glycemic index affected metabolic syndrome. However, a moderately hyper protein diet that incorporates low glycemic index, consisting of foods that can be beneficial to weight management after weight loss.
Romaguera et al (2010)	Not applicable. 5 years of follow-up.	This study shows that promoting the Standard Mediterranean Diet as a healthy eating model can help prevent weight gain and the development of obesity.
Roswall et al (2014)	Mediterranean diet and diet of the Nordic countries. 6,8 years of follow-up.	Increased Mediterranean Diet Score associated with waist circumference reduction and BMI independent of genes.
Schwingshackl et al (2016)	Not applicable. There was no time limitation.	22 studies provided sufficient data for meta-analysis. The category of higher consumption of dairy products (especially yogurt) was associated with reduced risk of abdominal obesity and risk of overweight.

Source: Authors

*The French Nutrition Score-National Sante Guide (PNNS-GS), the American Index Food Index (DGI), the Diet-International (DQI-I), the Mediterranean Diet Scale (MDS), the Mediterranean Diet Index (rMED) and the Mediterranean Standard Food Score Style (MSDPS).

positive results for waist circumference and weight reduction. However, it is important to strengthen the consumption of all types of fibers, especially cereals, fruits and vegetables that are important for weight loss and waist circumference²⁷.

Authors³¹ analyzed the quality of the diet and concluded that a high score for Mediterranean diet reduces waist circumference and BMI, independent of genes, reinforcing the results of the studies mentioned above. Corroborating the findings of authors²² regarding the promotion of the Mediterranean diet as a reference for healthy eating that assists in the prevention of weight gain and obesity²².

Regarding dietary guides, diet quality indexes were analyzed for adherence to the recommendations of the Santé Guide / National Guideline in France, the American Food Guide and Mediterranean Food Guide and its relationship with obesity²⁴. The main findings showed that following dietary guides and the Mediterranean diet is associated with lower weight gain in 13 years of study. Similar to the study³² that analyzed the association of diet quality, according to the French Nutrition and Health Program, Santé Guide / National Guideline in France, for six years, researchers evaluated the change in weight and waist circumference, and concluded that the low quality of the diet is reflected

in greater weight gain and that adherence to the food guide shows more adequate waist circumference values.

DISCUSSION

Food fiber, also called dietary fiber, consists of carbohydrate polymers, formed by three or more monomeric units, in addition to lignin, and might be soluble or insoluble. Soluble fiber dissolves in water and forms gel, which is easily fermentable, specifically in the colon, by the micro flora of the large intestine. The most common types are pectin, gums, inulin and some hemicelluloses. Unlike insoluble fiber, which is difficult to ferment in the colon, it increases the volume of the fecal matter, such as lignin, cellulose and some hemicelluloses. The benefit of fiber is related to the fermentation process in the large intestine. Fiber slows intestinal transit causing the pH to drop in the colon, making the medium more acidic. In this way, fiber prevents the formation of pathogens and facilitates the absorption of calcium interfering with bone metabolism and reducing the solubility of bile acids³³.

Fiber is composed of carbohydrates resistant to digestive enzymes, which in contact with the intestinal microbiota produce important metabolites that give rise to short-chain

fatty acids in the colon, which bind to fatty acid receptors and stimulate hormones associated with reduced appetite, gastric emptying delay and improved insulin response. In this way, intestinal microbiota is modulated by increasing the availability of fibers which helps in the prevention of metabolic disorders^{34,35}.

A fiber intake of 25 g to 30 g/day is recommended. Its benefits are proven, especially regarding the reduction of risk of chronic non-communicable diseases, coronary artery disease, stroke, hypertension and diabetes. It is also related to improved lipid profile and some intestinal disorders, in addition to the positive relationship with the immune system and reduction in body weight. Therefore, it is associated with the treatment of obesity along with physical activity, hypocaloric diet and medications^{36,37}.

The high consumption of fruits and vegetables helps with weight loss and reduced waist circumference, due to an increase in satiety, a reduction in energy intake due to slow gastric emptying and absorption of macronutrients²⁸. Results corroborated by several authors^{22,24,27,29,36} included in this review, affirm the benefits of fruits and vegetables in reducing the percentage of total adiposity, in the prevention of obesity, cardiovascular disease and type 2 diabetes. A cohort study conducted at Harvard University, for 24 years (1986-2010), with men and women, obtained strong evidence that reinforces the relationship between fruit and vegetable intake and lower weight gain in the long term³⁶.

Fruits and vegetables are also included in the dietary guides that have existed since 1980, being reviewed and updated every five years to address urgent public health issues and the nutritional needs of a specific populations. They are made up of healthy guidelines for six meals, respecting regional differences and suggesting foods and beverages that are easily accessible to the population³⁸.

The American Food Guide³⁹ is based on five guidelines that address issues about the importance of maintaining healthy lifelong nutrition; focusing on variety, nutrient density, and quantity; limiting consumption of sugar, sodium and saturated fat, changing food choices, which involves food and drink and supports healthy eating patterns for everyone. The Brazilian Food Guide¹³ is based on the ten steps to healthy eating: "Always prefer natural or minimally processed foods; use oils, fats, salt and sugar in small amounts; limit the consumption of processed foods; avoid ultra-processed foods; eat regularly and with care; prefer to eat in quiet and clean places and in the company of other people; do your shopping in places that have a wide variety of natural foods, when possible, prefer organic and agroecological foods; develop your culinary skills; plan your time; distribute responsibilities with food in your home because eating well is everyone's job; when eating out, prefer places that make food on time; be critical. There are many myths and misleading advertisements around food, evaluate the information that comes to you and advise your friends and family to do the same".

Thus, the guidelines vary according to countries,

customs and religions. The dietary guidelines, studied^{24,32} were developed with the purpose of verifying the efficacy of these guidelines in several populations and their relationship with the improvement in diet quality, increased levels of physical activity, as well as the reduction of percentage of body fat. The Food Guide came to be seen as a starting point for nutritional education, in which the basis is an increase in consumption of fruits, vegetables, lean meats, fish and foods with lower concentration of fat, sugars, caloric drinks and foods rich in sodium. Although they are known, these guidelines have low adherence. There are difficulties related to comprehensiveness, food grouping and nutritional needs that are insufficient for the populations^{40,41}.

Fish, lean, and preferably white meat, whole grains, polyunsaturated and monounsaturated fat source foods, nuts, fruits, spices, vegetables and wine are the bases of the Mediterranean diet which is old and well known, although it has been replaced by ultra-processed foods due to the industrial revolution and globalization. However, the diet has been growing in popularity again because of the noted benefits in health and the environment⁴².

New ideas have emerged as to the orientation of the use of the Mediterranean diet. The Mediterranean Diet Foundation⁴³ has created a pyramid for the Mediterranean Diet that besides bringing the foods to be consumed, also provides information on portions, frequency of consumption, as well as importance of consuming, in moderation, a diet rich in olive oil, legumes, unrefined cereals, fruit, and vegetables, the act of cooking and its relationship with the moment of leisure with family and friends. The pyramid also includes strengthening culture, the importance of living in a community and preferring foods that are season, as they are richer nutritionally, of lower price, require less pesticides to grow and contribute to the environment. Frequent physical activity of at least 30 minutes a day is also recommended, which is essential to aid in weight loss/maintenance among other health benefits and, while done in company, becomes more enjoyable. Finally, the importance of rest is also mentioned, as it is critical to living in balance and having a healthy lifestyle⁴⁴.

The Mediterranean diet is essential for weight loss and prevention of obesity, and is rich in monounsaturated fat, helps glucose metabolism, increases the oxidation of postprandial fat and potentiates thermogenesis, which helps increase daily caloric expenditure, besides reducing the number of adipocytes in the adipose tissue and is able to limit the hyperplasia in obese people⁴⁵. This positive relationship between diet and weight control was also observed in a randomized clinical trial, which showed the association between the Mediterranean diet, diet quality and weight loss in overweight or obese individuals⁴⁶.

In addition to obesity, the Mediterranean diet helps prevent cardiovascular disease, cancer and neurological diseases⁴⁷. Studies such as Prevention with Mediterranean Diet (PREDIMED) conducted in Spain showed a protective effect for cardiovascular disease of the diet and a 30%

reduction in cases. The EPIC study conducted in European countries showed a relationship between the Mediterranean diet adherence and a reduction of mortality in approximately 24%^{48,49}. A study of 1,865 elderly persons showed that the Mediterranean diet reduces the chance of developing dementia by 10% and has positive effects on memory performance, language, perception and spatial vision⁵⁰.

Nuts are an important element of the Mediterranean diet, with high nutritional density, essential lipid profile, monounsaturated and polyunsaturated fatty acids, and antioxidant, anti-inflammatory and anticarcinogenic properties are some of its main properties. It is a healthy food increasingly consumed by people who seek healthy eating patterns and/or aim to lose weight^{51,52}. A study⁵³ conducted in Australia shows that the consumption of 30 g/day of oleaginous associated with healthy dietary patterns and increased consumption of fish reflected positively on the weight of the individuals. Nut consumers gained an average of 700g in five years, compared to non-consumers, who gained 2.1 kg. Therefore, it is important to emphasize that high nut consumption and weight loss are always associated with a healthy diet.

The hyperproteic diet is responsible for increasing thermogenesis and providing satiety, helping to reduce weight. The thermogenic effect is related to the body's lack of protein storage capacity, which metabolizes this macronutrient automatically. The protein is transformed into peptides that stimulate anorectic hormones such as peptide 1, very similar to glucagon (GLP-1), cholecystokinin (CCK), peptide YY, as well as inhibition of the hormone "orexigenic" ghrelin (Ghr) (Diepvens et al 2008). The ideal amount is more than 20% relative to the total macronutrients and the most appropriate sources are lean red meat, chicken, fish, dairy and vegetable protein. According to the findings of this review the hyperproteic diet alone is not enough for weight reduction and therefore needs to be implemented along with physical activity and healthy eating habits^{23,30,54,55,56,57}.

According to the findings of this review, we observed that the articles selected aimed to reduce weight, but a quality feed for different purposes, as well as different methodologies. Although studies demonstrated statistically significant values for weight change and waist circumference, when analyzed clinically, differences do not present satisfactory values.

The findings of the present study showed that weight loss or maintenance is based on foods with high nutritional density. In this perspective, it is important to prioritize the insertion of healthy foods. Thus, analyzing the above, it was possible to observe that no single food type is effective. Furthermore, to obtain the desired benefits, it is necessary to associate several foods, since only the adoption of healthy lifestyle habits can contribute to improvements in the health of individuals.

CONCLUSION

From the findings of the present study it is noted that the most effective diet for weight loss is the high fiber diet,

although it contributes with small percentage values. However, in addition to diet, lifestyle change is fundamental, since this process of weight loss and maintenance is multifactorial. Along with diet, physical activity, sleep quality, and psychological control must be considered, among other factors, in the living of a balanced life.

Limitations of the study. A scoping review does not evaluate the quality of the evidence of the findings, which may reflect on the veracity of the results and the amount of data obtained is substantial, generating difficult decisions on amplitude versus depth.

Conflict of interest. There is no conflict of interest on the part of the authors.

Acknowledgements. This work was supported by CAPES - Coordination of Improvement of Higher Level Personnel.

REFERENCES

1. Global Nutrition Report. Development Initiatives Poverty Research Ltd; 2017. World Health Organization. WHO. Global Status Report on Noncommunicable Diseases 2014. Geneva; 2017.
2. Ministério da Saúde. Vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. VIGITEL. Estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no Distrito Federal em 2016 / Ministério da Saúde, Secretaria de Vigilância em Saúde, Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção da Saúde. Brasília; 2017.
3. Vasconcelos FAG, Batista Filho M. História do campo da alimentação e nutrição em saúde coletiva no Brasil. *Ciência Saúde Coletiva* 2011; 16:81-90.
4. Steele EM, Raubenheimer D, Simpson SJ, Baraldi LG, Monteiro CA. Ultra-processed foods, protein leverage and energy intake in the USA. *Public Health Nutrition* 2017; 21(1): 114-124.
5. Scrinis G, Monteiro CA. Ultra-processed foods and the limits of product reformulation. *Public Health Nutrition* 2017; 21(1): 247-252.
6. Pulker CE, Scott JA, Pollard CM. Ultra-processed family foods in Australia: nutrition claims, health claims and marketing techniques. *Public Health Nutrition* 2017; 21(1): 38-8. World Health Organization. European Prospective Investigation into Cancer and Nutrition (EPIC). European Union, 1992.
7. Malik VS, Willett WC, Hu FB. Global obesity: trends, risk factors and policy implications. *Nature Reviews Endocrinology* 2013; 9: 13-27.
8. Riboli E, Kaaks R. The EPIC Project: rationale and study design. *European Prospective Investigation into Cancer and Nutrition. Int J Epidemiol* 1997; 26(1): 6-14.
9. Larsen TM, Dalskov S, Van BM, Jebb S, Kafatos A, Pfeiffer A, et al. The Diet, Obesity and Genes (Diogenes) Dietary Study in eight European countries-a comprehensive design for long-term intervention. *Obes Rev* 2010; 11:76-91.
10. Moore CS, Lindros AK, Kreutzer M, Larsen TM, Astrup A, Van BM, et al. Strategy to manipulate ad libitum macronutrient intake, and glycaemic index, across eight European countries in the DIOGENES study. *Obes Rev* 2010; 11: 67-75.
11. Hercberg S, Galan P, Preziosi P, Bertrais S, Mennen L. The SU.VI.MAX study: a randomized, placebo-controlled trial

- of the health effects of antioxidante vitamins and minerals. *Archives of internal medicine* 2004; 164(21): 2335-2342.
12. European Food Safety Authority. Development of Food-based Dietary Guidelines. EFSA Scientific Colloquium No 5 Summary Report. Parma, Italy: EFSA; 2007.
13. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Guia alimentar para a população brasileira / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. 2. ed., 1. Reimpr. Brasília: Ministério da Saúde; 2014.
14. World Health Organization. Healthy Diet: Fact Sheet N° 394. Geneva; 2015.
15. Bluher M. Obesity: global epidemiology and pathogenesis. *Nat Rev Endocrinol*. 2019; 15(5): 288-298.
16. PRISMA. Moher D, Liberati A, Tetzlaff J, Altman D & the PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA Statement. *Annals of Internal Medicine* 2009; 151: 264-269.
17. Freiberg A, Scheffer C, Girbig M, Murta VC, Seidler A. Health effects of wind turbines in working environments – a scoping review. *Scand J Work Environ Health* 1995; 21(5): 1-19.
18. Daudt HML, Mossel CV, Scott SJ. Enhancing the scoping study methodology: a large, inter-professional team's experience with Arksey and O'Malley's framework. *BMC: Mecial Research Metodology* 2013; 13(48): 3-9.
19. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology* 2005; 8(1): 19-32.
20. Khalil H, Peters M, Godfrey CM, McInerney P, Soares CB, Parker D. An Evidence-Based Approach to ScopingReviews. *Worldviews on Evidence-Based Nursing* 2016; 13(2): 118-123.
21. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implementation Science* 2010; 5(69): 2-9.
22. Romaguera D, Norat T, Vergnaud AC, Mouw T, May AM, Agudo A, et al. Mediterranean dietary patterns and prospective weight change in participants of the EPIC-PANACEA project1-3. *Am J Clin Nutr* 2010; 2: 912-921.
23. Loria-Kohen V, Gómez-Candela C, Fernández-Fernández C, Pérez-Torres A, García-Puigi J, Bermejo LM. Evaluation of the usefulness of a low-calorie diet with or without bread in the treatment of overweight/obesity. *Clinical Nutricion* 2013; 31: 455-461.
24. Lassale C, Fezeu L, Andreeva VA, Hercberg S, Kengne AP, Czernichow S, Kesse-Guyot E. Association between dietary scores and 13-year weight changeand obesity risk in a French Prospective cohort. *International Journal of Obesity* 2012; 6: 455-462.
25. Kesse-Guyot E, Castetbon K, Estaquio C, Czernichow S, Galan P, Hercberg S. Association Between the French Nutritional Guideline-based Score and 6-Year Anthropometric Changes in a French Middle-aged Adult Cohort. *American Journal of Epidemiology* 2009; 170(6): 757-765.
26. Papadaki A et al. Impact of weight loss and maintenance with ad libitum diets varyingin protein and glycemic index content on metabolic syndrome. *Nutrition* 2014; 30: 410-417.
27. Feskens EJM, Sluik D, Du H. The Association Between Diet and Obesity in Specific European Cohorts: DiOGenes and EPIC- PANACEA. *Curr Obes Rep*. 2014;3(1): 67-78.
28. Buijsse B, Feskens EJM, Schulze MB, et al. Fruit and vegetable intakes and subsequent changes in body weight in European populations: results from the project on Diet, Obesity, and Genes (DiOGenes). *Am J ClinNutr* 2009; 90: 202-209.
29. Du H, van der A DL, van Bakel MME, Slimani N, Forouhi NG, Wareham NJ, et al. Dietary glycaemic index, glycaemic load and subsequent changes of weight and waist circumference in European men and women. *Int J Obes (Lond)* 2009; 33: 1280-1288.
30. Fogelholm M, Anderssen S, Gunnarsdottir I, Lahti-Koski M. Dietary macronutrients and food consumption as determinants of long-term weight change in adult populations: a systematic literature review. *Food & Nutrition Research* 2012; 56: 1-45.
31. Roswall N, Angquist L, Ahluwalia TS, Romaguera D, Larsen SC, Østergaard JN, et al. Association between Mediterranean and Nordic diet scores and changes in weight and waist circumference: influence of FTO and TCF7L2 loci1-3. *Am J Clin Nutr* 2014; 100(4): 1188-1897.
32. Assmann KE, Lassale C, Galan P, Hercberg S, Kesse-Guyot E. Dietary Quality and 6-Year Anthropometric Changes in a Sample of French Middle-Aged Overweight and Obese Adults. *PLOS One* 2014; 9(2): 1-11.
33. Bernaud FSR, Rodruigues TC. Fibra alimentar: ingestão adequada e efeitos sobre a saúde do metabolismo. *Arquivos Brasileiros de Endocrinologia e Metabologia* 2013; 57(6): 397-405.
34. Canfora EE, Meex RCR, Venema K, Blaak EE. Gut microbial metabolites in obesity, NAFLD and T2DM. *Nat Rev Endocrinol*. 2019; 15(5): 261-273.
35. Rios JL, Bomhof MR, Reimer RA, Hart DA, Collins KH, Herzog W. Protective effect of prebiotic and exercise intervention on knee health in a rat model of dietinduced obesity. *Nature* 2019; 9: 1-10.
36. Institute of medicine of the National Academies. DRI- Dietary reference intake for energy, carbohydrate, fiber, fat, fat acids, cholesterol, protein, and amino acids. Washinton. DC. USA, National Academy Press 2002; VOLUMEN: 107-264.
37. Bertioia ML, Mukamal KJ, Cahill LE, Hou T, Ludwig DS, Mozaffarian D et al. Changes in Intake of Fruits and Vegetables and Weight Change in United States Men and Women Followed for Up to 24 Years: Analysis from Three Prospective Cohort Studies. *PLoS Med* 2015; 12(9): 1-20.
38. USDA. U.S. Departamento f Health and Human Services and U.S. Departamento f Agriculture. 2015-2020 Dietary Guidelines for Americans. 8th Edition. December 2015. <https://health.gov/dietaryguidelines/2015/guidelines/>. Acessado 30 de junho de 2018.
39. Nutrition and your health: Dietary Guidelines for Americans. Washington, DC: US Departamento of Agriculture of Health and Human Services;1980.
40. Bailey B, Perkins A, Tucker LA, LeCheminant JD, Tucker JM, Moncu B. Adherence to the 2010 Dietary Guidelines for Americansand the Relationship to Adiposity in Young Women. *Journal of Nutrition Education and Behavior* 2015; 47(1): 86-93.
41. Montagnese C, Santarpia L, Dietitian MB, Dietitian AN, Dietitian ARCS, Dietitian ESS, Contaldo F, Pasanisi F. European food-based dietary guidelines: A comparison and update. *Nutrition* 2015; 31: 908-915.
42. Almeida M, Oliveira A. Padrão Alimentar Mediterrânico e Altântico: uma abordagem às suas características-chave e efeitos na saúde. *Acta Portuguesa de Nutrição* 2017; 11: 22-28.
43. Fundación Dieta Mediterránea. UNESCO. Organización das Nações Unidas para a Educação, a Ciência e a Cultura. 2010. Disponível no link: http://mediterradiet.org/pt/nutrition/mediterranean_diet_pyramid Acesso 5 de julho de 2018.
44. Pérez AR, Velasco AR. Adherence to Mediterranean diet and

- bone health. *Nutrición Hospitalaria* 2014;29(5):989-96.
45. Kwan HY, Chao X, Su T, Fu X, Tse AKW, Fong WF, Yu ZL. The anticâncer and antiobesity effects of Mediterranean diet. *Critical Reviews in Food Science and Nutrition* 2015; 57(1): 82-94.
 46. Martinez-González MA, et al. Cohort Profile: Design and methods of the PREDIMED study. *International Journal Epidemiology* 2012; 41: 377-385.
 47. Garaulet M, Heredia FP. Behavioural therapy in the treatment of obesity (II): role of the Mediterranean diet. *Nutrición Hospitalaria* 2010; 25(1): 9-17.
 48. Ros E, Martinez-González MA, Estruch R, Salas-Salvadó J, Fitó M, Martínez JA, Corella D. Mediterranean Diet and Cardiovascular Health: teaching of the PREDIMED Study. *American Society for Advance Nutrition* 2014; 5: 3305-3365.
 49. Burlingame B, Dernini S. Sustainable diets: the Mediterranean diet as an example. *Public Health Nutrition* 2011; 14: 2285-2287.
 50. Francis HM, Stevenson RJ. Potential for diet to prevent and remediate cognitive deficits in neurological disorders. *Emerging Science Journal* 2018; 76(3): 204-217.
 51. USDA. Food Composition Database. Database; 2016. Disponível em: <https://ndb.nal.usda.gov/ndb/se-arch/list>
 - Acesso em 08 de julho de 2018.
 52. Nishimura T, Murakami K, Livingstone MBE, Sasaki S, Uenishi K. Adherence to the food-based Japanese dietary guidelines in relation to metabolic risk factors in young Japanese women. *British J Nutr* 2015; 114: 645-653.
 53. Ndanuko RN, Tapsell LC, Charlton KE, Neale EP, Batterham MJ. Effect of individualised dietary advice for weight loss supplemented with walnuts on blood pressure: the HealthTrack study. *Europ J Clin Nutr* 2018; 72: 894-903.
 54. Halton TL, Hu FB. The Effects of High Protein Diets on Thermogenesis, Satiety and Weight Loss: A Critical Review. *J American Col Nutr* 2004; 23(5): 373-385.
 55. Wycherley TP, Moran LJ, Clifton PM, Noakes M, Brinkworth GD. Effects of energy-restricted high-protein, low-fat compared with standard-protein, low-fat diets: a meta-analysis of randomized controlled trials. *Am J Clin Nutr* 2012; 96: 1281-1298.
 56. Clifton PM, Condo D, Keogh JB. Long term weight maintenance after advice to consume low carbohydrate, higher protein diets: a systematic review and meta-analysis. *Nutrition, Metabolism & Cardiovascular Diseases* 2014; 24: 224-235.
 57. Ajala O, English P, Pinkney J. Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes. *Am J Clin Nutr* 2013; 97: 505-516.