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VEGETARIANISM X NUTRITIONAL IMPACTS: AN INTEGRATIVE REVIEW

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Abstract: Introduction: In some ancient societies, meat was not part of the diet, either for religious reasons or because poorer populations did not have access to it. According to SVB's Food Guide for Vegetarian Diets for Adults, vegetarians are those who exclude from their diet all types of meat, poultry and fish and their derivatives, and may or may not use dairy products or eggs. It is necessary to draw attention to the participation of the nutritionist in the dietary planning of vegetarian individuals, in order to guide and adapt nutritional recommendations and needs. **Objective:** To verify the possible nutritional impacts of a vegetarian diet. **Method:** For this, an integrative review was carried out, which sought to answer the following question: What findings verify the possible nutritional impacts of a vegetarian diet? The questions addressed in the objective refer to the PEAK strategy, with patients being those of different age groups, adept at vegetarian eating. **Results:** From 130 records identified by searching the databases, 10 publications were retrieved for further evaluation, including 07 articles for review. Evidence pointed to the benefits of a predominantly plant-based diet in promoting and protecting health, in addition to conferring benefits on the planet. **Conclusion**: The main objective of the nutritionist must be to elaborate a specific food plan, minimizing the possible deficiency risks brought by the vegetarian diet in any modality, respecting both the patient's wishes and his/her metabolic needs.
Keywords: Food and Nutrition Education, Vegetarian Diet, Diet, Eating habits.

INTRODUCTION

Historically, in the Paleolithic era, human beings fed primarily on vegetables, as hunting animals to eat was very exhausting: meat consumption was sporadic (LEITZMANN, 2014).

Due to food shortages during World War II, the British were encouraged to grow their own foods, vegetables and fruits, encouraging vegetarianism. The concern with the lack of food for the population grew and provoked the so-called Green Revolution (1966) whose objective was to end hunger in the world through an increase in production, thanks to new technologies such as genetic improvement of seeds, use of new agricultural pesticides and the use of machines in the field (OLIVEIRA; NASSER, 2007).

In some ancient societies, meat was not part of the diet, either for religious reasons or because poorer populations did not have access to it. Some ancient philosophers stood out in defense of vegetarianism, mainly due to principles related to religion or ethics. In other words, the reasons why individuals adhere to vegetarian diets are varied, and may be linked to healthy living, as well as ethical and religious issues (FERRIGNO, 2012; MIRANDA et. al, 2013).

Regarding health, in 2013, the Brazilian Institute of Geography and Statistics (IBGE) released the results of the first National Health Survey to verify which Brazilian states had the highest rate of bowel and colorectal cancer and cardiovascular disease. And Rio Grande do Sul leads the ranking, because we are talking about a state where the barbecue culture is still very strong. According to the UN (2013), seven out of ten diseases that appeared in the last decade could cease to exist if the appetite for animal products were not so high in our society.

In Brazil, the Brazilian Vegetarian Society (SVB) was created in 2003 (SOCIEDADE VEGETARIANA BRASILEIRA, 2019b) and, according to the SVB Food Guide for Vegetarian Diets for Adults, "[...] those who exclude from their diet are considered vegetarians. all types of meat, poultry and fish and their derivatives, with or without dairy or eggs" (SLYWITCH, 2012).

According to Slywitch (2010), there are several types of vegetarian diets, all of which have the same philosophy of not eating meat and using vegetable foods. Thus, from the author's point of view, "Ovolactovegetarians" do not eat any type of meat, but consume eggs, milk and dairy products; "Lactovegetarians" do not consume meat or eggs, but consume milk and dairy products; "the "Ovo vegetarians" do not consume meat or dairy products, but they do consume eggs; "Vegans" do not consume anything of animal origin (not even leather, wool and silk clothing); the "Semi Vegetarians" are those who claim to be vegetarian, but make exceptions for fish or poultry, but do not consume red meat.

The vegetarian and vegan population continues to grow. In Brazil, the prevalence of vegetarians varied greatly, in 2018 the Brazilian Institute of Public Opinion and Statistics (IBOPE) had an average prevalence of 6% in populations between 50 and 500 thousand inhabitants (ALLENDE; DIAZ; AGUERO, 2017 ; CLAYS; BIERHALS; ASUNCIÓN, 2018).

In the 1960s and 1970s, there was a belief that the vegetarian diet did not reach nutritional support, causing nutritional deficiencies (SABATÉ, 2003). Despite recognizing the benefits of adhering to a balanced vegetarian diet, the American Dietetic Association and nutritionists of Canada (The American Dietetic Association and Dietitians of Canada, 2003) warn that some specific nutrients may not be available, predisposing them to the risk of development of deficiency diseases in this public.

The critical nutrients in vegetarians are protein, omega 3 fatty acids, iron, zinc, iodine, vitamin D, vitamin B12. The nutrient and energy needs of vegetarian women do not differ from those of non-vegetarian women, however, a cohort study showed that iron

intake was higher in vegetarian women and they were more likely to use supplements. (ALLENDE; DIAZ; AGUERO, 2017);

The study by Nascimento, Dias and Mendes (2018) presented the position of the American Dietetic Association regarding adequate food planning and its benefits due to the large amount of plant foods and better cardiovascular protection; as well as the lower Body Mass Index (BMI) reference, emphasizing the proper assessment of nutritional status.

A diet strategically selected by the nutritionist, well planned and with good management of food choices, can supply energy needs, as well as macro and micronutrients (MONTEIRO et. al, 2020). Thus, it is necessary to draw attention to the participation of the nutritionist in the dietary planning of vegetarian individuals, in order to guide and adapt nutritional recommendations and needs (NORONHA et al., 2017).

Thus, the objective of this review was to verify the possible nutritional impacts arising from a vegetarian diet today, exposing the importance of adequate nutritional management of adherent individuals.

MATERIAL AND METHODS

The formulation of this integrative review sought to answer the following question: What findings verify the possible nutritional impacts arising from a vegetarian diet today? The questions addressed in the objective refer to the PICO strategy, with adult patients adept at vegetarian diet.

SEARCH STRATEGY

The following databases were searched until June 2021: MEDLINE, LILACS and SciELO. The search strategy included terms related to vegetarian diets, food and nutrition education, and eating habits.

ELIGIBILITY CRITERIA

Articles that met the following criteria: studies that addressed vegetarian practices in adults, their risks and nutritional benefits, in the last 05 (five) years. There were no restrictions based on sex, race or comorbidities.

Exclusion criteria were: theses, dissertations, reviews, experience report and duplicate publications.

DATA EXTRACTION

Initially, titles and abstracts were evaluated. Full versions of articles were retrieved for further evaluation. All necessary information was extracted from published articles, protocols and comments related to each study. In addition to the conclusion data, the names of authors, title, year of publication and journal of publication were extracted. Data were stored in a database in Microsoft Office Excel 2007 program.

RESULTS AND DISCUSSION

STUDIES INCLUDED

From 130 (one hundred and thirty) records identified by searching the databases, 10 (ten) publications were retrieved for further evaluation, including 07 (seven) articles for review. The flow diagram that illustrates the research and selection of studies is shown in the figure 1.

The findings of the study by Hagmann, Siegrist and Hartmann (2019) drew attention to environmental issues in vegetarian diets, as well as associating better diet quality and fewer issues related to overweight. It corroborates the results of the study by Hemler and Hu (2019), who pointed out the risks of environmental degradation in low nutritional quality diets and drew attention to the evidence of consumption of plant-based foods and lower environmental impact, as well as lower risk of chronic diseases related to diet.

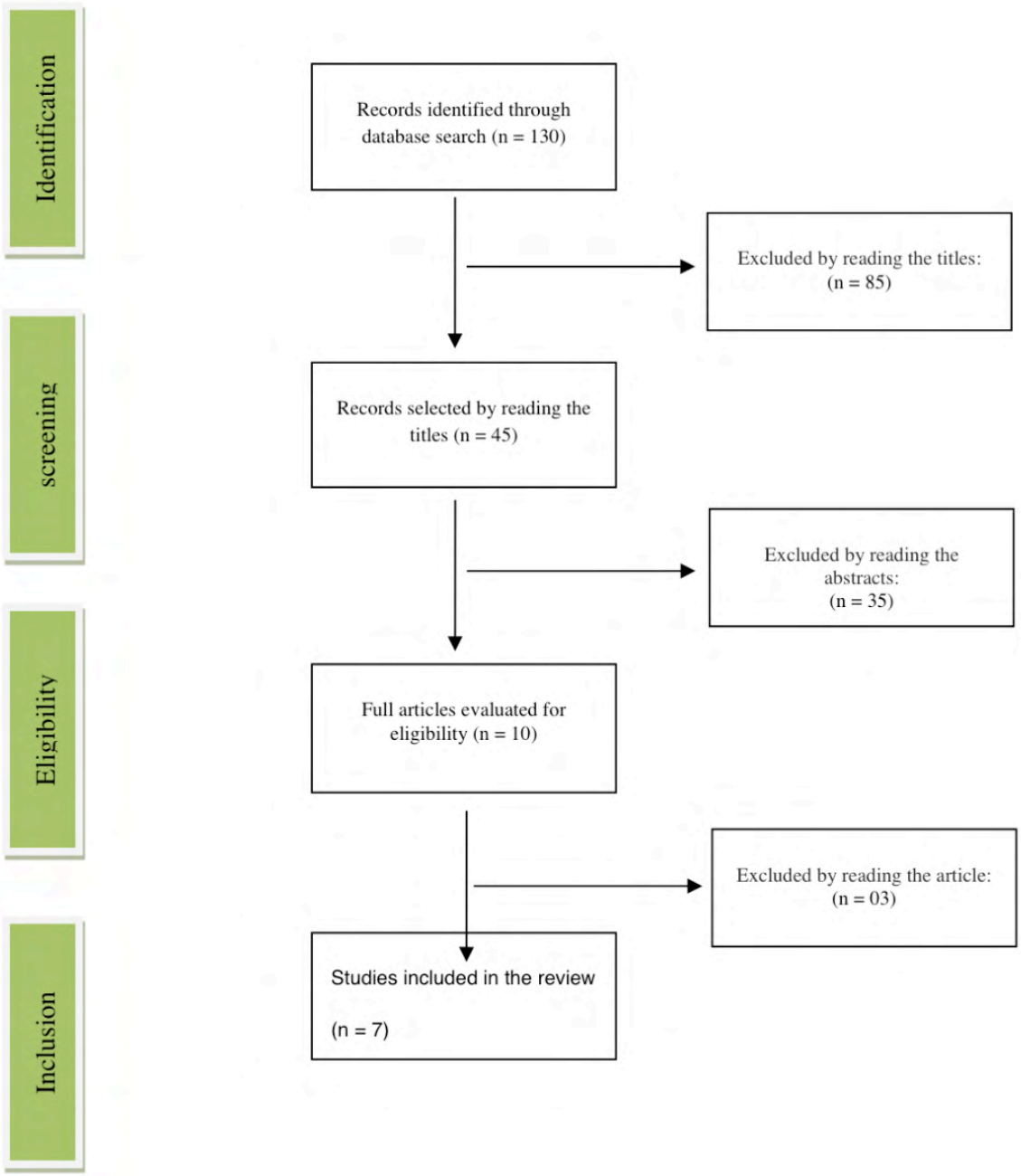

Figure 1. Study selection flow diagram.

Author	Year/Local	Kind of study	Objective	Sample	Age	Results	Conclusion
Hagmann, Siegrist e Hartmann (2019)	2019/ Switzerland	Longitudinal	Explain which factors predict the variation in meat consumption among consumers who reported deliberately eating little or no meat.	5.781 adults	20 – 30 years	Environmental and animal welfare concerns were highly endorsed by vegetarians/vegans and fishermen; flavor-related reasons were a stronger motivation..	Ethical motives along with taste preferences are more prevalent in consumers who identify with a vegetarian lifestyle, while the motivation to lose weight plays a more important role for low meat consumers, especially in women. Vegetarian and semi-vegetarian diets may be associated with better diet quality and lower prevalence of overweight.
Brytek-Matera *et al* (2019)	2019/ Poland	Descriptive transversal	Determine the predictors of Orthorexia Nervosa (ON) in individuals with different food preferences	79 adults	-	Individuals who follow a vegan diet have a higher level of knowledge about healthy eating than those who follow a vegetarian or omnivorous diet. Participants who maintained a vegan diet for health reasons were more likely to have greater knowledge about healthy eating. Cognitive restriction was a predictor of NO in a sample that followed a meat-free diet.	Our results can contribute to identify potential risk factors for strictly health-oriented dietary patterns and to gain a better understanding of ON.
Jaceldo-Siegl *et. Al* (2018)	2018/ United States	Cut	The role of BMI as a mediator in the associations between vegetarian diets and the inflammatory biomarkers we measure (CRP, IL-6, IL-10 and TNF-α), and we hypothesize that lower concentrations of inflammatory biomarkers associated with vegetarian diets are mediated by BMI.	96.194	At least 30 years old	Lower CRP concentrations associated with vegetarian diets were mediated by much lower BMI values among vegetarians. For IL-6, however, we found a strong mediating effect of BMI, but the direction was not clear.	Lower concentrations of CRP and IL-6 among vegetarians can be mediated by BMI.

Chiu *et al* (2018)	2018/China	Cut	To investigate the association between a vegetarian diet, changing dietary patterns and diabetes risk in a Taiwanese Buddhist population.	2.918	18-87 years	A consistent vegetarian diet was associated with 35% lower risks (HR: 0.65, 95% CI: 0.46, 0.92), while conversion from a non-vegetarian pattern to a vegetarian was associated with 53% higher risks low (HR: 0.47, 95% CI: 0.30, 0.71) for diabetes compared to non-vegetarians when adjusting for age, sex, education, physical activity, family history of diabetes, follow-up methods, use of drugs to reduce lipids and basal BMI.	A vegetarian diet and conversion to a vegetarian diet can protect against diabetes, regardless of BMI among Taiwanese.
Chiba *et al* (2016)	2016/Japan	Transverse	Develop a simple way to assess adherence to a PBD for Japanese patients with inflammatory bowel disease (DII).	67	-	PBD scores differed significantly, in descending order, by diet type: pro-Japanese diet, mixed diet, and pro-Western diet. The PBD scores in the ulcerative colitis and Crohn's disease groups were 10.9 ± 9.5 and 8.2 ± 8.2, respectively. For Crohn's disease patients, those with long-term remission and normal C-reactive protein concentration were significantly more likely to have PBD scores of 25 or greater than less than 25.	The PBD score was significantly different according to the type of diet in descending order: pro-Japanese diet, mixed type and pro-Westernized type. The PBD score of an SVD was significantly higher than that of an omnivorous diet. In Crohn's disease patients, a PBD score of 25 or greater was required to maintain long-term remission. The PBD score is a valid assessment of dietary adherence to a PBD. PBD and PBD scores can be modified for a variety of diseases and for different national food preferences.

Liu *et al* (2016)	2016/China	Transverse	The main objective of this study was to explore the associations between frequency of vegetable intake and osteoporosis (OP) in postmenopausal Chinese women.	1903	30 – 90 years	Multiple regression analysis indicated that frequency of vegetable intake was independently and significantly associated with osteoporosis (P <0.1 for model 1 and model 2). Postmenopausal women with a high frequency of vegetable intake had a higher prevalence of osteoporosis.	Our results suggested that the frequency of intake of medium-cooked vegetables was independently and significantly associated with osteoporosis. The prevalence of osteoporosis was higher in postmenopausal Chinese women who frequently consumed vegetables. According to our findings, a change in dietary preferences or habits may be beneficial in preventing osteoporosis in postmenopausal Chinese women.
Elorinne *et al* (2016)	2016/ Finland	Transverse	Compare food intake and nutritional status of long-term Finnish vegans and non-vegetarians.	22	18-50 years	All vegans adhered strictly to their diet; however, individual variability was marked in food consumption and supplementation habits. Intake of essential nutrients, vitamins B12 and D, was lower (P<0.001) in vegans than in non-vegetarians. Nutritional biomarker measurements showed lower concentrations of serum 25-hydroxyvitamin D3 (25(OH)D3), iodine, and selenium (corrected for multiple comparisons, P < 0.001), vegetarians showed more favorable fatty acid profiles (P < 0.001), as well as much higher concentrations of polyphenols such as genistein and daidzein (P < 0.001). The proportions of eicosapentaenoic acid in vegans were higher than expected. The mean concentration of iodine in urine was below recommended levels in both groups.	This study supports the view that nutritional guidance is important to vegans and that vegan diets must be regularly supplemented with essential nutrients. More emphasis must be placed on vitamin D and iodine to ensure sufficient intake. The results also indicate a more favorable lipid and fatty acid profile in vegans. However, as fatty fish are not consumed by vegans, we recommend using LNA-rich vegetable oils (18:3 n-3) such as rapeseed oil to maximize EPA formation.

Table 1: Synthesis with characteristics of the studies included in this review

The findings by Brytek-Matera et al. (2019) drew attention to the relationship of potential risk factors for dietary patterns strictly oriented towards health and understanding of orthorexia nervosa. Corroborating the results of the study by Da Silva and Fernandes (2020), who found a high prevalence of orthorexia nervosa in health professionals, as they are highly committed to healthier lifestyle habits. As well as the study carried out by Penaforte et al. (2018) drew attention to the discussion of the terms "healthy eating" and "being healthy" due to social pressure and because it is a worrying issue that must not be neglected.

According to Sabaté (2003), advances in nutrition research are changing scholars' understanding of the contribution of vegetarian diets to health and to the development of diseases. So, it is worth noting that restrictive or unbalanced vegetarian diets can determine nutritional deficiencies, particularly in situations of increased metabolic demand, but well-balanced vegetarian diets can prevent these possible nutritional deficiencies, as well as some chronic diseases.

Jaceldo-Siegl et al. (2018) emphasize the relationship between the decrease in body weight – which can be inferred from the reduction in the individual's BMI – and the decrease in the concentration of inflammatory mediators among the public adhering to vegetarianism.

One of the most eaten foods among vegetarians is soy, which has a high concentration of phytoestrogens, plant structures that have functions similar to estrogens in metabolism. Phytoestrogens present in soybeans act on adipocytes and hepatocytes through hypoglycemic and thermogenic actions, which contribute to the oxidation of fatty acids; in addition to being able to decrease the concentration of triacylglycerols, increase HDL levels, reduce serum insulinemia and insulin resistance, beneficially affect appetite control and body composition (PEIXOTO, 2011).

In the findings by Chiu et al. (2018) emphasizes the relationship between the vegetarian diet and diabetes. In agreement with the study carried out by Eid et al. (2018), which evaluated adults and there was a significant association linked to the consumption of fruits and vegetables and monitoring of fasting and postprandial blood glucose. Evidencing, thus, a better therapeutic result and a quality of life in diets based on fruits and vegetables.

In the findings by Chiba et al. (2016), despite the study's sample size being small, it was possible to relate eating habits - especially hospital - with the prognosis of patients with Crohn's Disease.

Liu et al. (2016) drew attention to changes in food preferences and prevention of osteoporosis in postmenopausal women. Confirming the findings of the study carried out by Oliveira and Sinico (2020), who called attention to an adequate and balanced diet, rich in minerals and vitamins as a measure to prevent and treat osteoporosis in menopausal women.

According to the Vegetarian Nutrition booklet (SVB, 2019), a vegetarian diet, even in the strict form (without the consumption of any animal products), can meet the daily needs of calcium, but requires greater attention. In general, the intake of this micronutrient is equal to or greater in lacto-ovo vegetarians than in non-vegetarians. However, it is lower in strict vegetarians than in non-vegetarians. Thus, one must avoid concomitantly ingesting foods rich in calcium and high in oxalate, which reduces calcium absorption. Another factor that interferes with this absorption are the phytates present in beans and cereals. When replacing cow's milk with vegetable milk, one must opt for those fortified with calcium.

The findings by Elorinne et al. (2016) drew attention to the benefits of a vegan diet in relation to the lipid and fatty acid profile, however, it emphasizes the importance of supplementing essential nutrients, such as vitamin D and iodine. This corroborates the findings of the study carried out by Merli and Vidigal (2020), drawing attention to the need for supplementation of some vitamins in vegetarian adults, as well as to the participation of the nutritionist as a means of providing guidance to minimize nutritional deficiencies.

The contributions of meat and plant consumption to the human diet is the hallmark of the omnivorous species. However, we are consuming diets low in vegetables and high in processed animals, which negatively contribute to the development of chronic diseases and environmental degradation. Evidence pointed to the benefits of a predominantly plant-based diet in promoting and protecting health, in addition to conferring benefits on the planet (KATZ, 2019).

On the other hand, the study by Fraga et al. (2017) evaluated the diet of adult vegetarians and concluded that they had inadequate consumption of foods from the food groups proposed by the Guidelines of the Brazilian Vegetarian Society, mainly from the groups of vegetables, fruits, oilseeds and beans, with higher consumption in the group of cereals. However, they call attention to proper food planning and to the benefits of this eating style and to avoid nutritional deficiencies.

To ensure that the vegetarian's meals are within the recommendations, nutritional monitoring is necessary for adjustments regarding food choices. Poorly planned diets generate deficiencies in essential nutrients such as vitamin B12, vitamin D, omega 3 fatty acids, calcium, iron and zinc, which are predominantly of animal origin negatively affecting neuronal function, synaptic activity and decreased cognitive function (KREY et al., 2017).

CONCLUSION

The public adepts to vegetarianism has been growing, as well as the concern about the possible nutritional vulnerability arising from the adherence to this diet. Vegetarian diet has benefits for general health, such as reduced risk of type 2 diabetes, lower cholesterol levels, blood control and body fat. However, when not observed, some nutrients may present levels below the recommendations, such as Vitamin B12, Vitamin D, omega 3 fatty acids, calcium, iron and zinc, which are predominantly available in foods of animal origin.

Adequate nutritional monitoring allows for better qualitative and quantitative adjustments in food plans to ensure that all nutrients are in the proper way.

Thus, it is inferred that there is a need for an academic formation in the undergraduate course in Nutrition that encourages the performance of these professionals in the area, allowing them, with that, security in meeting such demand. The nutritionist's main objective must be to elaborate a specific food plan, minimizing the possible deficiency risks brought by the vegetarian diet in any modality, respecting both the patient's wishes and their metabolic needs.

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