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Vegetarian diet - how does it affect our body?

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Abstract

Introduction and Purpose of Research:

Vegetarianism, characterized by the exclusion of meat, poultry, fish, seafood, and their derivatives, has gained popularity as studies continue to highlight its positive impact on health. This study aims to comprehensively evaluate the health and lifestyle impacts of vegetarian diets by examining both the benefits and potential risks.

Review Methods:

The review is grounded in findings from 40 recent studies sourced through a systematic search of open-access databases, including PubMed and Google Scholar, focusing on literature published between 2000 and 2024.

Abbreviated description of the state of knowledge:
Vegetarian diets are associated with significant health benefits, including reduced risks of chronic diseases such as heart disease, type 2 diabetes, and obesity, largely due to their high content of fiber, antioxidants, and healthy fats. Additionally, vegetarians tend to have lower BMI and improved cholesterol and blood pressure levels. However, unbalanced vegetarian diets may lead to deficiencies in essential nutrients such as protein, vitamin B12, iron, zinc, and omega-3 fatty acids, which can impact overall health.
Conclusion:
Properly planned vegetarian diets are healthy, nutritionally correct and can be beneficial in the prevention and treatment of certain diseases. Careful selection of meal ingredients and adequate supplementation are key to maximising the benefits and counteracting the potential risks associated with such diets.

Introduction

Over the years, there has been a noticeable increase in interest in plant-based diets in Western countries, which is associated with an increased consumption of plant-based products. [1] Vegetarianism, defined as a diet that excludes the consumption of meat, poultry, fish, seafood and products containing them, is becoming increasingly popular due to its health, ethical and environmental benefits. [2] Studies have repeatedly confirmed that vegetarian diets promote better health and reduce the risk of chronic diseases such as heart disease, type 2 diabetes and obesity. Thanks to their high levels of fibre, antioxidants and healthy fats while keeping saturated fat levels low, vegetarian diets help lower cholesterol, blood pressure and improve insulin sensitivity. In addition, people who follow a vegetarian diet tend to have a lower body mass index (BMI), which counteracts obesity and its associated health complications. [1] However, there are also some risks associated with an unbalanced vegetarian diet - an insufficient supply of protein (including protein with low biological value and essential amino acid content), vitamin D and B12, zinc, iron and omega-3 fatty acids. [3] This study looks at various aspects of the vegetarian diet to comprehensively explore its impact on health and lifestyle. Research in this area can help to reduce barriers to the decision to switch to a vegetarian diet, as well as they can help to improve the quality of life of those already following this diet, eliminating potential negative effects.

Review methods

This review is based on findings from 40 recent studies selected through a systematic search of open-access databases, including PubMed and Google Scholar. The selection process prioritized studies published between 2000 and 2024 to ensure a comprehensive and up-to-date analysis of vegetarian diet. The inclusion of diverse methodologies and study designs augments the reliability and applicability of the review’s conclusions.

Purpose of the study

This study seeks to provide an evaluation of the health and lifestyle impacts associated with vegetarian diets. It aims to explore both the positive aspects, such as improved cardiovascular health, reduced risk of certain chronic diseases, and environmental sustainability, as well as the potential drawbacks, including nutrient deficiencies, hormonal imbalances, and their effects on specific populations like pregnant individuals, athletes, and those with mental health concerns. By examining the benefits and risks, this research intends to offer a balanced perspective to help individuals make informed dietary choices while addressing gaps in current knowledge.

Discussion

Diet is a way of eating and it plays a key role in human life. The food consumed significantly influences the development and proper functioning of the body. In order to maintain health, specific nutritional requirements must be met. Dietary components provide the body with the necessary substances for energy production, regeneration and growth processes. Vegetarianism involves consciously excluding meat, fish and seafood from the daily diet. In recent years, it has become an increasingly popular diet choice among the Polish community. According to the latest data quoted in the "RoślinnieJemy" report in May 2019, 6.6% of Poles declared being on a vegetarian or vegan diet (1.8%), and 3.8% limited the consumption of meat and fish products. [4] Giving up meat consumption is due to a wide variety of reasons. Some of the key motives are health, the need to follow such a diet due to food intolerances, allergies or concerns about the negative effects of meat products on the body. Environmental considerations, such as awareness of the negative environmental impact of the production of zoonotic products, including high water consumption and greenhouse gas emissions, are also an important factor, prompting the promotion of meat-free diets. The decision to exclude meat may also be determined by the influence of tradition and family culture, such as the continuation of vegetarian habits of relatives. Moral and religious aspects, such as respect for life or adherence to the principles of one's religion, are equally important. Opposition to the practices of large corporations related to the exploitation of local communities and global mass production, as well as growing concerns about the future difficulties of feeding the population and the need for alternatives to meat, also play an increasingly important role. Vegetarians also cite economic reasons or problems of world hunger. [5]

Vegetarian diets include different types of dietary food intake. [Table 1] The most restrictive diet is the vegan diet, which involves the complete omission of foods of animal origin. Some vegans forgo the consumption of honey because it is produced by bees. In extreme cases, they also exclude medicines for which animal tissues have been used. Vegans also often avoid using items and clothing made of wool or leather, and some choose only organically grown products. Lactovovegetarians do not consume meat, while milk, dairy products and eggs appear in their diet. The proponents of lactovegetarianism are mostly religious factions and faith groups. Pescovegetarians consume fish, milk, dairy products and eggs. Semi-vegetarians consume meat and meat products in minimal quantities. Of all vegetarian diets, it is the easiest to arrange in terms of the nutrients provided to the body. Some studies distinguish between these types of diets, while others group them together. [6]

Type of vegetarian diet	Poultry meat	Red meat	Fish	Vegetables and fruits	Milk and diary products	Cooked products	Eggs
Vegan	-	-	-	+	-	+	-
Lactovovegetarianism	-	-	-	+	+	-	+
Pescovegetarianizm	-	-	+	+	+	+	+
Semi-vegetarianizm	+	+	+	+	+	+	+

Table 1. *Types of vegetarian diets*

Impact on health

Research indicates that a vegetarian maintenance and reduces the risk of overweight and obesity. Its benefits come from a reduction in saturated fat and cholesterol intake and a higher proportion of fiber, potassium, magnesium, vitamins (C, E), folic acid, carotenoids and phytochemicals.

Regular adherence to this diet leads to lower blood pressure. In clinical trials, a vegetarian diet was associated with a reduction in blood pressure - by an average of 4.8 mm Hg in systolic pressure and 2.2 mm Hg in diastolic pressure - compared to a diet containing meat. The condition is that it should be a diet based on unprocessed plant products. [7] This effect can be compared to a weight loss of 5 kg. [8]

An improved lipid profile, including LDL reduction, and reduces the risk of atherosclerosis, metabolic syndrome and cardiovascular and cerebrovascular incidents. [9] Furthermore, this diet increases insulin sensitivity, which reduces the risk of diabetes, however, the type of food that should be eaten while following this diet is crucial to achieving therapeutic effects [10].

A wide range of evidence points to a link between the consumption of specific plant products, such as fruit and vegetables, and a reduced risk of cancer diagnosis and recurrence. Plant components such as fiber, antioxidants and other phytochemicals, as well as maintaining a healthy body weight, play a key role. In contrast, meat consumption, especially red and processed meat, is associated with a higher risk of various cancers.

Vegetarian diet promote the consumption of beneficial plant products and nutrients, while eliminating red and processed meat, which supports the maintenance of a healthy weight. Evidence, both direct and indirect, suggests that plant-based diets may be an effective strategy for reducing cancer risk. [11]

However, there are also some risks associated with an unbalanced vegetarian diet - too low a supply of protein (including protein with low biological value and essential amino acid content), vitamin D and B12, zinc, iron and omega-3 fatty acids.

Proteins are large molecules made up of smaller units called amino acids. There are 20 types of amino acids and their unique combinations are responsible for a variety of protein functions. In vegetarian and vegan diets, the main sources of protein are legumes, grains, seeds and nuts. Vegetarians can additionally reach for products such as eggs, milk and milk products (except butter and cream). It is worth noting that - contrary to old beliefs - it is not necessary to combine plant proteins from different sources in one meal. Plant protein can meet protein requirements when a variety of plant foods are consumed and energy needs are met. [12]

When it comes to vitamin D some studies suggest that children on vegetarian diet may be at higher risk of vitamin D deficiency and lower serum 25(OH)D concentrations, although this is not the rule. [13,14,15] Therefore, it is recommended to consider supplementation and consumption of vitamin D-fortified foods for children with limited sun exposure. Appropriate dietary decisions and the use of supplements can help children on plant-based diet to maintain adequate vitamin D levels, supporting healthy bone development. [16]

A study by Crowe et al. found that adult people following a vegetarian diet and its various variations consume less vitamin D and have lower plasma 25(OH)D concentrations. However, it is still not fully clear whether reduced 25(OH)D levels in vegetarians and vegans are associated with any negative health consequences. [17]

Vitamin B12 is found in foods such as meat, fish, eggs, milk and cheese, which are eliminated in many variations of the vegetarian diet. [18] It is a key micronutrient involved in numerous biochemical processes, including the maturation of red blood cells, the normal functioning of the nervous system and the biosynthesis of neurotransmitters. [19] Symptoms of vitamin B12 deficiency are well documented and include fatigue, shortness of breath, lack of energy, headaches, irritability, anaemia, pale skin, depression, sleep problems and other disorders of general wellbeing.

Vitamin B12 deficiency may only become apparent after a long period of time, as its reserves in the liver allow adequate levels to be maintained for many years. [20] People following this diet should take care to supplement vitamin B12 with fortified foods or supplements such as methylcobalamin, adenosylcobalamin and hydroxycobalamin. [21]

The optimal level of zinc, whose bioavailability is reduced in vegetarian diets, is an important aspect of assessing the correct use of this diet. In a study by Foster et al., adult vegetarians, both men and women, were shown to have lower dietary zinc intake and lower serum zinc concentrations. In contrast, for the elderly, children and pregnant and lactating women, there was insufficient evidence to conclude conclusively whether zinc intake and status were lower in vegetarians compared to those following an omnivorous diet. [22]

People following a plant-based diet may have lower iron levels due to the lack of bioavailable haem iron in a meat-free diet and the presence of plant components that limit the absorption of non-haem iron. A study by Haider and co-authors found that vegetarians were more likely to have lower iron stores compared to meat eaters. [23] To improve iron absorption from plant products, it is worth enriching meals with sources of vitamin C, such as fresh vegetables or fruit.

Soaking seeds before consumption is recommended, as well as using sprouted seeds and fermented products. Sipping on beverages such as tea or coffee should be avoided, as well as combining iron-rich and calcium-rich foods in a single meal. Additionally, the introduction of iron-fortified foods into the diet and the use of appropriate probiotic therapy may be beneficial. [24]

Omega-3 fatty acids have many health benefits, with the most evidence pointing to the positive effects of fish-derived eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). [25] Vegetarians do not usually show clinical signs of DHA deficiency, but data are lacking on whether the levels observed in vegetarians are sufficient. People with increased needs such as pregnant and breastfeeding women, as well as the elderly or those with chronic diseases such as diabetes, may benefit from supplementation with DHA and EPA from microalgae. [26]

Soy as a source of controversy

Soya and soya products are a popular dietary choice among vegetarians, mainly due to their high protein content and their potential to be used as meat and milk substitutes. However, there is some controversy regarding their potential health effects, including their role in reducing the risk of cardiovascular disease, as well as possible negative effects on thyroid function and hormonal balance. [27] Of particular interest to researchers are isoflavones, genisteins and daidzeins. Isoflavones are phytoestrogens similar in structure to the human hormone 17-β-estradiol. They mimic the action of oestrogen on the organs by binding to and activating oestrogen receptors. Concerns continue to be raised that the phytoestrogens contained in soya may feminise men. In the meta-analysis by Reed et al. total testosterone (TT) and free testosterone (FT) levels were measured in 1,753 and 752 men, respectively; estradiol (E2) and estrone (E1) levels were measured in 1,000 and 239 men, respectively; and sex hormone binding globulin (SHBG) was measured in 967 men. Regardless of the statistical model, there was no significant effect of soy protein or isoflavone intake on any of the measured outcomes. This meta-analysis indicates that, irrespective of the dose and duration of the study, neither exposure to soy protein nor to isoflavones affects TT, FT, E2 or E1 levels in men. [28] Furthermore, soya has many beneficial values. A research paper by Boutas et al investigated whether the amount of soy and isoflavones consumed has a positive effect on pre - and postmenopausal women. The data indicated a clear inverse correlation between the amount of isoflavones consumed and the incidence of breast cancer in pre- and postmenopausal women. [29] Regarding thyroid hormones, in a study Otun et al showed that the use of soy-containing products has no effect on thyroid hormones and only slightly raises TSH levels. [30]

Male fertility

Diet may influence male reproductive potential; however, the biochemical processes that regulate sperm quality are not yet well understood. Fruits and vegetables (being a common component of a meat-free diet) are abundant in antioxidants that help regulate reactive oxygen species (ROS) in sperm, thereby minimizing DNA damage and enhancing sperm motility and vitality. [31]

However in study by Samimisedeh et al. indicated that there were no definitive positive or negative correlations between a vegetarian diet and semen quality, sex hormone levels, or infertility. The researchers emphasized the need for further studies to better comprehend the impact of vegetarian dietary patterns on infertility and reproductive health. [32]

Vegetarian diet and pregnancy

The positions of the Canadian Paediatric Society, the American Dietetic Association as well as the Academy of Nutrition and Dietetics state that well-planned vegetarian diets are appropriate for individuals during all stages of the life cycle, including pregnancy and lactation. [33,34,35]

Athletes

Some reports suggest that a plant-based diet could be advantageous for exercise performance due to its rich content of carbohydrates, phytochemicals, and antioxidants. [36] A properly planned and nutritious vegetarian diet is rich in fiber and often consists of low-calorie, high-volume foods. To meet their energy needs, vegetarian athletes can adopt strategies such as consuming five to eight meals or snacks daily, reducing high-fiber food intake, and opting for energy-dense food options. For some athletes, it can be difficult to cover protein requirements from plant-based products to support optimal muscle protein synthesis. If there is such a need, adding a protein supplement to the daily diet may be the right decision. Such a diet is also rich in products with a low glycaemic index, which limits the rise in blood glucose levels after carbohydrate consumption. The lower glycaemic response leads to lower insulin levels, which promotes the process of lipolysis during exercise. [37] To improve performance, recovery, endurance and boost immunity, it is recommended to increase the intake of legumes, green vegetables, seeds, nuts, whole grains and other diverse and colourful plant products. [38]

Mental health

Diet plays an important role not only in physical health, but also in cognitive and mental health. In a study by Iguacel et al, a vegan or vegetarian diet was associated with a higher risk of depression and lower anxiety scores. [39] In the context of Alzheimer's disease, a plant-based diet has a favorable blood lipid profile and contains products that may support the prevention of cognitive decline. Additionally, a vegan diet promotes the intake of quercetin, a natural monoamine oxidase (MAO) inhibitor, which may support mental health and reduce the risk of developing Alzheimer's disease. However, vegans who do not supplement micronutrients are at greater risk of deficiencies in vitamin B12, vitamin D and DHA, which may promote the disease. Therefore, assessing the impact of a vegan diet on the prevention and/or progression of Alzheimer's disease should take into account both the benefits described and the potential risks. [40]

Relevance of the article

This article is highly relevant to understanding the broader implications of vegetarian diets on health and lifestyle. It explores a balanced perspective by delving into both the benefits, such as disease prevention, enhanced antioxidant intake, and suitability for various life stages, and the potential risks, including nutrient deficiencies and possible mental health impacts.

By addressing controversial topics like soy consumption, hormonal health, fertility, and cognitive function, the article provides a comprehensive overview that is crucial for individuals, healthcare professionals, and researchers seeking evidence-based insights into vegetarian diets. Its relevance is particularly significant for guiding dietary planning, informing public health policies, and identifying areas where further research is needed.

Conclusion

Vegetarian diets offer significant health benefits when planned well. These diets lead to lower blood pressure, reduce the risk of overweight and obesity, and support pregnancy, lactation, sports performance and cognitive health, especially with appropriate supplementation. Although they are associated with potential mental health risks, their antioxidant-rich profile promotes overall health. Careful selection of meal ingredients and adequate supplementation appropriate to the lifespan and current needs are key to maximising the benefits and counteracting the potential risks associated with such diets.

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References:

1. Hernández-Lougedo J, Maté-Muñoz JL, García-Fernández P, Úbeda-D'Ocasar E, Hervás-Pérez JP, Pedauyé-Rueda B. The relationship between vegetarian diet and sports performance: A systematic review. Nutrients. 2023 Nov 6;15(21):4703. doi: 10.3390/nu15214703.
2. Parker HW, Vadiveloo MK. Diet quality of vegetarian diets compared with nonvegetarian diets: A systematic review. Nutr Rev. 2019 Mar 1;77(3):144-160. doi: 10.1093/nutrit/nuy067. PMID: 30624697.
3. Leitzmann C. Vegetarian diets: What are the advantages? Forum Nutr. 2005;(57):147-156. doi: 10.1159/000083787. PMID: 15702597.
4. Roslinniejemy. Publications on plant-based diets. [Internet]. Available from: https://roslinniejemy.org/publikacje.
5. Cader P, Lesiów T. Veganism and vegetarianism as diets in modern consumer society. Nauki Inżynierskie i Technologie. 2021;37:9-33. doi: 10.15611/nit.2021.37.01. Polish.
6. Olfert MD, Wattick RA. Vegetarian diets and the risk of diabetes. Curr Diab Rep. 2018 Sep 18;18(11):101. doi: 10.1007/s11892-018-1070-9. PMID: 30229314; PMCID: PMC6153574.
7. Śliż D, Folga A. Vegetarian diet: A new trend or a recipe for treating hypertension? Kardiologia w Praktyce. 2014;8(1):36-38. Polish.
8. Graudal NA, Hubeck-Graudal T, Jurgens G. Effects of low sodium diet versus high sodium diet on blood pressure, renin, aldosterone, catecholamines, cholesterol, and triglyceride. Cochrane Database Syst Rev. 2011 Nov 9;(11):CD004022. doi: 10.1002/14651858.CD004022.pub3. PMID: 22071811.
9. Kahleova H, Levin S, Barnard ND. Vegetarian dietary patterns and cardiovascular disease. Prog Cardiovasc Dis. 2018 May-Jun;61(1):54-61. doi: 10.1016/j.pcad.2018.05.002.
10. Rozenbajgier M, Wójcik-Grudzień J, Pawłowska P, Ozga-Stachurska A. Plant-based diets and the risk of type 2 diabetes. Journal of Education, Health and Sport. 2022 Sep 4;12(9):439-445. doi: 10.12775/JEHS.2022.12.09.050.
11. Lanou AJ, Svenson B. Reduced cancer risk in vegetarians: An analysis of recent reports. Cancer Manag Res. 2010 Dec 20;3:1-8. doi: 10.2147/CMR.S6910.
12. Sim SYJ, Srv A, Chiang JH, Henry CJ. Plant proteins for future foods: A roadmap. Foods. 2021 Aug 23;10(8):1967. doi: 10.3390/foods10081967.
13. Thane CW, Bates CJ. Dietary intakes and nutrient status of vegetarian preschool children from a British national survey. J Hum Nutr Diet. 2000;13(3):149-162.
14. Hovinen T, Korkalo L, Freese R, et al. Vegan diet in young children remodels metabolism and challenges the statuses of essential nutrients. EMBO Mol Med. 2021;13(2):e13492.
15. Desmond MA, Sobiecki JG, Jaworski M, et al. Growth, body composition, and cardiovascular and nutritional risk of 5- to 10-year-old children consuming vegetarian, vegan, or omnivore diets. Am J Clin Nutr. 2021;113(6):1565-1577.

16. Devulapalli CS. Vitamin D intake and status in children and adolescents: Comparing vegetarian, vegan, and omnivorous diets. Acta Paediatr. 2024 Oct 20. doi: 10.1111/apa.17463. Epub ahead of print. PMID: 39428613.
17. Crowe FL, Steur M, Allen NE, Appleby PN, Travis RC, Key TJ. Plasma concentrations of 25-hydroxyvitamin D in meat eaters, fish eaters, vegetarians, and vegans: Results from the EPIC-Oxford study. Public Health Nutr. 2011;14(2):340-346. doi: 10.1017/S1368980010002454.
18. Green R, Allen LH, Bjorke-Monsen AL, Brito A, Gueant JL, Miller JW, Molloy AM, Nexo E, Stabler S, Toh BH, et al. Vitamin B12 deficiency. Nat Rev Dis Primers. 2017;3:17040. doi: 10.1038/nrdp.2017.40.
19. O'Leary F, Samman S. Vitamin B12 in health and disease. Nutrients. 2010;2(3):299-316. doi: 10.3390/nu2030299.
20. Allen LH. Causes of vitamin B12 and folate deficiency. Food Nutr Bull. 2008;29(Suppl):S20-S34. doi: 10.1177/15648265080292S105.
21. Marrone G, Guerriero C, Palazzetti D, Lido P, Marolla A, Di Daniele F, Noce A. Vegan diet health benefits in metabolic syndrome. Nutrients. 2021 Mar 2;13(3):817. doi: 10.3390/nu13030817.
22. Foster M, Samman S. Vegetarian diets across the lifecycle: Impact on zinc intake and status. Adv Food Nutr Res. 2015;74:93-131. doi: 10.1016/bs.afnr.2014.11.003. Epub 2015 Jan 7. PMID: 25624036.
23. Haider LM, Schwingshackl L, Hoffmann G, Ekmekcioglu C. The effect of vegetarian diets on iron status in adults: A systematic review and meta-analysis. Crit Rev Food Sci Nutr. 2018 May 24;58(8):1359-1374. doi: 10.1080/10408398.2016.1259210.
24. Samek G, Gogga P. Preventing iron deficiency in individuals following a vegan diet. Med Og Nauk Zdr. 2022;28(1):33-39. doi: 10.26444/monz/143826. Polish.
25. Lane KE, Wilson M, Hellon TG, Davies IG. Bioavailability and conversion of plant-based sources of omega-3 fatty acids: A scoping review to update supplementation options for vegetarians and vegans. Crit Rev Food Sci Nutr. 2022;62(18):4982-4997. doi: 10.1080/10408398.2021.1880364.
26. Saunders AV, Davis BC, Garg ML. Omega-3 polyunsaturated fatty acids and vegetarian diets. Med J Aust. 2013 Aug 19;199(S4):S22-26. doi: 10.5694/mja11.11507.
27. Rizzo G, Baroni L. Soy, soy foods and their role in vegetarian diets. Nutrients. 2018 Jan 5;10(1):43. doi: 10.3390/nu10010043. PMID: 29304010; PMCID: PMC5793271.
28. Reed KE, Camargo J, Hamilton-Reeves J, Kurzer M, Messina M. Neither soy nor isoflavone intake affects male reproductive hormones: An expanded and updated meta-analysis of clinical studies. Reprod Toxicol. 2021 Mar;100:60-67. doi: 10.1016/j.reprotox.2020.12.019.
29. Boutas I, Kontogeorgi A, Dimitrakakis C, Kalantaridou SN. Soy isoflavones and breast cancer risk: A meta-analysis. In Vivo. 2022 Mar-Apr;36(2):556-562. doi: 10.21873/invivo.12737.
30. Otun J, Sahebkar A, Östlundh L, Atkin SL, Sathyapalan T. Systematic review and meta-analysis on the effect of soy on thyroid function. Sci Rep. 2019 Mar 8;9(1):3964. doi: 10.1038/s41598-019-40647-x. PMID: 30850697; PMCID: PMC6408586.

31. Ferramosca A, Zara V. Diet and male fertility: The impact of nutrients and antioxidants on sperm energetic metabolism. Int J Mol Sci. 2022 Feb 25;23(5):2542. doi: 10.3390/ijms23052542.
32. Samimisedeh P, Afshar EJ, Ejtahed HS, Qorbani M. The impact of vegetarian diet on sperm quality, sex hormone levels, and fertility: A systematic review and meta-analysis. J Hum Nutr Diet. 2024 Feb;37(1):57-78. doi: 10.1111/jhn.13230.
33. Amit M. Vegetarian diets in children and adolescents. Paediatrics & Child Health. 2010 May-Jun;15(5):303-314. Canadian Paediatric Society.
34. Position of the American Dietetic Association: Vegetarian diets. J Am Diet Assoc.
35. Melina V, Craig W, Levin S. Position of the Academy of Nutrition and Dietetics: Vegetarian diets. J Acad Nutr Diet. 2016 Dec;116(12):1970-1980.
36. Craddock JC, Probst YC, Peoples GE. Vegetarian and omnivorous nutrition: Comparing physical performance. Int J Sport Nutr Exerc Metab. 2016;26(3):212-220. doi: 10.1123/ijsnem.2015-0231.
37. Shaw KA, Zello GA, Rodgers CD, Warkentin TD, Baerwald AR, Chilibeck PD. Benefits of a plant-based diet and considerations for the athlete. Eur J Appl Physiol. 2022 May;122(5):1163-1178. doi: 10.1007/s00421-022-04902-w.
38. Fuhrman J, Ferreri DM. Fueling the vegetarian (vegan) athlete. Curr Sports Med Rep. 2010 Jul-Aug;9(4):233-241. doi: 10.1249/JSR.0b013e3181e93a6f.
39. Iguacel I, Huybrechts I, Moreno LA, Michels N. Vegetarianism and veganism compared with mental health and cognitive outcomes: A systematic review and meta-analysis. Nutr Rev. 2021 Mar 9;79(4):361-381. doi: 10.1093/nutrit/nuaa030.
40. Katonova A, Sheardova K, Amlerova J, Angelucci F, Hort J. Effect of a vegan diet on Alzheimer's disease. Int J Mol Sci. 2022 Nov 29;23(23):14924. doi: 10.3390/ijms232314924.