Medical and Life Sciences (2025) 4(2): 26–36
ISSN (E): 2976-7245

Plant-Based Diets: Nutritional Adequacy and Health Benefits

Samina Kauser[1]
Mehak Fatima[1]
Eesha Zubair[1]
Alisha Fatima[1]
Laiba Fayyaz[1]
Aqib Ishaq[2]
Muhammad Abubakar Saeed[1]
Kanz Ul-Eman[1]
Momina Batool[3]
Muhammad Soban Mumtaz[4]

How to cite this article:
Kauser, S., Fatima, M., Zubair, E., Fatima, A., Fayyaz, L., Ishaq, A., Saeed, M. A., Ul-Eman, K., Batool, M., Mumtaz, M. S. (2025). Plant-based diets: Nutritional adequacy and health benefits. *Medical and Life Sciences*, *4*(2), 26–36.

Received: 15 August 2025 / Accepted: 28 November 2025 / Published Online: 30 December 2025

Abstract

Plant-based diets (PBDs) are gaining popularity due to their potential health and environmental benefits. Studies have linked PBDs to a lower likelihood of long-term conditions including cardiovascular disorders, type 2 diabetes, high blood pressure, obesity, and specific malignancies. Plant-based dietary intake, which exclude animal products, are particularly correlated with lower overall cancer incidence. PBDs also promote enhanced digestive function and microbial diversity. Environmental sustainability is a key driver of the shift towards PBDs, as plant food production is less resource-intensive and causes less ecological damage than animal agriculture. However, concerns remain about protein quality and muscle protein synthesis (MPS), as plant proteins have a different amino acid profile than animal proteins. Research on the relationship between plant-based diets and athletic performance is limited, with most evidence derived from observational studies. More randomized controlled trials are needed to understand how dietary patterns impact strength, endurance, and recovery.

Keywords: Plant-Based Diet, Chronic Disease, Protein Quality, Muscle Protein Synthesis, Dietary Fiber.

1 Introduction

PBDs correlates with a decreased incidence of developing cardiovascular disorders, a lower prevalence of diabetes and hypertension, and weight loss. A vegan diet, which excludes all animal products, significantly lowers the risk of total cancer, according to a recent meta-analysis (Dinu et al., 2017). Furthermore, research indicates that PBD might help treat several chronic illnesses, including rheumatoid arthritis (Storz et al., 2018). Due to a variety of factors, popularity of plant-

[1]Institute of Food Science and Nutrition, University of Sargodha, Sargodha-40100, Pakistan
Corresponding Author: samina.kauser@uos.edu.pk
[2]Department of Food Technology and Nutrition, School of Science, RMIT University, Bundoora, VIC 3083, Australia
[3]School of Food Science and Engineering, Ocean University of China, Qingdao-266404, China
[4]School of Tea and Food Science, Anhui Agricultural University, Hefei-230036, China

based dietary patterns has increased over the past ten years (Kamiński et al., 2020). Climate change, sustainable food systems, and treatment of animals are the concerns among people as well as their well-being. According to people, definition of plant-based diet is different. Some of it rely particularly on plant-origin food while others exclude entirely animal-origin food (Molina-Montes et al., 2020). In previous study, instead of using term "plant-based", term vegan diets (total plant-based nutrition) and lacto-ovo-vegetarian diets (this allows for the consumption of dairy products and egg) are used (Craig et al., 2021). Diets based on plants are being promoted more because of their potential to support sustainability and health objectives (Medawar et al., 2019). Surpassing one-fourth of Americans (28%) report cutting back on meat-origin diet, and the retail sales of plant-origin diet in the United States increased 44.5% between 2019 and 2022, reaching a fair value of 8 billion Dollars (Neff et al., 2018). The plant-based or plant-forward eating patterns are centered on plant-based foods. It includes whole grains, legumes, beans, nuts, and seeds and oils besides fruits and vegetables. Vegetarian or vegan eating patterns emphasize plant-derived foods with plant sources contributing majority of the dietary intake (McManus, 2021). The phrase "plant-derived diet" refers to a diverse spectrum of eating patterns that contain less animal-originated meals and more plant-origin meals, such as vegetable, seeds, legumes, fruits, grains and nuts. This also covers more flexible eating patterns that allow animal products, like pescatarian (which includes consumers of fish, two percent of U.S. adults) and flexitarian (omnivore but with controlled meat consumption, twenty-two percent of U.S. adults), even though vegetarianism (which includes no meat, two percent of U.S. adults) and veganism (which excludes all animal-source products, two percent of U.S. adults) are included (Leonetti et al., 2024). Although the high intake of animal meat and, especially red and processed meat tends to lead to chronic diseases, such as type 2 diabetes, cardiovascular diseases, and some types of malignancy, as it is a high source of cholesterol and saturated fat, there is an increasing number of studies suggesting that the vegetal-based diet with high amounts of lightly refined foods such as fruits, vegetables, and whole grains is positively linked to reduced chronic disease rates and improved gut microbiota diversity and digestive capability due to its high phytonutrient and dietary fiber levels. (Leonetti et al., 2024). Plant-based meals contain a number of different micronutrients that are deficient or have reduced absorption properties, despite plant-based diets with slight processing have been associated with positive health outcomes. An example is that vegans and vegetarians are at the risk of having deficiencies in certain nutrients including vitamin B12, vitamin D, omega-3 fatty acids, calcium, iron, iodine, zinc, and protein in comparison to omnivores (Ruddy et al., 2016). Diets focused on plants, such as vegetarian, vegan, or generally less animal-based diets, are becoming more popular as a means of promoting both environmental and physical health (Marinova & Raphaely, 2018). Sticking to plant-origin diets is linked to a reduced incidence of progressing chronic diseases, and producing plant foods usually requires fewer resources and damaging to the environment due to various causes, particularly because it produces fewer greenhouse gas emissions (GHGEs) as compared to the emissions caused by animal farming for human consumption. Moreover, some people still doubt whether plant-based diets are sufficient to sustain exercise performance, despite the well-established advantages of plant-based diets for both humans and the environment (Lynch et al., 2018). To address these concerns, this review looks at research on the nutrient composition, human health, performance, and ecological impacts of plant-based and meat-containing diets (Figure 1). The literature comparing the effects of vegetarian and omnivore dietary regimens on exercise outcome is discussed, with special attention paid to the distinctions between plant and animal proteins (Lynch et al., 2018). Constant availability, accessibility, and consumption of food that meets human dietary needs and preferences is known as food and nutrition security (Cena & Calder, 2020). Ensuring that everyone has access to enough safe food is essential to maintaining an active and healthy lifestyle. In addition to improving food production, distribution, and access, food and nutrition security necessitates a multifaceted approach that tackles underlying social and economic problems that could affect both securities. The ability of food production to meet current demands without jeopardizing the ability of future generations to meet their own needs is known as sustainability (Cena & Calder, 2020). Dietary patterns that limit or minimize animal products are gaining popularity. Within the category of "plant-origin diets," these diets include vegetarian, vegan, pescetarian, flexitarian, and whole-food plant-based (WFPB) diets (Gibbs et al., 2022). Although this is often not achieved, food systems and individual dietary habits can promote environmental sustainability and human health. Human morbidity and death are greatly increased by unhealthy diets; this risk is higher than the cumulative effects of unsafe sex and alcohol consumption, use of various drugs, and tobacco (Gibbs et al., 2022).

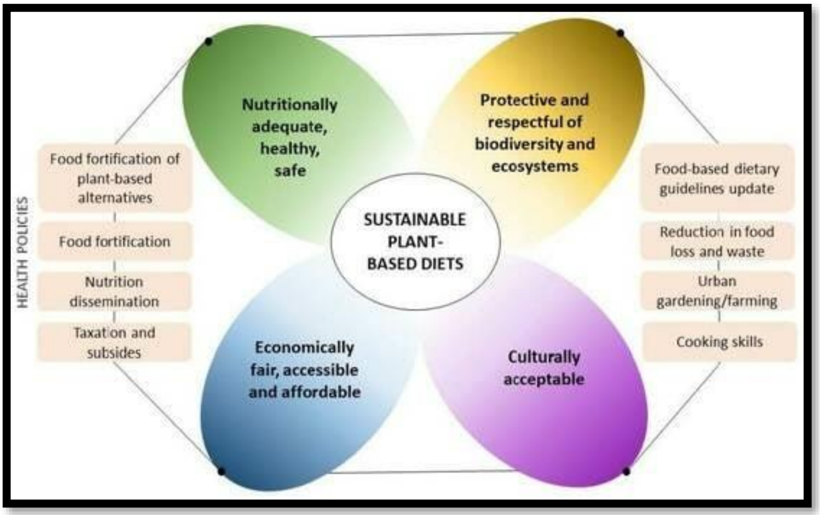

Figure 1: The pros and cons of plant-based diets: the health perspective, environmental effects, accessibility, and acceptability of food (Viroli et al., 2023).

1.1 Vegetarian Diets and Health

Observational literature shows that vegetarians tend to record successful cardiovascular results compared to omnivores and lower prevalence of morbidity and mortality rate caused by heart diseases. Lowered likelihood of Type 2 Diabetes, lower probability of progressing metabolic syndrome (MetS), decreased incidence of malignancies, especially among vegans, and decreased mortality from all causes. These beneficial health effects are likely related to lower blood sugar levels and BMI (Dinu et al., 2017). controlled blood pressure's systolic and diastolic levels, controlled triglycerides, cholesterol, and low-density lipoprotein cholesterol. Vegetarians were shown to have greater levels of plasma ascorbic acid and reduced concentrations of uric acid and high-sensitivity C-reactive protein (Ortiz et al., 2024). Results from experiments using vegan and vegetarian diets are comparable. Dietary therapies using vegetarian diets have shown changes in participants' lipid profiles, including reductions in triglycerides (TG), LDL-C, and total cholesterol. Other studies have demonstrated improved oxidative stress indicators, insulin sensitivity, and decreased visceral fat in diabetic individuals (Kahleova et al., 2017). While vegan diet-based therapies are less prevalent, one experimental trial found that a 3-week vegan dietary intervention reduced the inflammatory marker C-reactive protein (CRP) (Sutliffe et al., 2015). An additional 4-week trial with a vegan diet markedly decreased participants' overall use of medication by lowering their lipids including both systolic and diastolic blood pressure. Food consumption is not only harmful to the environment, but it is also harmful to human health. Dietary choices affect both the human health and the environment. Generally, production of protein in manufacturing plants consumes less energy and space than production of animal protein and thus the overall GHGEs production is also lower (Springmann et al., 2016). Additionally, compared to plant products, animal-based food products require higher resource inputs per kilogram (kg) of product. Consequently, excessive eating of plant-derived diet is frequently seen to be the best way to reduce GHGEs and farmland use associated with production and consumption of food on a systemic level (Machovina et al., 2015). A less well-known but no less significant environmental issue is quickly diminishing worldwide provision of top quality, extractable phosphorus. The recognized sources of phosphorus, which are used in fertilizers for crop and food cultivation, are finite and may run out in 50–100 years if consumption patterns continue. Because vegan dietary patterns need significantly low amount of phosphorus to generate as compared to diets that are animal based, changing dietary patterns on a large scale to consume less meat may be an essential tactic to address the impending mineable phosphorus shortage. However, the environmental impact of different types of meat and animal protein varies (Figure.2). For example, consuming meat from monogastric animals, such as poultry or pork, rather than ruminants like beef, reduces the GHGEs associated with the diet (Hallström et al., 2015).

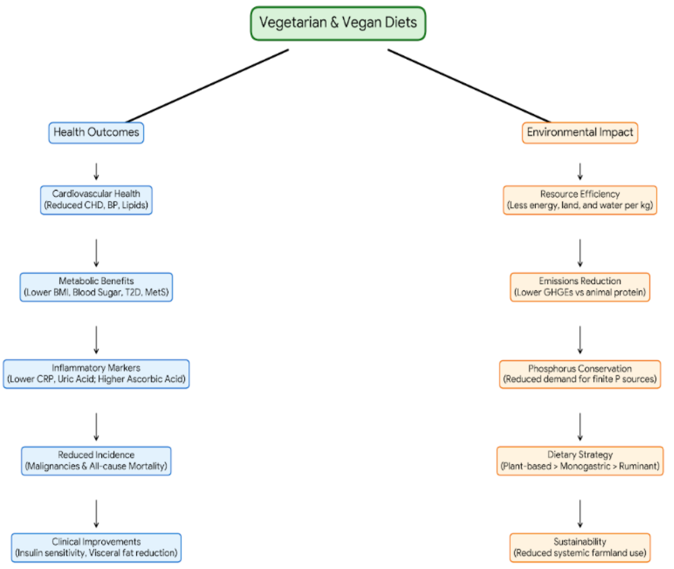

Figure 2: Summary of Health and Environmental Benefits of Vegetarian Diets

2 Protein Quality and Current Recommendations

In addition to the source, several characteristics set plant-origin protein apart from animal-origin protein. For enhancing muscle protein synthesis (MPS) the essential amino acids, leucine, isoleucine, and valine are branched-chain amino acids (BCAAs) which are extremely crucial. Compared to plant proteins, animal-based proteins contain greater concentration of certain amino acids (Van Vliet et al., 2015). Different proteins can have varying rates of digestion and absorption, which might affect postprandial MPS rates. Because of this, some proteinslike which are referred to be "fast" because they digest quickly, causing amino acids to enter the bloodstream more quickly. Because they cause a slower, longer rate of absorption, other proteins, including casein, are referred to as "slow. "Even when both protein sources contain 10 g of essential amino acids which an amount typically considered sufficient to stimulate optimal MPS in young adults (around age 30)-MPS is not promoted to the same extent by soy protein, which is also regarded as a fast protein, as it is by whey protein. This could be the result of variations in the makeup of amino acids, particularly a reduced level of leucine (Devries et al., 2018).

Further study is needed to examine MPS following protein intake standardized for total leucine levels, as it has been proposed that this level may be crucial in triggering anabolic processes of muscle proteins (Fields et al., 2016). It is interesting to note that very little variation in lean mass development between groups is typically observed in intervention studies combining strength training with either whey or soy protein supplementation. It is interesting to note that very little variation in lean mass development between groups is generally observed in intervention studies in which strength training is combined with either whey protein or soy protein supplementation (Reidy et al., 2016). These are commonly found in plant foods, beans, legumes, soybeans, and cereals all these components work in different mechanisms to reduce the digestion of protein. One of the mechanisms is typified by the interference with enzymes in protein digestion. Protein decomposition is an example of a process facilitated by the pancreatic enzyme trypsin. Raw soybean meal, beans, legumes, cereals, tomatoes and potatoes have trypsin inhibitors which slow down the digestion of proteins (Wolfe et al., 2024). Because they suppress digestive enzymes, tannins, which are present in millet, barley, sorghum, legume seeds, beans, and peas, decrease the digestion of protein, carbohydrates and minerals. By chelating specific mineral cofactors, tannins further affect digestion by reducing digestive enzyme activity. Nuts, seeds, and grains contain phytates, which binds to proteins in the digestive system and decreases their absorption. However, several preparation methods can potentially reduce the effect of antinutritional elements. Foods can lower their phytate levels through soaking, fermentation, and germination (Table 1). Moreover, digestibility of proteins in beans increases following both home processing and commercial canning, with home cooking generally resulting in greater improvements in digestibility compared to commercially prepared products. This is likely due to reduced formation of complexes between trypsin and trypsin inhibitors, thereby allowing more enzymes to be available for protein digestibility. For a more detailed discussion on antinutritional factors and their mechanisms, readers are referred to the review by Wolfe et al. (2024). Taking a vegan or vegetarian diet that is properly designed and balanced and consists of a variety of plant protein sources has been repeatedly demonstrated to be dietarily complete by supplying sufficient levels of essential amino acids, even though anti-nutritional factors are more common in vegetable-based protein foods. Therefore, prominent food and nutrition institutions, such as the Academy of Nutrition and Dietetics, continue to endorse and promote these diets (Melina et al., 2016).

Table 1: Summarized overview of Bridging the Nutritional Gap: Strategies for Achieving Essential Amino Acid Adequacy in Plant-Based Dietary Patterns.

Topic	Key Points	Examples / Details	Reference
Animal vs. Plant Protein — Amino Acid Profile	Animal proteins contain higher concentrations of essential amino acids (EAAs), especially BCAAs (leucine, isoleucine, valine), which are critical for muscle protein synthesis (MPS).	**Animal** Higher BCAA content **Plant** Lower BCAA concentration	Van Vliet et al. 2015
Digestion Speed & MPS	Proteins differ in digestion rate "fast" proteins raise blood amino acids quickly; "slow" proteins provide a prolonged release. Even at equal EAA doses (~10g), whey outperforms soy in stimulating MPS.	**Fast: Whey Slow: Casein Fast: Soy** Soy's lower leucine content may explain the reduced MPS compared with whey at equal EAA intake.	Devries et al. 2018
Leucine's Role in MPS	Leucine is proposed as a key trigger for anabolic processes in muscle protein. More research is needed on MPS when total leucine is standardized across protein sources.	Leucine threshold hypothesis may explain differences between protein sources in promoting MPS.	Devries et al. 2018

Whey vs. Soy in Resistance Training	Despite mechanistic differences, intervention studies combining strength training with whey or soy supplementation show minimal differences in lean mass gains between groups.	Practical outcomes (lean mass) may be similar despite differences in acute MPS responses.	Reidy et al., 2016
Antinutritional Factors (ANFs)	Compounds in plant foods reduce protein digestion and absorption through multiple mechanisms including enzyme inhibition and mineral chelation.	**Trypsin inhibitors:** Raw soy, beans, legumes, cereals, tomatoes, potatoes **Tannins:** Millet, barley, sorghum, legumes, peas inhibit digestive enzymes **Phytates:** Nuts, seeds, grains bind proteins in the gut	Gilani et al., 2005; Wolfe et al., 2024
Reducing ANF Effects	Several food preparation methods can significantly reduce the impact of antinutritional factors and improve protein digestibility.	**Methods:** Soaking, fermentation, germination, cooking, commercial canning Home cooking generally improves digestibility more than commercial canning by reducing trypsintrypsin inhibitor complex formation.	Wolfe et al. 2024
Adequacy of Plant-Based Diets	Well-planned vegan and vegetarian diets that include a variety of plant protein sources can supply sufficient EAAs and are considered nutritionally complete.	Endorsed by the **Academy of Nutrition and Dietetics** as nutritionally adequate for all life stages.	Melina et al. 2016

3 Dietary pattern and their impact on nutrient intake and diet quality

There is little research on how dietary habits affect the results of exercise or athletic performance, despite the obvious variations in eating patterns between vegetarians, vegans, and omnivores. However, observational studies may provide useful literature in this field. To examine the differences between vegetarian and meat-eating athletes, observational designs may still be useful even though these studies lack the valuable information that randomized controlled trials (RCTs) can offer. Numerous RCTs pertaining to exercise or sports place omnivorous participants on vegetarian diets for brief duration but generalize findings to athletes who maintain vegetarian diets over an extended length of time. The impact of longer-term plant-based dietary patterns on athletic performance is probably not fully reflected by short-term treatments. The length of time a person follows a specific dietary pattern can also affect exercise performance and fitness measures, including strength, power, and cardio-respiratory endurance, because vegans, vegetarians, and omnivores differ widely in their nutritional consumption and nutrient profiles (Wolfe et al.,2024). The degree of animal-food limitation undoubtedly affects nutrient intakes. A large cross-sectional study compared macro- and micro-nutrient intakes across different dietary patterns: omnivores (n=1475), Pesco-vegetarians (n=155), semi-vegetarians (n=145) (defined as individuals consuming meat, fish, and poultry no more than once per week) (n=498), vegetarians (n=573) and, vegans (n=104). the findings indicated that omnivores had higher intakes of total energy, saturated fats, cholesterol, sodium, and protein but lower intakes of fiber, calcium, and iron compared to vegetarians (Leech, et al., 2019). Vegans consumed more fiber and iron but less energy, saturated fat, salt, and calcium. These findings have been substantially supported by other research with smaller sample sizes. Although vegan diets are typically higher in iron, vegetarians usually exhibit lower serum ferritin levels (a measure of iron stores) compared to those who consume meat. This is probably because the iron present in plants has a lower bioavailability. A delicate balance must be struck to maximize blood's oxygen-carrying capacity while preventing an increased risk of non-communicable diseases, since elevated iron stores may be a risk factor for several chronic diseases (Haider et al., 2018). On the other hand, because iron is essential for oxygen delivery, insufficient iron levels can lead to iron-deficiency anemia, which can impair athletic performance, especially during endurance sports (Alaunyte et al., 2015). Given the critical roles that proteins and carbohydrates play in building and repairing muscle tissue and in producing energy during exercise, especially at high intensities, dietary differences between vegetarians and omnivores may theoretically affect how well people perform and recover from exercise. Vegetarians and omnivores have been shown to consume different amounts of certain nutrients, and the general quality of their diets has also been evaluated (Figure.3). For vegans and vegetarians than for omnivores, diet quality scores were higher in a group of recreational runners who were both vegetarians and vegans (Turner-McGrievy et al., 2016).

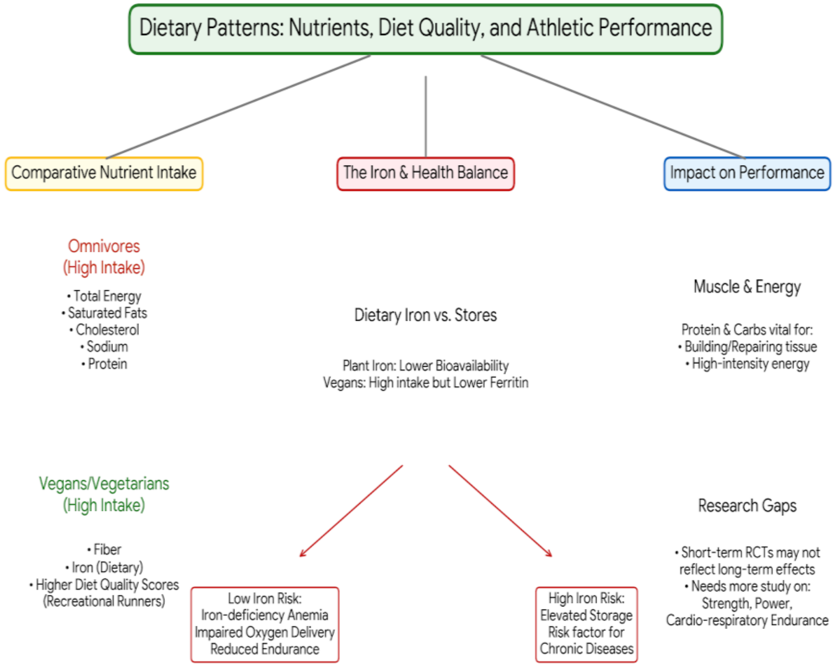

Figure 3: Dietary Patterns: Nutrients, Diet quality and Athletic Performance

4 Plant-Based Nutrition: Enhancing Athletic Performance

The instruction and fueling requirements of athletes training for endurance sports differ from those of athletes training for strength and power-oriented sports. For various athletes, a vegetarian diet may therefore have varying effects on performance evaluation. By evaluating greater oxygen uptake, Physiological markers including strength, blood PH regulation, acute MPs and sustained hypertrophy rather than competitive event performance. Several studies have evaluated the diet's potential to indirectly affect performance outcomes. Other studies have evaluated performance *consequences* Such as cycling time to exhaustion. What is now known regarding the relationships between dietary patterns and the results of endurance and strength, or power training will be addressed in the following sections. Most of the research to date on the relationship between strength, anaerobic, and aerobic exercise performance and a vegetarian diet was included in a current systematic review conducted by Craddock et al. (2016). Only eight papers were included in the study due to the search terms employed, indicating the paucity of research specifically looking at how a vegetarian diet affects performance (Craddock et al., 2016). Additionally, just one of these studies looked at how endurance exercise affected immunological indicators, four evaluated both anaerobic and aerobic performance, and three primarily concentrated on strength training and power. Since no changes in strength, anaerobic, or aerobic performance were found in the one cross-sectional trial and seven RCTs that were analyzed, the authors concluded that vegetarian diets had no effect on performance (Craddock et al., 2016).

5 Strength and Power Exercise

The effect of switching to a plant-based diet on strength and power performance is equally significant. Analyzing how variations in the physiological amounts of creatine and carnosine may affect anaerobic activities has been one aspect of this research. Meat, fish, and poultry all contain beta-alanine, which is the rate-limiting precursor for carnosine synthesis, a key intracellular buffer

in human skeletal muscle (Shaw et al., 2022). Since muscle buffering potential and high-intensity performance are positively correlated, it is crucial to ascertain whether switching to a plant-based diet affects muscle buffering capacity and, in turn, sprint or high-intensity performance. Participants in a 5-week intervention by Baguet et al. (2011) were randomized to either an omnivorous diet or a lacto-ovo-vegetarian group (supplemented with 1 g of creatine to compensate for the reduced creatine content). All participants performed sprint training two to three times a week. Muscle carnosine concentration did not meaningfully change from baseline in either group. Sprint power output on the cycle ergometer increased in both groups, with no significant differences observed between them. Despite a notable time by group interaction for soleus carnosine concentration, characterized by a non-significant increase in the omnivore group and a non-significant decrease in the vegetarian group, buffering capacity remained unaffected (Lynch et al., 2018).
The significance of standard of life as a component of *wellness* and well-being is becoming more widely acknowledged by the public and medical experts (Boldt, 2022) gave 281 recreational runners the World Health Organization Quality of Life Brief questionnaire to compare the quality-of-life scores of male and female runners who were vegan, vegetarian, and omnivore. To provide a general picture of life satisfaction, this questionnaire asked about physical health, psychological well-being, social relationships, and surroundings (such as contentment with one's residence and place of employment, financial independence, and access to healthcare) (Boldt, 2022).

6 Conclusion

A plant-based diet (PBD) is a diet rich in fruits, vegetables, whole grains, legumes, nuts, and seeds, with restrictions on meat, poultry, fish, dairy products, and processed foods. PBDs have been linked to a minimize risk of heart disease, diabetes, hypertension, weight loss, and Some types of cancer have been linked to diets high in cholesterol and saturated fat. In contrast, vegan diets which eliminate all animal origin foods have been associated with a notably reduced overall risk of cancer. Research indicates that PBD might help treat chronic illnesses, including rheumatoid arthritis. Over the past decade, interest in plant-based diets has grown substantially, largely driven by concerns about personal health, climate change, the sustainability of food production systems and animal welfare. These dietary patterns are linked to a reduced risk of chronic diseases and support better digestive health and greater gut micro-biome diversity, primarily due to their high fiber and phytonutrients content. Additionally, plant-based diets are associated with lower environmental impact, as the production plant food typically requires fewer resources and causes less ecological damage. Plant-based protein, such as essential amino acids like leucine, isoleucine, and valine, is crucial for muscle protein synthesis (MPS). Animal-based protein contains higher concentrations of certain amino acids, which can affect MPS rates. Home processing or commercial canning of beans can improve protein digestibility by releasing more enzymes for protein digestion. Research on the impact of dietary habits on exercise and athletic performance is limited, despite variations in food consumption between vegetarians, vegans, and omnivores. Observational studies may provide useful literature, but randomized controlled trials (RCTs) provide insights. The relationship between dietary patterns and the results of endurance and strength or power-focused exercise is still under-researched.

Author Contributions

Samina Kauser, Mehak Fatima, Eesha Zubair, Alisha Fatima, Laiba Fayyaz, Aqib Ishaq, Muhammad Abubakar Saeed, Kanz Ul-Eman, Momina Batool, and Muhammad Soban Mumtaz contributed to the conceptualization, literature search, review and synthesis of nutritional and health-related evidence, organization of the scientific content, interpretation of findings from the published literature, and preparation of the manuscript. All authors contributed to writing—original draft and writing—review and editing. All authors read and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

Conflict of Interest

The authors declare that they have no financial, professional, commercial, institutional, or personal

conflicts of interest that could have influenced the content or conclusions of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data Availability

No new experimental or primary dataset was generated or analysed during this study. All information supporting the review was obtained from the published scientific literature cited in the manuscript.

Informed Consent

Not applicable. The study did not involve direct interaction with human participants or the collection of primary personal data.

Use of Generative AI

The authors declare that no generative artificial intelligence tools were used to conduct the literature analysis, generate the scientific content, interpret the evidence, or formulate the conclusions presented in this article.

7 References

Alaunyte, I., Stojceska, V., & Plunkett, A. (2015). Iron and the female athlete: A review of dietary treatment methods for improving iron status and exercise performance. *Journal of the International Society of Sports Nutrition, 12*(1), Article e38. https://doi.org/10.1186/s12970-015-0099-2

Baguet, A., Everaert, I., De Naeyer, H., Reyngoudt, H., Stegen, S., Beeckman, S., & Derave, W. (2011). Effects of sprint training combined with vegetarian or mixed diet on muscle carnosine content and buffering capacity. *European Journal of Applied Physiology*, *111*(10), 2571–2580.

Boldt, L. J. (2022). *An analysis of consumer response to plant-based meat alternative labelling policy* [Doctoral dissertation].

Cena, H., & Calder, P. C. (2020). Defining a healthy diet: Evidence for the role of contemporary dietary patterns in health and disease. *Nutrients, 12*(2), Article e334. https://doi.org/10.3390/nu12020334

Craddock, J. C., Probst, Y. C., & Peoples, G. E. (2016). Vegetarian and omnivorous nutrition: Comparing physical performance. *International Journal of Sport Nutrition and Exercise Metabolism, 26*(3), 212–220. https://doi.org/10.1123/ijsnem.2015-0231

Craig, W. J., Mangels, A. R., Fresán, U., Marsh, K., Miles, F. L., Saunders, A. V., Orlich, M. (2021). The safe and effective use of plant-based diets with guidelines for health professionals. *Nutrients, 13*(11), Article e4144. https://doi.org/10.3390/nu13114144

Devries, M. C., McGlory, C., Bolster, D. R., Kamil, A., Rahn, M., Harkness, L., & Phillips, S. M. (2018). Protein leucine content is a determinant of shorter-and longer-term muscle protein synthetic responses at rest and following resistance exercise in healthy older women: A randomized, controlled trial. *The American Journal of Clinical Nutrition*, *107*(2), 217–226. https://doi.org/10.1093/ajcn/nqx028

Dinu, M., Abbate, R., Gensini, G. F., Casini, A., & Sofi, F. (2017). Vegetarian, vegan diets and multiple health outcomes: A systematic review with meta-analysis of observational studies. *Critical Reviews in Food Science and Nutrition, 57*(17), 3640–3649. https://doi.org/10.1080/10408398.2016.1138447

Fields, H., Ruddy, B., Wallace, M. R., Shah, A., Millstine, D., & Marks, L. (2016). How to monitor and advise vegans to ensure adequate nutrient intake. *Journal of Osteopathic Medicine, 116*(2), 96–99. https://doi.org/10.7556/jaoa.2016.022

Gibbs, J., & Cappuccio, F. P. (2022). Plant-based dietary patterns for human and planetary health. *Nutrients, 14*, Article e1614. https://doi.org/10.3390/nu14081614

Gilani, G. S., Cockell, K. A., & Sepehr, E. (2005). Effects of antinutritional factors on protein digestibility and amino acid availability in foods. *Journal of AOAC International*, *88*(3), 967–987.

Haider, L. M., Schwingshackl, L., Hoffmann, G., & Ekmekcioglu, C. (2018). The effect of vegetarian diets on iron status in adults: A systematic review and meta-analysis. *Critical reviews in food science and nutrition*, *58*(8), 1359–1374.

Hallström, E., Carlsson-Kanyama, A., & Börjesson, P. (2015). Environmental impact of dietary change: A systematic review. *Journal of Cleaner Production, 91*, 1–11. https://doi.org/10.1016/j.jclepro.2014.12.008

Kahleova, H., Levin, S., & Barnard, N. (2017). Cardio-metabolic benefits of plant-based diets. *Nutrients, 9*(8), 848. https://doi.org/10.3390/nu9080848

Kamiński, M., Skonieczna-Żydecka, K., Nowak, J. K., & Stachowska, E. (2020). Global and local diet popularity rankings, their secular trends, and seasonal variation in Google Trends data. *Nutrition*, *79*, Article e110759.

Leech, R. M., Timperio, A., Worsley, A., & McNaughton, S. A. (2019). Eating patterns of Australian adults: Associations with blood pressure and hypertension prevalence. *European Journal of Nutrition, 58*, 1899–1909. https://doi.org/10.1007/s00394-018-1741-y

Leonetti, M., Kolodinsky, J., Trubek, A., & Belarmino, E. H. (2024). A qualitative study of rural plant-based eaters' knowledge and practices for nutritional adequacy. *Nutrients, 16*(20), Article e3504. https://doi.org/10.3390/nu16203504

Lynch, H., Johnston, C., & Wharton, C. (2018). Plant-based diets: Considerations for environmental impact, protein quality, and exercise performance. *Nutrients, 10*(12), Article e1841. https://doi.org/10.3390/nu10121841

Machovina, B., Feeley, K. J., & Ripple, W. J. (2015). Biodiversity conservation: The key is reducing meat consumption. *Science of the Total Environment*, *536*, 419–431. https://doi.org/10.1016/j.scitotenv.2015.07.022

Marinova, D., & Raphaely, T. (2018). Impact of vegetarian diets on the environment. In W. J. Craig (Ed.), *Vegetarian nutrition and wellness* (pp. 13–24). Routledge. https://doi.org/10.1201/b22003-2

McManus, K. D. (2021). What is a plant-based diet and why should you try it. *Harvard Health Blog*. https://www.health.harvard.edu/blog/what-is-a-plant-based-diet-and-why-should-you-try-it-201809261700

Medawar, E., Huhn, S., Villringer, A., & Witte, A. V. (2019). The effects of plant-based diets on the body and the brain: A systematic review. *Translational Psychiatry, 9*(1), Article e226. https://doi.org/10.1038/s41398-019-0552-0

Molina-Montes, E., Salamanca-Fernández, E., Garcia-Villanova, B., & Sánchez, M. J. (2020). The impact of plant-based dietary patterns on cancer-related outcomes: A rapid review and meta-analysis. *Nutrients, 12*(7), Article e2010. https://doi.org/10.3390/nu12072010

Melina, V., Craig, W., & Levin, S. (2016). Position of the academy of nutrition and dietetics: Vegetarian diets. *Journal of the Academy of Nutrition and Dietetics*, *116*(12), 1970–1980. https://doi.org/10.1080/10408398.2016.1259210

Neff, R. A., Edwards, D., Palmer, A., Ramsing, R., Righter, A., & Wolfson, J. (2018). Reducing meat consumption in the USA: A nationally representative survey of attitudes and behaviours. *Public Health Nutrition, 21*(10), 1835–1844. https://doi.org/10.1017/S1368980017004190

Ortiz, J. E., Sánchez-Palencia, Y., López-Cilla, I., Morales-Molino, C., Gardoki, J., Torres, T., & Morellón, M. (2024). Lipid biomarkers in high mountain lakes from the Cantabrian range (Northern Spain): Coupling the interplay between natural and anthropogenic drivers. *Anthropocene, 46*, Article e100431. https://doi.org/10.1016/j.ancene.2024.100431

Reidy, P. T., Borack, M. S., Markofski, M. M., Dickinson, J. M., Deer, R. R., Husaini, S. H., & Rasmussen, B. B. (2016). Protein supplementation has minimal effects on muscle adaptations during resistance exercise training in young men: A double-blind randomized clinical trial. *The Journal of nutrition*, *146*(9), 1660–1669.

Shaw, K. A., Zello, G. A., Rodgers, C. D., Warkentin, T. D., Baerwald, A. R., & Chilibeck, P. D. (2022). Benefits of a plant-based diet and considerations for the athlete. *European Journal of Applied Physiology, 122*(5), 1163–1178. https://doi.org/10.1007/s00421-022-04902-w

Springmann, M., Godfray, H. C. J., Rayner, M., & Scarborough, P. (2016). Analysis and valuation of the health and climate change co-benefits of dietary change. *Proceedings of the National Academy of Sciences, 113*(15), 4146–4151. https://doi.org/10.1073/pnas.1523119113

Storz, M. A. (2018). Is there a lack of support for whole-food, plant-based diets in the medical community? *The Permanente Journal, 23*, 18–068. https://doi.org/10.7812/TPP/18-068

Sutliffe, J. T., Wilson, L. D., de Heer, H. D., Foster, R. L., & Carnot, M. J. (2015). C-reactive protein response to a vegan lifestyle intervention. *Complementary Therapies in Medicine, 23*(1), 32–37. https://doi.org/10.1016/j.ctim.2014.11.001

Turner-McGrievy, G. M., Leach, A. M., Wilcox, S., & Frongillo, E. A. (2016). Differences in environmental impact and food expenditures of four different plant-based diets and an omnivorous diet. *Journal of Hunger & Environmental Nutrition, 11*(3), 382–395. https://doi.org/10.1080/19320248.2015.1066734

Van Vliet, S., Burd, N. A., & van Loon, L. J. (2015). The skeletal muscle anabolic response to plant- versus animal-based protein consumption. *The Journal of Nutrition, 145*(9), 1981–1991. https://doi.org/10.3945/jn.114.204305

Viroli, G., Kalmpourtzidou, A., & Cena, H. (2023). Exploring benefits and barriers of plant-based diets: Health, environmental impact, food accessibility and acceptability. *Nutrients, 15*(22), Article e4723. https://doi.org/10.3390/nu15224723

Wolfe, R. R., Church, D. D., Ferrando, A. A., & Moughan, P. J. (2024). Consideration of the role of protein quality in determining dietary protein recommendations. *Frontiers in Nutrition, 11*, Article e1389664. https://doi.org/10.3389/fnut.2024.1389664