

PROTEIN RECOMMENDATIONS FOR VEGETARIANS AND VEGANS: AN INTEGRATIVE REVIEW

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Abstract: Objective: Analyze official protein recommendations for vegan and vegetarian individuals in all life stages. Methods: Integrative review carried out with official recommendations from six different countries and one continent, found in the PubMed database e Google Scholar. This study included articles with official recommendations from different countries, published in the last ten years in English, Spanish or Portuguese. Results: In the search, after analyzing the titles and abstracts, seven articles were considered for the study. Conclusions: Considering only proteins, it is possible to have a healthy vegetarian diet, provided that individuals are careful with protein consumption so that the daily recommendations are met and there is not any deficiency related to this macronutrient. However, in vegan diets, individuals should have greater caution since these only include plant protein sources which have lower bioavailability and, therefore, need to be consumed in a bigger quantity and from various different sources throughout the day. Nutritional assistance is essential in this dietary choice.

Keywords: Diet, vegetarian. Plant protein. Life cycle stages.

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INTRODUCTION

Interest in the term vegetarianism and what it means has been growing in recent years. In 2018 in Brazil, around 14% of the country's population called themselves vegetarian, 55% of participants stated that they would buy more vegan products if specified on the packaging and 60% would be interested in this dietary pattern if the products were more financially accessible (Ibope, 2018).

Vegetarianism is characterized by the exclusion of meat of all types, with some subdivisions within it depending on the type of food excluded from the diet. While some individuals exclude only meat from their diet (ovolactovegetarians, lactovegetarians or ovovegetarians), others remove all foods of animal origin, such as eggs, dairy products and honey (strict vegetarians and vegans). Therefore, the basis of vegetarian diets are cereals, legumes, fruits and vegetables, with no or varying amounts of eggs, milk and dairy products (Satija and Hu, 2018; Sakkas et al. , 2020).

The reasons why individuals choose to follow a vegetarian diet are diverse, among the main reasons are animal rights, health and well-being, ethics, the environment and religious/spiritual reasons (Carvalho and Moreira, 2020).

Proteins are fundamental for the functioning of the human body, therefore there are daily recommended values that must be achieved (Rosa et al ., 2021). According to the IOM (Institute of Medicine) the acceptable range of protein distribution is 10-35% of the total energy value (National Academies of Sciences , Engineering , and Medicine , 2019).

Although scarce, recent studies indicate that protein intake in vegetarians is within the appropriate distribution, although consumption is lower than in omnivores (Neufingerl and Eilander , 2021).

The objective of this integrative review was to analyze protein nutritional recommendations from different countries for vegetarians and vegans at all stages of life.

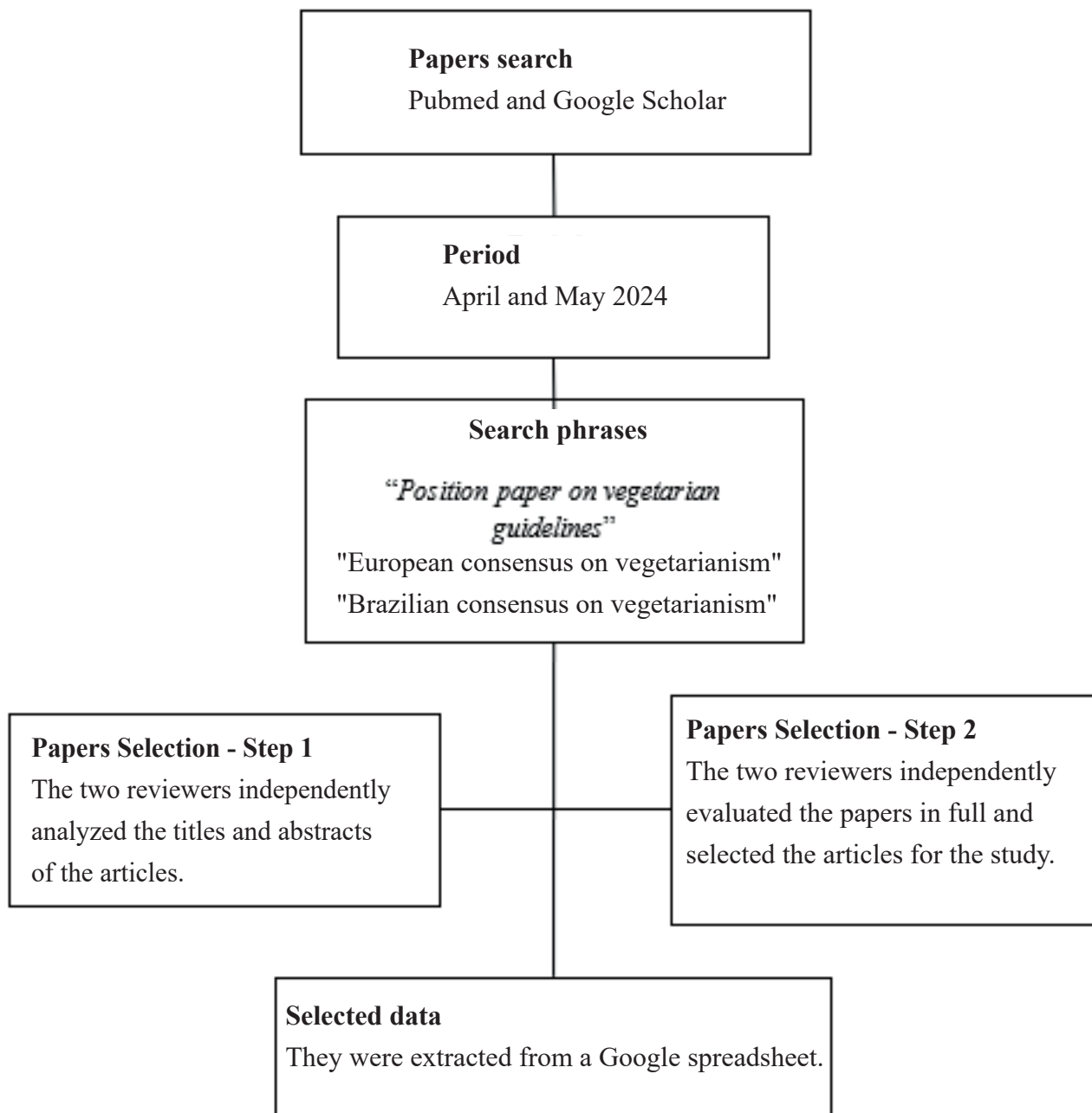


METHODS

This is an integrative review of the literature (Souza et al. , 2010). The PubMed and Google Scholar databases were used for the searches . The following phrases were used for the search: “ Position paper on vegetarian guidelines ” , “European consensus on vegetarianism” and “Brazilian consensus on vegetarianism”. The inclusion criteria were: articles that comprised official recommendations from different countries, articles published in English, Spanish or Portuguese and published in the last ten years.

The selection of studies was carried out between April and May 2024. The analysis of the articles was carried out descriptively in a Google spreadsheet, considering the inclusion criteria and the following characteristics of each article: identification of the article, audience involved, recommendation of proteins and conduct description.





RESULTS

From the searches carried out in the databases and after reading the article summaries and applying the inclusion criteria, seven articles were selected to be part of this study.

Recommendations from six different countries and one continent were analyzed, namely:



Germany, Brazil, United States of America, Spain, Italy, Portugal and Europe. These articles comprise recommendations from medical and/or nutrition associations regarding vegetarian or vegan diets for different stages of life. Two of these recommendations were published in 2016, one in 2017, one in 2018, one in 2019, one in 2021 and another in 2022. Of these recommendations, only the macronutrient protein was considered for the analysis.

Location/ Identification	Year/ Year	Life stage	Recommendations
Italy / 2017 / Italian Society of Human Nutrition		All stages of life	<p>Pregnant and breastfeeding women : breast milk from vegetarian breastfeeding women is nutritionally adequate; babies who receive milk from well-nourished vegetarian breastfeeding women grow normally.</p> <p>Preschoolers (6 months to 3 years) : children who follow a suitable vegetarian diet have similar growth to non-vegetarian children.</p> <p>Children (4-10 years) : Vegetarian children’s protein intake meets recommendations, although they still consume less protein than omnivorous children. Since plant-based proteins are less digestible and contain fewer essential amino acids, it is recommended that vegan children consume more protein sources. One study suggests 30-35% of VET in children under 2 years old and 20-30% in 2-6 year olds.</p> <p>Adolescents (11 – 18 years) : Studies show that there is not much difference in growth in vegetarians and omnivores. Just like children, vegan teenagers may need greater amounts of protein than omnivores and vegetarians. One study recommends that active vegans consume 7-10% of VET and sedentary people 10-13%.</p> <p>Adults : protein consumption in vegetarian and vegan adults is, in general, lower than in omnivores, but meets recommendations. One study suggested increasing the protein recommendation for women from 0.8 to 1.0 g/kg/day, as the women in this study consumed more plant-based protein than animal protein.</p> <p>Elderly people : they have lower protein intake compared to omnivores, however, in most cases, they reach the recommendation.</p>
Spain / 2019/ Committee on Nutrition and Breastfeeding of the Spanish Pediatric Association]		Children and teenagers	<p>Achieve daily protein and energy recommendations.</p> <p>It is recommended to consume different foods rich in vegetable protein (such as legumes, seeds and nuts) daily. Other foods that help to achieve adequate consumption are soy and derivatives and pseudocereals such as quinoa and amaranth. Care is needed in periods of life where needs are increased.</p>
Europe/ European Society for Pediatric Gastroenterology, Hepatology and Nutrition Committee on Nutrition	2021/	Children and teenagers	<p>Inadequate consumption of calories, proteins and other nutrients can occur in vegetarian diets due to the limited variety of choices. Therefore, it is recommended that a child following a vegetarian diet have adequate nutritional planning and monitoring by a trained health professional.</p>



Germany / 2016/ German Nutrition Society (DGE)	All stages of life	An adequate distribution of different protein sources throughout the day is recommended, as well as adequate energy consumption. By combining different vegetable proteins, the quality of consumption will increase, as well as the intake of all essential amino acids. Children: During the growth phase, children need more amino acids than adults, therefore it is essential to ensure adequate protein and energy intake.
United States/ 2016/ Academy of Nutrition and Dietetics	All stages of life	A varied consumption of plant foods daily provides sufficient essential amino acids if the energy value meets the recommendations. Regular consumption of legumes, soy and derivatives is recommended to ensure adequate protein intake, as well as providing other nutrients. Children and adolescents: vegans in this age group may have slightly higher protein needs than non-vegan children due to the lower digestibility of the amino acid composition. A protein intake of 30-35% has been suggested for children 1 to 2 years of age, 20 to 30% for 2 to 6 years, and 15 to 20% for 6 years and older. Elderly: Some evidence suggests that with aging, protein is used less efficiently by the body, which suggests greater needs for this nutrient. It is necessary for older vegetarians and vegans to include protein-rich foods (such as legumes and soybeans) in their diets.
Portugal/ 2018/ Portuguese Nutrition Association	Children in the first years of life	6 months : Exclusive breastfeeding. Breast milk from a well-nourished nursing mother (if vegetarian ensures adequate nutritional intake through food or nutrient supplementation), meets all the baby's nutritional needs. 5th and 6th month: Period of dietary diversification, in the European context this period can begin between the 5th and 6th month of life. From that moment on, it is necessary to progressively replace the protein that previously came from breast milk or exclusively use formula. You can start to introduce another protein of vegetable origin such as tofu (fresh and without seasoning), legumes (soaked to facilitate digestion) and, if you are a lacto-ovo vegetarian, eggs (from 8 months yolk and 9 months white). 8 months: From 8 months onwards, hemp protein can be offered, which has 46g of protein for every 100g of food. Due to the large amount of protein, if offered, it should be in small quantities, maximum of one spoonful of coffee/meal at 8 months and one spoonful of dessert/meal at 9 months). Another option is pea protein, with which care must be taken regarding the high sodium content, therefore it must be used with caution in the 1st year of life. Foods such as natural yogurt, fermented soy preparation (vegan), seaweed, tempeh (fermented soy), seitan (wheat gluten) can also be gradually included in the vegetarian or vegan infant's diet. 12 months : It is recommended to continue breastfeeding until 12 months, associated with the appropriate consumption of other foods with progression of textures. If it is not possible to continue breastfeeding, infant formula can be used; for healthy infants, vegan formulas available on the market, such as soy or rice, can be used. From 12 months onwards, integration into the family diet should occur. Vegetable drinks such as soy, almond and oat drinks do not replace formulas and should not be introduced before 24 months, as they do not provide sufficient nutrients.



Brazil/ International Sciences Institute	2022/ Life Children up to 5 years of age	<p>In vegan diets, sources of protein are beans, grains, nuts, seeds and green leafy vegetables. 20 amino acids are found in these foods, including the 9 essential ones. Other foods that have a similar amount of amino acids to animal protein are soy and derivatives, pseudocereals (wheat, buckwheat, quinoa and amaranth), lupins, spinach and hemp seeds. In vegan diets, the amino acid lysine is present in smaller quantities, due to low amounts present in food sources (grains), most of the time not reaching recommendations, as well as methionine and cysteine present in legumes.</p> <p>Vegetable proteins have lower digestibility than those from animals, around 10 to 30% less. In the first years of life, protein needs vary from 1.2 to 2.2 g/kg/day, and in younger infants the recommendation is higher. According to the RDA (Recommended Dietary Intake), children under 2 years old should be offered 20% more protein, and children aged 2 to 6 years old should be offered 10 to 15%, with these proteins coming from different sources. In older children, the need is lower, so only a few adjustments are necessary, being around 10 to 15% more of the daily amount of protein.</p> <p>Vegetable-based drinks do not have the same nutrients as cow's milk and its derivatives, so it is necessary to be aware of the risk of malnutrition and micronutrient deficiency. Vegetable-based infant formulas are enriched with methionine and other micronutrients due to regulatory legislation. Vegetable proteins such as tofu, tempeh (fermented soybeans) and seitan (processed gluten/wheat extract) do not have the same protein quality as proteins from animal sources, nor the supply of micronutrients found in them.</p>
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Table 1. Results

DISCUSSION

Pregnant and breastfeeding women

Protein nutritional needs are increased during pregnancy due to fetal growth, the increase in fetal annexes and the accelerated expansion of blood volume. An adequate diet reduces the risk of fetal death and improves fetal growth. At this stage of life, nutritional recommendations are generally increased, with 1.1 to 1.2 g/kg/day (or at least 71g/day) being recommended. During the second and third trimesters, there is a need for 21g/day for fetal tissues and placenta alone (Sebastiani et al., 2019).

Due to the increase in protein needs in the last two trimesters and during breastfeeding, additional portions of protein-rich foods such as beans, lentils, chickpeas, soybeans and their



derivatives should be included. In the case of lacto-ovo vegetarians, eggs and dairy products can also be included (Baroni et al. , 2018).

In a cohort study carried out with vegetarian and vegan pregnant women in the United States, it was found that they consumed less protein/day than non-vegetarians, 56.2g/day and 91.3g/day, respectively. The study suggests that newborns born to vegetarian women are smaller than average in height, but still within the normal range. No relationship was found between vegetarianism and gestational diseases or postpartum mortality (Yisahak et al. , 2020).

pre -pregnancy weight , should monitor their protein intake more carefully. This study also associated the low weight of newborns with vegan mothers, one explanation for this was the low weight of the woman before pregnancy, as vegan women are more susceptible to low weight (Kesary et al., 2020). Another study published in 2023 states that vegan women with compromised prenatal nutritional status may have low fat reserves for breastfeeding. Therefore, these women must be monitored closely and carefully to ensure adequate consumption of all nutrients, vitamins and necessary supplementation, thus reducing the risk of health problems. (Bali and Naik , 2023)

The Italian Society of Human Nutrition states that breast milk from vegetarian breastfeeding women, as long as they are well nourished, is nutritionally adequate for the baby. (Agnoli et al ., 2017). A study from Norway also stated that as long as the nursing mother is consuming and/or supplementing her diet adequately, the baby only needs breast milk, only if necessary including the use of infant formula (Hay et al. , 2022).

Children and teenagers

At these stages of life, protein is essential for growth, and adequate consumption is essential within the needs of each stage. This macronutrient also participates in the restoration and construction of tissues, among other functions (Savarino al. , 2021).

The general recommendation, for children up to one year of age, is 1.2g/kg/day. From the



first year of life to 3 years of age, the recommendation is 1.05 g/kg/day and from 4 to 13 years of age, 0.95 g/kg/day is recommended. The recommended values for adolescents aged 14 to 18 are 0.85g/kg/day for both sexes. The values do not differentiate between omnivores and vegetarians (National Academies of Sciences , Engineering , and Medicine, 2019).

Until six months of age, exclusive breastfeeding is recommended, as the breast milk of a well-nourished vegetarian breastfeeding woman is enough to meet all the baby's nutritional needs. (Agnoli et al ., 2017; Pimentel et al. , 2018)

Studies state that the quality of vegetable protein is lower when compared to animal protein, its digestibility is lower, therefore, for both children and adolescents, it is necessary to consume different sources of protein throughout the day so that the recommendations are achieved (Agnoli et al ., 2017; Ferreiro et al. , 2020; Melina et al ., 2016; Konstantyner et al ., 2022). Due to the lower bioavailability of protein in foods of plant origin, it is recommended to increase the amount of protein/day, the amounts vary depending on age. It is estimated that the digestibility of vegetable proteins is around 10 to 30% lower than that of animal proteins (Konstantyner et al ., 2022). The Academy Nutrition and Dietetics suggests an intake of 30-35% for children 1 to 2 years of age, 20 to 30% for 2 to 6 years, and 15 to 20% for 6 years and older (Melina et al ., 2016). Recommendations in Italy use the same percentages for children and add that active vegan teenagers should consume 7-10% of VET and sedentary teenagers 10-13% (Agnoli et al ., 2017). The ILSI Brasil Consensus reports slightly different numbers, the recommendation is that children under 2 years old should be offered 20% more protein, and children aged 2 to 6 years old should be offered 10 to 15%, maintaining this last guideline as well. for older children (Konstantyner et al ., 2022).

According to the Italian Society of Human Nutrition , protein consumption in children aged four to ten years old reaches the daily recommendations, although consumption is lower than that of omnivorous children (Agnoli et al ., 2017).

Some studies indicate that inadequate consumption of proteins and other nutrients can occur in vegetarian diets due to a limited variety of choices. Therefore, if the child/adolescent follows a



vegetarian diet, adequate nutritional planning is recommended, especially in periods of life where needs are increased. and follow-up with a trained healthcare professional (Verduci et al. , 2021; Ferreiro et al. , 2020).

Adults

During adulthood, the recommendation is the same for both sexes, being 0.8 g/kg/day (National Academies of Sciences , Engineering , and Medicine , 2019).

Some studies propose that protein consumption in vegetarian and vegan adults, although lower than that of omnivores, reaches or even exceeds the daily protein intake recommendation, as long as caloric intake is adequate (Melina et al ., 2016; Agnoli et al ., 2017; Richter et al. , 2016). A review study compared protein consumption data among vegan, vegetarian and omnivorous adults, without considering the use or not of supplements. The results showed that vegans and vegetarians consume less protein when compared to carnivores, being 12.9%, 13.4% and 16% respectively . According to the results, although consumption is lower, it is still within the macronutrient distribution values established by Acceptable Macronutrient Distribution Range (AMDR), which is 10 to 35% of the total energy value/day (Neufingerl et al. , 2021; National Academies of Sciences , Engineering , and Medicine , 2019).

Another review study calculated and compared the amount of protein consumed by omnivores, vegetarians and vegans, according to the amounts presented in two different studies, one carried out in France and the other in England. Although the studies were conducted in different locations, with different populations, number of participants and eating habits, the results found were very similar to each other and to the previously mentioned study. The French study found that omnivores would be consuming an average of 84 grams of protein/day, being around 17.6% of the total energy value/day, vegetarians would be consuming 64g/day, being 14.2% and vegans 60g/day , being 12.8%. The British study found 90g/day, 70g/day and 64g/day, being 17.2%, 14% and 13.1%, respectively for omnivores,



vegetarians and vegans. Again, although the values vary between people who consume meat and those who do not, the values found are within those recommended by the DRIs - “ Dietary Reference Intakes for Sodium and Potassium ” (Mariotti and Gardner, 2019; National Academies of Sciences , Engineering , and Medicine, 2019).

Elderly

Elderly people have an increased need for protein for general health, this macronutrient helps to improve illnesses and maintain the proper functioning of the body. Attention should also be paid to adequate consumption to reduce muscle loss that occurs naturally with age (Baum et al , 2016).

In old age, the DRIs recommendation for protein consumption remains the same as in adult life of 0.8g/kg/day (National Academies of Sciences , Engineering , and Medicine , 2019). A 2014 study based on a workshop presented by the European Society for Clinical Nutrition and Metabolism (ESPEN), suggests different values due to the increased needs of this age group. This recommendation proposes that healthy elderly people should ingest 1.0 to 1.2 grams of protein/kg of weight/day and for elderly people with chronic or acute diseases, 1.2 to 1.5 g of protein/kg/day, in the case of serious illnesses or injuries this consumption must be even greater (Deutz et al. , 2014).

The Academy of Nutrition and Dietetics states that as we age, protein is used less effectively by the body, which may mean a greater need for this macronutrient. Therefore, older vegetarians and vegans should include protein-rich foods (such as legumes and soybeans) in their diets daily. Another study adds that these foods should be consumed two to three times a day (Melina et al ., 2016; Craig et al. , 2021) . A third study also suggests the consumption of 0.4g/kg/meal to prevent the loss of muscle mass in the elderly, or around 30g/meal of more digestible protein (such as soy, for example) to improve protein synthesis. , this study considered elderly people in general, without differentiating diets (Lancha et al ., 2016). The recommendation from Italy states that there are few studies available on elderly vegetarians, but the evidence indicates that, although elderly people have lower protein



intake than omnivores, they are still within the appropriate range (Agnoli et al ., 2017).

CONCLUSION

Of the recommendations analyzed, three of them ensure that well-planned vegetarian diets provide all the nutrients necessary for the cycles of life (Agnoli et al ., 2017; Melina et al ., 2016; Pimentel et al ., 2018). Two of them reinforce that vegetable proteins have lower bioavailability than animal proteins, therefore, vegetarians should consume more protein than recommended for the general population (Agnoli et al ., 2017; Melina et al ., 2016).

Three other recommendations, two focusing on infants and children and another on all life cycles, do not recommend strict vegetarian or vegan diets due to the greater risk of nutritional deficiencies. Mainly during periods of greatest energy need, such as pregnancy, breastfeeding, childhood and adolescence . Omnivorous diets are recommended, with a large intake of plant foods or ovolactovegetarian diets, as in the long term they are safer and guarantee adequate nutritional intake (Ferreiro et al ., 2020 ; Konstantyner et al ., 2022 ; Richter et al ., 2016).

Three of them also reiterate the importance of adequate nutritional monitoring, with professionals trained in counseling and health promotion (Konstantyner et al ., 2022 ; Verduci et al ., 2021; Pimentel et al ., 2018).

It is concluded that monitoring with a professional nutritionist is essential to assess the patient's health profile, nutritional status, life cycle and food preferences, in order to define a personalized approach for each individual. Furthermore, the importance of including protein-rich foods in the main meals is highlighted to achieve the daily recommendation for this macronutrient in each age group.

Limitations: The study has limitations inherent to a literature review. Therefore, more studies are suggested with vegetarians and vegans in all life cycles, to reach more precise conclusions, given the scarcity of studies and official recommendations related to this topic.



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