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Review Article

The Portfolio Diet in the Prevention and Management of Cardiovascular Disease

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Abstract

Cardiovascular disease (CVD) ranks as the primary cause of global mortality. The present review is designed to provide a comprehensive evaluation of the portfolio dietary pattern—an approach endorsed in the Canadian Cardiovascular Society (CCS) guidelines emphasizing viscous fiber, plant sterols, soy/plant protein, nuts, and monounsaturated fatty acids (MUFA)—with respect to its multifaceted impacts on lipid profiles, blood pressure, body weight, glycemic regulation, systemic inflammation, and environmental sustainability. A comprehensive literature search was conducted across the PubMed/MEDLINE, ScienceDirect, Google Scholar, and ResearchGate databases to identify randomized controlled trials (RCTs), cohort studies, and meta-analyses published between 2000 and 2026. Current evidence indicates that the most pronounced and robust clinical efficacy of the portfolio diet lies in improving serum lipid profiles, highlighted by low-density lipoprotein cholesterol (LDL-C) reductions comparable to those achieved with low-dose statin therapy. In contrast, evidence regarding the diet's effects on body weight management, blood pressure control, blood glucose levels, and inflammatory markers, as well as its environmental sustainability, remains limited, preliminary, and variable. In conclusion, the portfolio dietary pattern should be framed as a complementary therapeutic nutrition strategy to support standard pharmacological interventions rather than a substitute. Further large-scale clinical studies are required to confirm its long-term clinical efficacy and evaluate its cultural feasibility with regional dietary alternatives (e.g., soy substitutes).

Keywords: Portfolio diet, Nutrition, Sustainability, Cardiovascular disease.

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1. Introduction

Cardiovascular diseases are one of the leading causes of death worldwide (Glenn et al., 2023a). According to 2025 data from the Turkish Statistical Institute (TURKSTAT), diseases of the circulatory system represent the leading cause of mortality, accounting for 34.7% of total deaths. Furthermore, among deaths attributed to circulatory system diseases, ischemic heart disease accounted for 42.3%, other heart diseases for 24.6%, and cerebrovascular disease for 18.2% (TURKSTAT, 2026a).

The Canadian Cardiovascular Society (CCS) guidelines on the management of dyslipidemia to prevent CVD in adults recommend medical nutritional therapy as a cornerstone of CVD prevention and control (Anderson et al., 2016). Recent evidence suggests that following balanced diets rich in viscous fiber, nuts and seeds, phytosterols, and plant proteins, and relatively low in energy density may benefit cardiovascular health (Glenn et al., 2023a).

The Portfolio Diet, as investigated by Jenkins et al. (2006), included plant sterols (1.0 g/1000 kcal), viscous fiber (10 g/1000 kcal; oats, barley, okra, eggplant, and psyllium), soy protein (22.5 g/1000 kcal), and almonds (23 g/1000 kcal). For a 2000-kcal diet, these amounts correspond to daily intakes of 2 g, 20 g, 45 g, and 46 g, respectively. Monounsaturated fatty acids (45 g/day) were subsequently incorporated as a fifth component—sourced from olive, canola, or high-oleic sunflower oils, or avocado—to further optimize blood lipids, particularly high-density lipoprotein cholesterol (HDL-C) (Jenkins et al., 2010; CCS, 2023). The core components of the portfolio diet and their corresponding cardiovascular effects are illustrated in detail in Figure 1.

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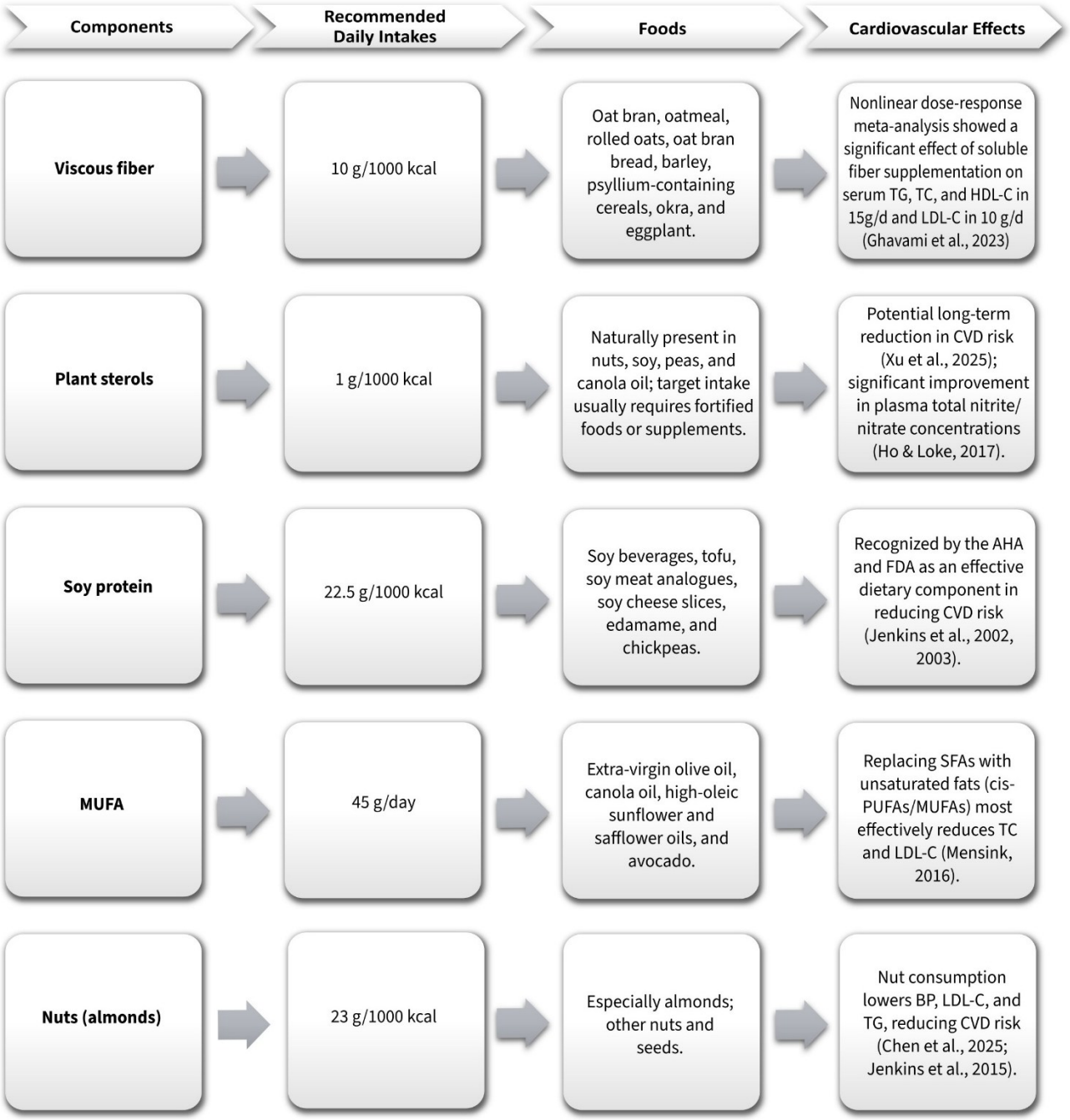


Figure 1. Core components and cardiovascular effects of the portfolio diet

The foundation of the diet is based on vegetarian nutrition, and the consumption of meat, poultry, and fish is limited to “less than three servings per week”. It is stated that if it is to be consumed, skinless white meat or lean red meat should be preferred, and that no more than 3 egg yolks per week or unlimited egg whites/substitutes can be consumed. Also, the portfolio diet limits the dietary energy from saturated fats to ≤7% and dietary cholesterol to ≤200 mg/day (Jenkins et al., 2006).

Although studies addressing the individual components and general effects of the portfolio diet exist in the literature, comprehensive syntheses evaluating the diet's relationship with cardiovascular risk factors (lipid profile, blood pressure, glycemic control), inflammation, and sustainability in tandem remain limited. The primary aim of this review is to address this gap in the literature by examining these parameters through an integrated approach in light of current scientific evidence.

2. Review Method

This study is a narrative review that synthesizes the role of the portfolio diet on cardiovascular risk factors and related clinical parameters from a comprehensive perspective. The literature search was conducted across the PubMed/MEDLINE, ScienceDirect, Google Scholar, and ResearchGate databases and academic platforms, covering publications from 2000 to 2026. The search strategy utilized the keywords "portfolio diet", "dietary portfolio", "cardiovascular disease", "lipids", "LDL cholesterol", "hypertension", "blood pressure", "inflammation", "sustainability", and "body weight", along with combinations of Boolean operators (AND, OR) in both English and Turkish. The review included RCTs, prospective cohort studies, systematic reviews, and meta-analyses published in peer-reviewed journals that examined the portfolio diet either as an integrated dietary pattern or at the level of its defined core components and reported cardiovascular markers as clinical outcomes. Conference abstracts, letters to the editor, and publications with inadequate methodology or inaccessible full texts were excluded. Studies selected in accordance with these defined criteria were critically synthesized based on study design, sample size, intervention duration, participant dietary adherence, and net changes in cardiovascular parameters.

3. Portfolio diet and Body Weight

Obesity is defined as an imbalance between the energy intake from diet and the energy expended. According to the World Health Organization (WHO), adults with a body mass index (BMI) of ≥25 kg/m2 are considered overweight, and those with a BMI of ≥30 kg/m2 are classified as having obesity. Obesity predisposes to the onset of chronic conditions such as type 2 diabetes mellitus (T2DM), hypertension, and CVD. The prevalence of obesity has been markedly increasing across all age groups (WHO, 2025a). Furthermore, projections suggest that by 2050, more than two-thirds of adults could be affected by overweight or obesity (Lopez-Jimenez et al., 2025).

In the Türkiye Demographic and Health Survey (TDHS) 2025 report, it is determined that the proportion of individuals aged 15 and over with obesity according to BMI values is 21.8% (TURKSTAT, 2026b). In the United States (U.S.), where the prevalence of obesity is estimated to reach 70%, the updated U.S. Dietary Guidelines were published in January 2026. When the guide is examined, certain changes aimed at combating obesity are noticeable. The guidelines recommend the consumption of vegetables, fruits, whole grains, and sources of healthy fats, such as olive oil, avocados, nuts, and seeds. They also recommend full-fat dairy products and emphasize the importance of plant protein alongside animal protein (U.S. Department of Agriculture [USDA] & U.S. Department of Health and Human Services [HHS], 2026).

Although the portfolio diet is a diet developed to manage metabolic risk factors, there are also studies on its effect in obesity management; however, the evidence in the literature is still limited and inconsistent (Chen et al., 2025; Glenn et al., 2021a). Viscous fiber, one of the main components of the portfolio diet (oats, barley, eggplant, okra, apples, and citrus fruits), binds water in the gut and forms a gel, thereby delaying the absorption of carbohydrates, dietary fats, and dietary cholesterol. This mechanism is effective in regulating appetite (Trautwein & McKay, 2020). In a cohort study, it is stated that as adherence to the portfolio diet increases, levels of the inflammatory biomarker hormone leptin decrease significantly (Glenn et al., 2023a). Studies indicate that as adherence to the portfolio diet increases, significant reductions in BMI are observed (Chen et al., 2025; Glenn et al., 2021a). A cohort study reports that each 1-point increase in the Portfolio Diet Score (PDS) leads to decreases in fat mass index (-0.019 kg/m^2), body weight (-0.124 kg), and waist circumference (-0.092 cm) (Chen et al., 2025). A meta-analysis, on the other hand, states that the portfolio diet has no statistically significant effect on body weight, reporting that the mean difference between those following the portfolio diet and the control group is -0.10 kg (Chiavaroli et al., 2018).

In conclusion, when evaluating the studies in the literature, although the portfolio diet is a dietary pattern designed primarily to manage metabolic risk factors such as blood cholesterol levels—independent of body weight rather than as a weight-loss diet—it may also exert effects on body weight, and these effects continue to be debated in the literature (Chen et al., 2025; Chiavaroli et al., 2018; Glenn et al., 2023a).

4. The Portfolio Diet and Hypertension

The WHO defines clinical hypertension in adults as ≥140 mmHg of systolic blood pressure (SBP) value and/or ≥90 mmHg of diastolic blood pressure (DBP) when measured on two different days (WHO, 2025b). Advanced age, obesity, alcohol and tobacco use, as well as unhealthy dietary habits, can increase the risk of hypertension. According to data from the WHO, it is stated that 1.4 billion people live with hypertension, but only one-fifth keep this condition under control through medication or by taking modifiable health risks into consideration (WHO, 2025c). According to the WHO's global hypertension report published in 2025, when mortality rates are examined, it is indicated that high blood pressure causes 11 million deaths and accounts for 16% of all deaths. Furthermore, the global burden of hypertension increases in the coming years, with the number of affected individuals potentially exceeding 1.5 billion by 2030 (WHO,

2025a,b). Modifiable risk factors, such as dietary habits, overweight/obesity status, alcohol and tobacco use, and insufficient physical activity levels, play a significant role in the prevention of hypertension (WHO, 2025c).

The dietary approaches to stop hypertension (DASH) diet, which emphasizes the consumption of low-fat milk and dairy products, whole grains, fruits, vegetables, and oilseeds, restricts the intake of red meat, processed meat products, sugary foods, and sodium (Glenn et al., 2021a). Research indicates that the DASH diet reduces blood glucose levels, lipid profiles, and cardiometabolic risk factors (Chiavaroli et al., 2019; Glenn et al., 2021a). Although the DASH diet is primarily recommended for the improvement of modifiable risk factors, the portfolio diet is also discussed in current literature (Glenn et al., 2021a; Jenkins et al., 2015).

While the portfolio diet, as a plant-based dietary pattern, shares similarities with the DASH diet, it additionally recommends a dietary intake of 2 g of phytosterols. In a study conducted in adults, it is determined that regular consumption of soy milk enriched with 2 g of phytosterols for 4 weeks can lower blood pressure and reduce long-term CVD risk (Xu et al., 2025).

In a study aimed at comparing the effects of the portfolio diet and the DASH diet, an intensive portfolio diet and a control diet (DASH) were administered to 241 adult participants with hyperlipidemia; when comparing the effects of these two diets on blood pressure at the end of the study, it was reported that despite a lower adherence rate to the portfolio diet (48% adherence), it yielded more significant reductions in diastolic, and mean arterial pressure compared to the DASH diet (105% adherence); however, it was noted that the participants' baseline therapeutic diet already incorporated most characteristics of the DASH diet (>60% adherence) and their baseline blood pressure was 119/73 mmHg. Nevertheless, it was stated that increased adherence to DASH diet elements in the control group was still associated with reductions in blood pressure (Jenkins et al., 2015).

In conclusion, although the individual components of the portfolio diet exert favorable effects on blood pressure, further research is required to elucidate the clinical efficacy and long-term outcomes of the diet as an integrated whole (Chen et al., 2025; Chiavaroli et al., 2018).

5. The Portfolio Diet and Lipid Profile

Dyslipidemia refers to an abnormal concentration of lipids or lipoproteins in the blood; it is typically characterized by elevated LDL-C levels, namely hypercholesterolemia, and is commonly accompanied by decreased HDL-C levels and elevated triglycerides (TG) concentrations, particularly in triglyceride-rich lipoproteins such as chylomicrons and very-low-density lipoproteins (VLDLs), representing one of the major modifiable risk factors for CVD (WHO, 2026a; Mach et al., 2020; Trautwein & McKay, 2020). Obesity, insulin resistance, a sedentary lifestyle, and a dietary pattern high in total dietary fatty acid content contribute to the development of dyslipidemia (WHO, 2007). Dyslipidemia and hyperlipidemia are among the preventable risk factors for CVD. In particular, high blood LDL-C levels are a major risk factor for CVD (Trautwein & McKay, 2020). According to the Global Burden of Disease (GBD) 2019 study, high LDL-C levels cause approximately 4.4 million deaths and 98.6 million disability-adjusted life years (DALYs) lost globally in 2019. The WHO recommends adopting a total risk approach in the prevention of CVD and acknowledges the critical role of blood cholesterol level control in primary and secondary prevention strategies (Roth et al., 2020).

In the treatment of dyslipidemia, the type of fat is more important than the amount of dietary fatty acids. In a meta-analysis and regression study conducted by the WHO, it was determined that replacing dietary Saturated Fatty Acids (SFAs) with polyunsaturated fatty acids (PUFAs) and MUFAs can be effective in lowering blood LDL-C levels, with the most favorable effect on blood lipids achieved by replacing saturated fats with PUFAs. In the same study, replacing every 1% of dietary SFAs with an equivalent amount of carbohydrates was associated with significant increases in TG and the TG/HDL-C ratio, and significant decreases in Total Cholesterol (TC), LDL-C, HDL-C, and the LDL-C/HDL-C ratio. As a result of the study, reducing saturated fatty acid intake by replacing SFAs with PUFAs and MUFAs appears to exert more favorable effects on the blood lipid profile compared to replacing SFAs with a carbohydrate mixture (Mensink, 2016).

Increasing dietary fiber intake is one of the effective factors in improving dyslipidemia. In a meta-analysis study, it is reported that high dietary fiber intake causes significant decreases in TC and LDL-C (Trautwein & McKay, 2020). In dietary guidelines such as those from the WHO, the dietary Guidelines for Türkiye (TÜBER), and the European Food Safety Authority (EFSA), it is stated that total daily dietary fiber intake should be 25–30 g for an adequate and balanced diet (EFSA Panel on Dietetic Products, Nutrition, and Allergies, 2010; Ministry of Health, 2022; WHO, 2026b). Phytosterols are components structurally similar to cholesterol that compete with cholesterol to form chylomicrons and can be effective in lowering blood cholesterol levels by causing a reduction in intestinal cholesterol absorption (Xu et al., 2025). In a study, it is stated that a daily intake of 2 g of phytosterols, in addition to a healthy and balanced diet, can be effective in lowering LDL-C levels. In the same study, it is shown that regular consumption of soy milk enriched with 2 g of phytosterols for 4 weeks leads to a significant improvement in plasma total nitrite/nitrate concentration (Ho & Loke, 2017).

The portfolio diet is a therapeutic dietary pattern known for its ability to lower blood lipid levels (Kavanagh et al., 2024). In a four-week randomized controlled trial comparing the Portfolio Diet with lovastatin, a first-generation statin used to lower cholesterol in patients with hypercholesterolemia or coronary heart disease (CHD), the LDL-C-lowering effect of the Portfolio Diet (28.6%–35.0%) was comparable to that of lovastatin (30.9%) (Jenkins et al., 2003). According to the results of a meta-analysis, the portfolio diet reduces LDL-C by 17%, non-HDL-C by 14%, apolipoprotein B (ApoB) by 15%, and TC by 12% (Chiavaroli et al., 2018). In a prospective cohort study, having a higher PDS is associated with an 11% lower risk of CVD and a 14% lower risk of CHD (Glenn et al., 2021b). In another study, it is reported that PDS is inversely associated with LDL-C (Glenn et al., 2021c). In conclusion, when evaluating the conducted studies, it is considered that the components of the portfolio diet improve the lipid profile, thereby exerting protective effects on cardiovascular health (Chiavaroli et al., 2018; Glenn et al., 2021b).

6. The Portfolio Diet and Blood Glucose Control

Diabetes mellitus is a chronic disease characterized by hyperglycemia arising from insulin resistance, affecting many organs in the body and leading to organ involvement (International Diabetes Federation [IDF], 2025; Society of Endocrinology and Metabolism of Turkey [SEMT], 2024). Chronically untreated elevated blood glucose levels can damage many organs in the body and can also result in CVD, neuropathy, nephropathy, liver disease, cancer, weakness, vision loss, or even blindness. Achieving blood glucose control can delay or prevent severe complications. The International Diabetes Federation states that in 2024, the prevalence of DM in the 20–79 age group was 588.7 million, one in four adults living with diabetes (158 million) was aged 65 and older, approximately 653 million people experienced impaired blood glucose tolerance, and 252 million adults were unaware that they were living with diabetes. According to data from the IDF, the prevalence of DM is estimated to reach 852.5 million in 2050 (IDF, 2025). Prior to medical nutrition therapy in diabetes, multiple factors such as diabetes type, complications, blood glucose control status, anthropometric measurements, laboratory findings, prescribed medical treatment, dietary intake status, and lifestyle modifications need to be evaluated. The goal of nutritional therapy in diabetes is to control blood glucose levels, improve the lipid profile to reduce CVD risk, lower blood pressure levels, maintain ideal body weight, and prevent or reduce chronic complications of diabetes (SEMT, 2024).

A study incorporating two randomized dietary trials involving adults with type 2 diabetes mellitus (T2DM) examined the association between adherence to the Portfolio Diet and HbA1c levels, with the Portfolio Diet Score (PDS) increasing from 16% to 18%. The findings indicated that an increase of one cup in legume intake was associated with a 0.24% reduction in HbA1c levels. Greater adherence to the Portfolio Diet was associated with a lower glycemic index and reductions in total cholesterol and triglyceride levels, whereas no effect was observed on HDL-C or blood pressure. Furthermore, greater adherence was associated with lower HbA1c, LDL-C, and non-HDL-C levels (Kavanagh et al., 2024). In a prospective cohort study, the highest level of adherence to the portfolio diet was compared with the lowest level, and high adherence to the PDS is associated with a 13% reduction in the risk of T2DM. Furthermore, it is observed that a higher intake of viscous fiber sources and phytosterols is inversely associated with the incidence of T2DM. As a result of the study, it is observed that high adherence to the portfolio diet significantly reduces the incidence of T2DM in postmenopausal women (Glenn et al., 2023b). In a population-based prospective study evaluating the relationship between the level of adherence to the portfolio diet and the incidence of T2DM, it is stated that there is no significant association between overall PDS and the incidence of T2DM, but an inverse association exists between oilseed consumption and the incidence of T2DM (Malmir et al., 2025). In another study, the portfolio diet is associated with a reduction in HbA1c levels in patients with T2DM over a 6-month period, and it is stated that this reduction is primarily due to plant protein intake, including oilseeds and legumes (Chiavaroli et al., 2023).

In conclusion, when evaluating the studies in the literature, although favorable findings have been reported indicating that components of the portfolio diet may improve HbA1c levels and confer protection against T2DM risk, there are also studies that detected no significant effect. Therefore, current evidence remains preliminary and inconsistent, and further research is needed to reach a definitive clinical conclusion (Chiavaroli et al., 2023; Glenn et al., 2023b; Malmir et al., 2025).

7. The Portfolio Diet and Inflammation

Inflammation has a significant impact on the prognosis of chronic diseases such as T2DM and CVD (Wood et al., 2014). An increase in diet quality is associated with a reduction in inflammation and mortality risk (Wang et al., 2023). In a systematic review and meta-analysis, it was reported that the portfolio diet yielded a 32% reduction in levels of C-reactive protein (CRP), an inflammatory biomarker, compared to the control diet, and that the intake of viscous fiber and plant protein, which are components of the portfolio diet,

contributed to the anti-inflammatory profile of the diet (Chiavaroli et al., 2018). In a cross-sectional analysis, it was also reported that a higher dietary intake of MUFAs was associated with lower CRP levels (Chen et al., 2025).

In studies, a strong and inverse association is observed between the portfolio diet and CRP levels (Glenn et al., 2023a; Kavanagh et al., 2025). Each 8-point increase in the PDS is associated with a statistically significant 6.05% reduction in CRP levels (Kavanagh et al., 2025). In a cohort study, individuals with high adherence to the portfolio diet are found to have lower CRP levels compared to those with low adherence (Glenn et al., 2023a). The portfolio diet is also observed to have favorable effects on other inflammatory markers such as Interleukin-6 (IL-6) and leptin (Glenn et al., 2023a).

In conclusion, although available evidence suggests that components of the Portfolio Diet may reduce CRP levels, these findings should not be generalized to the entire inflammatory process, as current evidence is predominantly limited to CRP. Further research focusing on other inflammatory biomarkers is warranted (Chen et al., 2025; Chiavaroli et al., 2018; Kavanagh et al., 2025).

8. The Portfolio Diet and Sustainability

Population growth, climate change, and rising animal-based food consumption highlight the need to improve food system quality and environmental sustainability (Johnston et al., 2014). Sustainable dietary patterns recommend shifting from animal-based to plant-based foods and reducing overall animal-based food consumption (Wu et al., 2025). Adopting sustainable dietary patterns helps improve diet quality, promote a healthier lifestyle, and contribute to long-term food security (Meybeck & Gitz, 2017).

In the report published by the EAT-Lancet Commission in 2019, emphasis is placed on increasing the consumption of fruits, vegetables, whole grains, legumes, and oilseeds, and reducing the consumption of animal-based foods for health and environmental sustainability (Willett et al., 2019). In the report published by the EAT-Lancet Commission in 2025, on the other hand, the planetary health diet is recommended. The planetary health diet advocates a plant-based pattern while suggesting a more balanced and limited consumption of animal-based foods. At the same time, it emphasizes lower intake of simple sugars, SFAs, and sodium (Rockström et al., 2025).

The portfolio diet, characterized by the restriction of animal-based foods and an increased consumption of plant-based foods, is also considered to be a sustainable dietary pattern (Kent et al., 2022).

The foods included in the portfolio diet (plant proteins, nuts, fiber-rich foods) have low environmental impacts and are significant for planetary health; however, these inferences are fundamentally based on data from individual components or general plant-based diets, and evidence directly evaluating the environmental impacts of the portfolio diet as an integrated whole remains limited (Glenn et al., 2023a). By promoting foods with a low carbon footprint, such as plant sterols, nuts, and legumes, instead of animal-based foods, the portfolio diet is considered to have potential benefits in reducing greenhouse gas emissions, conserving water and land resources, and mitigating the environmental impact of food choices; however, more studies are needed to reach a comprehensive conclusion (Glenn et al., 2023a; Trautwein & McKay, 2020).

For young adults with a high awareness of climate change, the portfolio diet, composed of components with low environmental impact, is considered an ideal dietary pattern that both protects individual health and addresses planetary health concerns (Chen et al., 2025).

In conclusion, due to its components, the portfolio diet is considered to have the potential to offer favorable benefits as a sustainable dietary pattern with low environmental impacts; however, more model-specific evidence is required to confirm this effect as an integrated whole (Glenn et al., 2023a; Trautwein & McKay, 2020).

9. Conclusion and Recommendations

The clinical evidence regarding the effects of the portfolio diet on cardiovascular risk markers is summarized in Table 1. When evaluating the available scientific evidence, it is observed that the most prominent, robust, and consistent clinical effect of the portfolio diet on cardiovascular health is the improvement in serum LDL-C and the overall blood lipid profile. In contrast, findings regarding the effects of the dietary pattern on body weight management, blood pressure control, blood glucose levels, and inflammatory markers, as well as its environmental sustainability, remain more limited, preliminary, and variable. In this context, the portfolio diet should not be regarded as an alternative to appropriate medical and pharmacological therapies in the prevention and management of cardiovascular diseases; rather, it should be positioned as a therapeutic dietary pattern that supports and complements evidence-based medical treatment. Conducting large-scale, randomized controlled, prospective studies to more clearly elucidate the holistic effects of the diet regarding cardiovascular parameters and environmental sustainability will significantly contribute to the literature. To promote the utilization and widespread adoption of the portfolio diet, referrals to web-based applications that facilitate dietary tracking can be made; additionally, the adaptation of these applications to diverse populations can be ensured. Furthermore, since soy consumption is not aligned with traditional dietary habits in

Türkiye, conducting research on local foods that can serve as substitutes for soy is also recommended.

10. Strengths and Limitations

The main strength of this review is that it synthesizes the lipid profile, blood pressure, body weight, glycemic control, inflammation, and environmental sustainability dimensions of the portfolio diet from a holistic perspective in light of current literature. However, the study has certain limitations; the traditional narrative design of the review carries a risk of potential selection bias in study selection, and the fact that the examined controlled studies remain limited in terms of number and intervention duration, along with the variability in participants' dietary adherence levels, limits the generalizability of the findings. In addition, the reliance of certain non-lipid metabolic parameters predominantly on observational data and the fact that experimental evidence evaluating the direct effects of the portfolio diet on major clinical cardiovascular events and on environmental outcomes as a whole is still insufficient constitute other limitations of the review.

Table 1. Summary of clinical studies evaluating the effects of the portfolio diet on cardiovascular risk markers (in chronological order).

Reference / Study Design	*Study Population*	*Study Duration*	*Intervention*	*Key Findings*	*Limitations*
Jenkins et al. (2002)/ Crossover Metabolic Study	13 hyperlipidemic subjects	Mean of 49 days	Portfolio diet (per 1,000 kcal: 1.0 g sterols, 22.7 g soy protein, 8.2 g viscous fiber, raw almonds) on a background NCEP Step 2 diet for 4 weeks.	Reduced LDL-C by 29.0%, LDL-C: HDL-C by 26.5%, and CHD risk by 30%, with a downward trend in CRP.	Very small sample size (n=13) and short study duration.
Jenkins DJA. et al. (2003)/ RCT	Hypercholesterolemic and hyperlipidemic adults	4 weeks	Comparison of the portfolio diet with lovastatin treatment	Reduced LDL-C by 28.6%–35.0%, showing efficacy comparable to first-generation statins (30.9%).	Small sample size, short follow-up duration, and strictly controlled setting (lack of real-world evidence).
Jenkins et al. (2006)/ Open-Label, Single-Arm Study	66 hyperlipidemic participants	12 months	A portfolio diet intervention implemented under real-world conditions, compared with data from the previous 4-week metabolic diet and statin therapy.	Reduced mean LDL-C by 12.8% at 1 year under real-world conditions; high adherence achieved >20% reduction in >30% of participants, comparable to statin therapy.	Lack of a control group and low adherence to viscous fiber and soy protein (50–55%).
Jenkins et al. (2010)/ RCT	24 hyperlipidemic patients	2 months	Supplementation of the portfolio diet with 13% MUFA (sunflower oil/avocado)	Significantly increased HDL-C and Apolipoprotein A-I, and lowered TC: HDL - C ratio and CRP, without affecting weight or TG.	Small sample size, minimal weight loss, predefined dietary model failing to reflect real-world compliance, and an initial power calculation error.
Jenkins et al. (2015)/ Randomized Controlled Parallel Study (Post-Hoc)	241 hyperlipidemic patients	24 weeks	Comparison of the portfolio diet with a DASH-type diet	Compared to a DASH-type diet, the portfolio diet significantly reduced blood pressure (particularly diastolic and mean arterial pressure) at week 24; this reduction was negatively correlated with the intake of nuts, soy, viscous fiber, and potassium, and positively correlated with the Na^+/K^+ ratio.	Blood pressure not being a primary outcome, reliance on office-based measurements, and low dietary adherence (48%).
Chiavaroli L. et al. (2018)/ Systematic Review and Meta-Analysis	Hyperlipidemic and middle-aged adults (mean age: 57)	Varying by study; short- and medium-term	Portfolio diet intervention (plant sterols, soy protein, viscous fiber, and almonds)	The portfolio diet significantly reduced LDL-C by 17%, non-HDL-C by 14%, ApoB by 15%, SBP by 1%, DBP by 2%, and CRP by 32%.	Limited by short durations, predominance of single-center studies, exclusion of diabetic and younger populations, and statistical imprecision for some outcomes

Table 1. (Cont.)

Reference / Study Design	*Study Population*	*Study Duration*	*Intervention*	*Key Findings*	*Limitations*
Glenn et al. (2021a)/ Longitudinal Analysis (within the PREDIMED-Plus Framework)	6,874 older adults with metabolic syndrome (mean age: 65)	1 year	Analysis of the cardiometabolic impact of changes in portfolio and DASH diet scores	Per 1-SD increase in PDS improved HbA1c, fasting glucose, TG, BMI, and waist circumference without altering TC or LDL-C, supporting favorable cardiometabolic profiles in older adults with metabolic syndrome.	Self-reported diet, limited generalizability beyond older Mediterranean adults with metabolic syndrome, and omission of soy foods.
Glenn et al. (2021b)/ Prospective Cohort Study	123,330 postmenopausal women (WHI)	An average of 15.3 years	PDS based on 6 components (plant protein, nuts, fiber, sterols, MUFAs, low SFA/cholesterol); scored 1–5, higher indicating greater adherence	High adherence to the portfolio diet linked to reduced risk of total CVD (11%), CHD (14%), and heart failure (17%), but not stroke; findings remained consistent across all subgroups.	Self-reported dietary intake, cohort restricted exclusively to women, and inability to establish causality due to the observational design.
Glenn et al. (2023a)/ Prospective Cohort Study (Pooled Analysis of Three Large Cohorts)	A total of 210,240 adults (166,270 women, 43,970 men) free of cardiovascular disease and cancer at baseline across 3 prospective cohorts: NHS (73,924 women, aged 30–55), NHSII (92,346 women, aged 25–42), and HPFS (43,970 men, aged 40–75)	Up to 30 years of follow-up (NHS: 1984–2016; NHSII: 1991–2017; HPFS: 1986–2016)	Adherence evaluated via a plant-based PDS assigning positive scores to plant protein, nuts/seeds, viscous fiber, phytosterols, and MUFAs, and negative scores to foods high in saturated fat and cholesterol.	It was reported that participants with the highest adherence to the PDS had a 14% lower risk of total CVD, coronary heart disease, and stroke compared to those with the lowest adherence.	Observational design and reliance on self-reported data.
Glenn et al. (2023b)/ Prospective Cohort Study (WHI Data)	145,299 postmenopausal women free of diabetes at baseline (aged 50–79 years)	Mean follow-up of 16.0 years (between 1993 and 2021)	Derivation of a 6-component PDS (6–30 points) using an FFQ (plant protein, nuts, viscous fiber, phytosterols, MUFAs, and low SFA/cholesterol); evaluation of adherence and T2D risk compared to DASH and aMED diets	In the group with the highest adherence to the plant-based, cholesterol-lowering portfolio diet, the risk of developing T2DM was significantly reduced by 23% (13% after adjustment for BMI); this protective effect was found to be directly driven particularly by viscous fiber, plant sterols, and low saturated fat components.	Limited FFQ assessments (1–2), postmenopausal female cohort only, self-reported diabetes medication use, and residual confounding.
Kavanagh et al. (2024)/ Patient-Level Pooled Analysis of Two Randomized Dietary Trials (DMGI and DM-MRI Studies)	267 adults with T2DM	6 months	Evaluating the association between the portfolio diet and HbA1c as a determinant of glycemic control among adults with T2DM	Greater portfolio diet adherence significantly associated with lower HbA1c (7.5-point increase = 0.3% reduction), driven primarily by nuts/seeds and plant protein (particularly legumes).	Secondary analysis design, inability to establish direct causality, low intakes of plant sterols and MUFA (limiting the evaluation of their relationship with glycemic control in this cohort), and limited demographic diversity.
Kavanagh et al. (2025)/ Prospective Cohort Study	14,835 US adults (NHANES III)	An average of 22 years	Adherence measurement using the PDS	An 8-point increase in the PDS is associated with a 12% reduction in CVD mortality, a 14% reduction in CHD mortality, and a 12% reduction in all-cause mortality.	Cross-sectional, self-reported dietary assessment at a single time point and potential misclassification bias.
Chen et al. (2025)/ Cross-Sectional Analysis	1,507 young adults (mean age: 23, 69% female)	Dietary intake of the participants was assessed using a 1-month (FFQ).	Investigation of the association of the PDS with LDL-C and other established cardiovascular risk factors among young adults.	Higher PDS is associated with lower LDL-C, DBP, and adiposity.	Cross-sectional design precluding causal inferences and single-center university population.
Xu et al. (2025)/ Double-Blind, Randomized Controlled Crossover Trial	13 adults with metabolic syndrome (Singapore)	4-week intervention	Healthy eating pattern plus daily 2 g plant sterols (provided in soy milk)	A healthy dietary pattern combined with the consumption of plant sterol-rich foods exerted favorable effects in controlling blood pressure and reducing long-term CVD risk in individuals with metabolic syndrome, independently of endothelial function.	Small sample size, reduced dietary adherence due to coronavirus disease 2019 pandemic restrictions, and short study duration.
Malmir et al. (2025)/ Prospective Population-Based Cohort Study	2,188 adults (Tehran)	8.9 years	Adherence assessment via PDS and association with T2D risk	Although adherence to the portfolio diet did not significantly reduce the risk of T2DM, nut consumption was reported to be inversely associated with the incidence of T2DM.	Measurement errors inherent to the FFQ and potential confounding by local dietary patterns (high red meat consumption).

Declarations

Competing Interests

The authors declare that they have no financial or non-financial competing interests.

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Ethics Statement

Ethics committee approval was not required for this study because it did not involve human participants, animal experiments, or identifiable personal data.

Data Availability Statement

Not applicable.

AI Statement

The authors used Gemini (Google) only for language editing, translation, and formatting support. All scientific content and interpretations remain the responsibility of the authors.

Author Contributions

S. Kılıç: Conceptualization, Investigation, Writing – Original Draft.

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