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(REVIEW ARTICLE)

A review of key dietary patterns and the risk of obesity, type 2 diabetes, and cardiovascular diseases

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Abstract

This review examines how major dietary patterns influence the risk of obesity, type 2 diabetes, and cardiovascular diseases. Eighteen recent studies (between 2021 and 2026) were analyzed using a thematic approach. Evidence consistently shows that whole diet patterns such as the Mediterranean, DASH, Healthy Eating Index, and healthful plant-based diets lower cardiometabolic risk by improving lipid profiles, reducing inflammation, and supporting healthy body weight. Studies also show that dietary fat quality matters: diets high in saturated fats increase obesity risk, while those rich in polyunsaturated fats from nuts and seeds are protective. Research on plant-based diets highlights that diet quality is essential. Healthful plant-based diets reduce BMI, hypertension, and myocardial infarction risk, with especially strong benefits for individuals with high genetic susceptibility. Global studies reveal that Westernized diets are driving rising obesity and chronic disease in regions such as the Eastern Mediterranean, China, Myanmar, and Japan, often replacing protective traditional diets. Public health guidelines, including the Dietary Guidelines for Americans and American Heart Association recommendations, support whole-diet approaches but face challenges due to low population adherence, food insecurity, and cultural barriers. Overall, the review concludes that promoting nutrient-dense, culturally adaptable dietary patterns and addressing structural barriers are essential for reducing obesity, type 2 diabetes, and cardiovascular disease.

Keywords: Type-2 Diabetes; Cardiovascular Disease; Non-Communicable Disease; Obesity and Dietary Pattern

1. Introduction

Obesity, type 2 diabetes (T2D), and cardiovascular diseases (CVD) remain the leading causes of morbidity and mortality worldwide, driven in large part by rapid changes in dietary habits, food environments, and lifestyle patterns (Shang *et al*., 2023). A growing body of evidence demonstrates that diet quality is one of the most powerful modifiable determinants of cardiometabolic health (Wang *et al*., 2023). However, contemporary nutrition science has shifted away from evaluating isolated nutrients toward examining whole dietary patterns, recognizing that foods and nutrients interact synergistically within complex dietary matrices (Gomez-Delgado *et al*., 2021; Nestel & Mori, 2022). This shift has led to the development of multiple dietary pattern indices, such as the Mediterranean Diet, the dietary approaches to stop hypertension (DASH) diet, Healthy Eating Index (HEI), and plant-based diet indices, that aim to capture the cumulative effects of habitual eating behaviors on long-term health outcomes.

Despite substantial progress, literature remains fragmented across populations, methodologies, and dietary frameworks. For example, while some studies emphasize the cardio-protective effects of Mediterranean and plant-based diets (Heianza *et al*., 2021; Chen *et al*., 2022), others focus on the metabolic consequences of specific macronutrient distributions, such as saturated versus polyunsaturated fat intake (Brayner *et al*., 2021). Regional analyses further complicate the landscape, showing that nutrition transitions (i.e. the adoption of Westernized, energy

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dense diets) have accelerated obesity and non-communicable disease (NCD) burdens in regions such as the Eastern Mediterranean and parts of Asia (AlJawaldeh & Abbass, 2022; Zhao *et al*., 2022). At the same time, national dietary guidelines, including the Dietary Guidelines for Americans (DGA) and the American Heart Association (AHA) dietary guidance, increasingly emphasize whole diet approaches but face challenges in population adherence (Snetselaar *et al*., 2021; Gardner *et al*., 2023).

These inconsistencies highlight several gaps in the literature. First, there is limited integration across studies that examine dietary patterns from different conceptual frameworks (i.e., food-based and pattern-based). Second, evidence from diverse populations remains uneven, with some ethnic groups (e.g., Hispanics/Latinos) receiving more focused investigation than others (Chen *et al*., 2022), while many low- and middle-income regions also remain understudied despite high NCD burdens (AlJawaldeh & Abbass, 2022). Third, although emerging research suggests that genetic predisposition may modify dietary effects (Heianza *et al*., 2021), precision nutrition remains underdeveloped in population level dietary pattern research. Finally, there is a need for clearer synthesis of how dietary patterns influence obesity, T2D, and CVD collectively, rather than in isolation.

The purpose of this literature review is to systematically synthesize findings from literature to clarify how key dietary patterns influence the risk of obesity, T2D, and CVD. By organizing the literature thematically (healthy dietary patterns, dietary fat composition, plant-based diets and genetics, global nutrition transitions, and public health dietary frameworks) this review aims to integrate diverse strands of evidence into a cohesive narrative.

2. Methodology

This literature review aims to synthesize and critically evaluate the current evidence on the relationship between key dietary patterns and the risk of obesity, type 2 diabetes, and cardiovascular diseases. Drawing exclusively on 18 high-quality empirical and review studies, this review integrates findings across epidemiological, clinical, genetic, socio-cultural, and policy-oriented domains. A systematic literature review approach was adopted in this study because the subject matter was narrower and more specific to warrant a scoping literature review method. A review protocol was outlined prior to conducting the systematic review, which is in accordance with the review guidelines proposed by Kitchenham *et al*. (2010). The research questions were first defined, after which the keywords identified in this research were input into databases to select the relevant literature materials. The databases that were used to source literature materials in this study included: Science Direct, Google Scholar, Web of Science, and Research Gate. Search keywords or statements used in this study are as follows:

1. Key Dietary Patterns and the Risk of Obesity, Type 2 Diabetes, and Cardio-vascular diseases in the United States OR US
2. Dietary Patterns AND Risk of Obesity
3. Dietary Patterns AND Risk of Type 2 Diabetes
4. Dietary Patterns AND Risk of Cardiovascular Diseases

A selection criterion consisting of documents within nutrition or food science and public health was used to filter the documents and select relevant literature. A total of 77 literature materials were obtained using the above keywords and criteria for searching literature in the various search engines. Out of this number, only 18 were selected after excluding articles published before 2021 and articles written in languages other than English. All pertinent information was gathered from the selected literature materials and subsequently synthesized in accordance with the main theme of the research. A thematic analysis was used to discuss the relevant information captured in the literature section.

2.1. PRISMA Flow Diagram Used In this Study

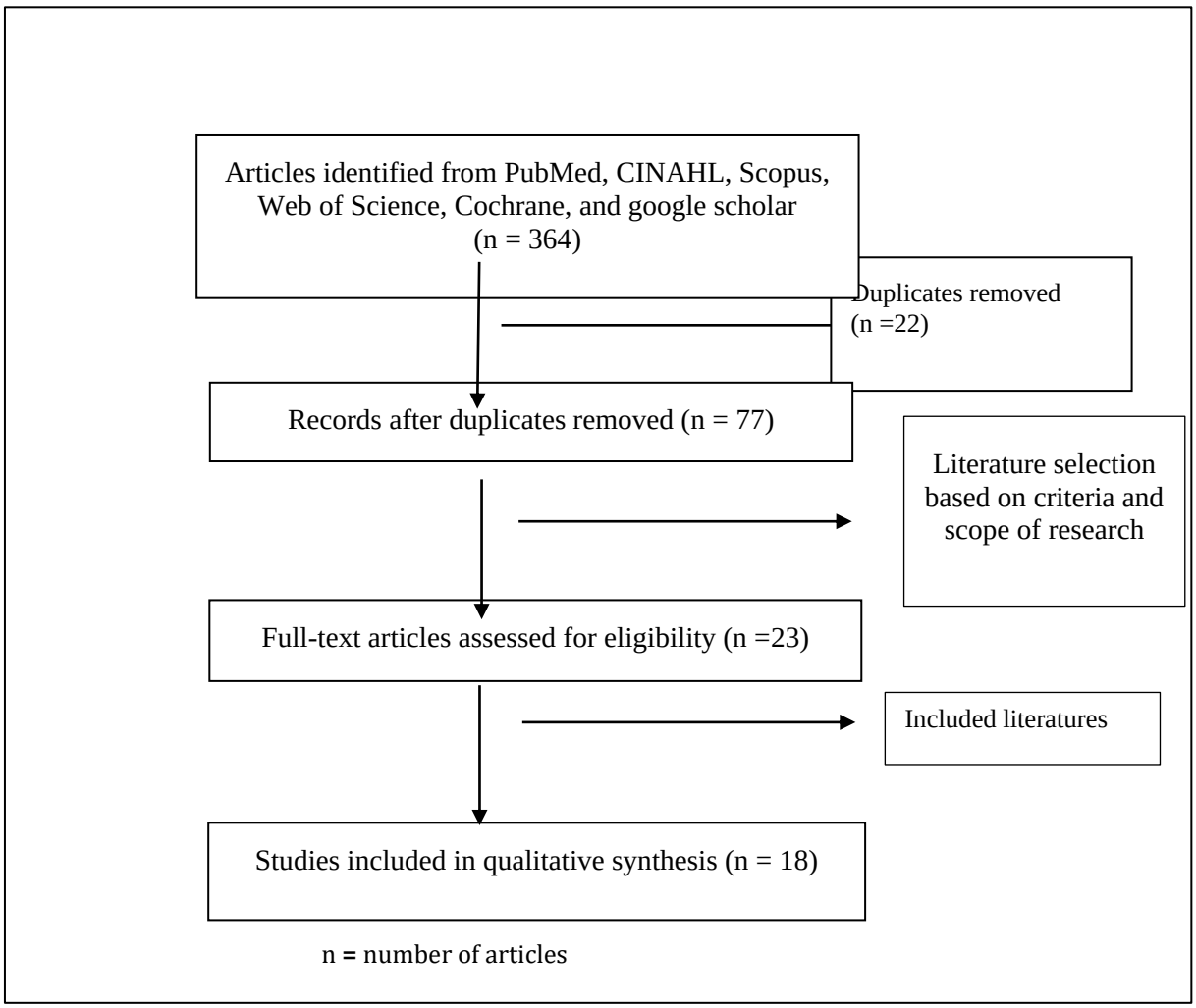

Figure 1 PRISMA Flow diagram showing the article selection process.

3. Findings from literature

3.1. Healthy Dietary Patterns and Cardiometabolic Risk

A substantial portion of contemporary nutrition research emphasizes the role of whole dietary patterns, rather than isolated nutrients, in shaping long-term cardiometabolic outcomes. Across multiple studies, consistent evidence demonstrates that adherence to high-quality dietary patterns such as the Mediterranean Diet, DASH diet, Healthy Eating Index (HEI), and healthful plant-based diets is associated with reduced risk of obesity, type 2 diabetes (T2D), and cardiovascular disease (CVD). This theme synthesizes findings from Gomez-Delgado *et al*. (2021), Nestel and Mori (2022), Chen *et al*. (2022), and Gardner *et al*. (2023), highlighting converging evidence on the protective effects of healthy dietary patterns and the mechanisms through which they influence cardiometabolic health.

Chen *et al*. (2022) provide one of the most comprehensive analyses of dietary patterns and CVD risk within a large, ethnically diverse U.S. Hispanic/Latino group. Using three validated dietary indices (i.e. the Alternate Mediterranean Diet [aMED], the Healthy Eating Index2015 [HEI2015], and the healthful Plant-Based Diet Index [hPDI]), the study demonstrates that higher adherence to any of these patterns significantly reduces the risk of incident cardiovascular disease (CVD). Specifically, a one-standard-deviation increase in aMED and hPDI scores was associated with a 26% reduction in CVD risk, while the same increase in HEI2015 scores yielded a 20% reduction. These findings emphasize the robustness of healthy dietary patterns across different scoring systems and cultural sub-groups. Importantly, Chen *et al*. (2022) also highlight substantial variation in dietary quality across Hispanic/Latino heritage groups. Individuals of Mexican background exhibited the highest adherence to healthy dietary patterns, whereas Puerto Rican participants showed the lowest adherence; patterns that mirrored sub-group differences in CVD prevalence. This suggests that

cultural dietary traditions may confer protective benefits that erode with acculturation, a finding consistent with broader literature on dietary transitions.

3.2. Mechanistic insights from dietary pattern research

Gomez-Delgado *et al*. (2021) provide mechanistic context by synthesizing evidence on how whole dietary patterns influence lipo-protein metabolism. Their review emphasizes that the "food matrix", which is the interaction of nutrients within whole foods, plays a more predictive role in CVD risk than individual nutrient intake. For example, Mediterranean dietary patterns rich in unsaturated fats, fiber, and polyphenols reduce low density lipo-protein (LDL) cholesterol, decrease LDL oxidation, and enhance high density lipo-protein (HDL) efflux capacity. These mechanisms directly target atherosclerotic processes, offering a biological explanation for the epidemiological findings reported by Chen *et al*. (2022). Similarly, Nestel and Mori (2022) argue that dietary patterns exert synergistic effects on blood pressure, lipid profiles, and systemic inflammation. They highlight that the Mediterranean dietary approaches to stop hypertension (DASH) diet, and plant-based diets consistently outperform nutrient-specific interventions because they address multiple metabolic pathways simultaneously. This reinforces the shift in global dietary guidelines toward pattern-based recommendations.

3.3. Alignment with public health dietary guidelines

Gardner *et al*. (2023) extend this evidence by evaluating how popular dietary patterns align with the American Heart Association's (AHA) 2021 dietary guidance. Their analysis categorizes diets into four tiers based on alignment scores, with Tier 1 diets (i.e. diets such as Mediterranean, DASH, Pescatarian, and Vegetarian patterns), achieving the highest scores (≥85). These patterns align strongly with AHA recommendations emphasizing whole grains, fruits, vegetables, lean proteins, and limited intake of added sugars and saturated fats. Conversely, Tier 4 diets (such as ketogenic and Paleolithic dietary patterns) scored poorly (≤53) due to their high saturated fat content and exclusion of fiber rich foods. This classification supports the findings of Gomez-Delgado *et al*. (2021), Chen *et al*. (2022), and Nestel and Mori (2022), all of whom emphasize the importance of plant-based, nutrient-dense dietary patterns for cardio-metabolic health.

3.4. Dietary Fat Composition and Metabolic Outcomes

Dietary fat quality has emerged as a critical determinant of metabolic health influencing obesity, lipid metabolism, and cardiovascular disease (CVD) risk. While earlier nutrition research focused on total fat intake, contemporary evidence emphasizes the importance of fat type, particularly the balance between saturated fatty acids (SFAs) and polyunsaturated fatty acids (PUFAs). The studies by Brayner *et al*. (2021) and Gomez-Delgado *et al*. (2021) provide complementary insights into how fat-based dietary patterns shape metabolic outcomes.

3.5. Fat-based dietary patterns and obesity risk

Brayner *et al*. (2021) conducted a longitudinal analysis of 16,523 UK Biobank participants to examine how dietary patterns characterized by fat type predict obesity and type 2 diabetes. Using reduced rank regression, the authors identified two primary dietary patterns (DP):

- **DP1:** High intake of all fat types (SFAs, MUFAs, PUFAs), largely from nuts, seeds, and butter.
- **DP2:** High SFA intake from butter, high-fat cheese, and ice cream, combined with low PUFA and MUFA intake due to low consumption of nuts and seeds.

The findings show that only DP2, the high SFA/low PUFA pattern, was significantly associated with increased incidence of both overall and abdominal obesity (Brayner *et al*., 2021). In contrast, DP1, despite including butter in their dietary pattern, did not increase the risk of obesity, likely due to its concurrent high intake of nuts and seeds, which are rich in unsaturated fats and bioactive compounds (Brayner *et al*., 2021). Interestingly, neither DP1 nor DP2 showed a significant association with T2D incidence over the 6.3-year follow-up. This suggests that while fat quality strongly influences adiposity, its relationship with T2D may be more complex or require longer follow-up periods to detect significant effects (Brayner *et al*., 2021).

3.6. Mechanistic insights: lipoprotein metabolism and fat quality

Gomez-Delgado *et al*. (2021) provide mechanistic context by synthesizing evidence on how dietary fats influence lipoprotein metabolism and CVD risk. The findings of Gomez-Delgado *et al*. (2021) pointed out that SFAs increase LDL cholesterol by altering hepatic LDL receptor activity, contributing to atherogenesis. This mechanism aligns with the findings of Brayner *et al*. (2021) indicating that high SFA dietary patterns increase obesity risk, a major CVD risk factor. Furthermore, Gomez-Delgado *et al*. (2021) indicated that PUFAs, particularly omega3 and omega6 fatty acids, reduce

LDL cholesterol, improve triglyceride levels, and enhance HDL functionality. These effects help explain why DP1, which is rich in nuts and seeds, did not increase obesity risk despite containing some SFA sources. The study by Gomez-Delgado *et al*. (2021) further emphasizes that modern eating patterns keep individuals in a prolonged postprandial state, during which triglyceride-rich lipoproteins circulate at elevated levels. Diets rich in unsaturated fats, such as the Mediterranean diet, help modulate this postprandial response, reducing residual CVD risk. Gomez-Delgado *et al*. (2021) argue that the health effects of dietary fats depend not only on the fatty acid profile but also on the food matrix. For example, dairy fats consumed within fermented foods may have different metabolic effects than isolated SFAs. These mechanistic insights reinforce the epidemiological findings of Brayner *et al*. (2021), demonstrating that fat quality (measured as the SFA to PUFA ratio) plays a central role in metabolic health.

3.7. Plant-Based Diets, Genetics, and Precision Nutrition

Plant-based dietary patterns have gained increasing attention for their potential to reduce obesity, T2D, and CVD. However, emerging evidence suggests that the benefits of plant-based diets may vary depending on diet quality and individual genetic predisposition. The studies by Heianza *et al*. (2021) and Milenkovic *et al*. (2021) provide critical insights into how plant-based dietary patterns interact with genetic and metabolic factors, offering a foundation for precision nutrition approaches.

3.8. Healthful plant-based diets and genetic risk of obesity

Heianza *et al*. (2021) conducted one of the largest prospective analyses examining how adherence to a healthful plant-based diet index (hPDI) interacts with genetic susceptibility to obesity to influence cardiometabolic outcomes. Using data from 121,799 UK Biobank participants and a 75-variant genetic risk score (GRS), the study demonstrates that individuals with high genetic risk experience greater metabolic benefits from adhering to a healthful plant-based diet than those with low genetic risk. Heianza *et al*. (2021) indicated that healthy plant-based diets more effectively lowered BMI among individuals with high GRS. Additionally, High hPDI adherence was associated with a significantly lower probability of untreated hypertension in genetically susceptible individuals. Heianza *et al*. (2021) further indicated that among high GRS participants, those in the highest hPDI tertile range had a 46% lower risk of myocardial infarction (MI) compared to those in the lowest tertile range (HR = 0.54). Finally, nuts and vegetables showed the strongest interactions with genetic risk in reducing MI. These findings suggest that plant-based diets may be particularly effective for individuals genetically predisposed to obesity and CVD, supporting the concept of targeted dietary interventions.

3.9. Quality matters: Healthful vs. Unhealthful plant-based diets

A critical insight from Heianza *et al*. (2021) is that not all plant-based diets are equally beneficial. The hPDI specifically emphasizes whole grains, fruits, vegetables, nuts, legumes, and healthy oils, while minimizing refined grains, sugars, and processed plant foods. This distinction is essential because unhealthful plant-based diets, high in refined carbohydrates and added sugars, may not confer the same cardiometabolic benefits. Milenkovic *et al*. (2021) reinforce this point by highlighting the role of bioactive compounds in plant foods, such as polyphenols, phytosterols, and antioxidants, which contribute to improved endothelial function, lipid metabolism, and inflammation reduction. Their study emphasizes that the cardio-protective effects of plant-based diets arise not only from the absence of animal products but from the presence of nutrient-dense, minimally processed plant foods.

3.10. Mechanistic pathways linking plant-based diets to cardiometabolic health

The metabolic benefits of healthful plant-based diets can be explained through several biological pathways. Plant-based diets rich in unsaturated fats and fiber reduce LDL cholesterol and triglycerides while improving HDL functionality (Milenkovic *et al*., 2021). Bioactive compounds in nuts, vegetables, and whole grains modulate inflammatory pathways, which is particularly relevant for genetically susceptible individuals (Heianza *et al*., 2021). High fiber intake improves glycemic control and reduces insulin resistance, lowering T2D risk. These pathways help explain why individuals with high genetic risk derive disproportionate benefits from healthful plant-based diets.

3.11. Global Nutrition Transition and Regional Dietary Patterns

Global dietary patterns have undergone profound transformations over the past several decades, driven by rapid urbanization, globalization of food markets, socio-economic change, and shifts in cultural norms. These transitions, often characterized by increased consumption of energy-dense, nutrient-poor foods, have contributed to rising rates of obesity, T2D, and CVD across diverse regions. The studies by Al-Jawaldeh and Abbass (2022), Zhao *et al*. (2022), Xiao *et al*. (2021), and Ueno *et al*. (2021) provide critical insights into how regional dietary patterns evolve and how these shifts influence cardio-metabolic risk. Together, they highlight the importance of contextualizing dietary interventions within cultural, economic, and environmental realities.

3.12. The case of eastern mediterranean region: westernization and obesity epidemics

Al-Jawaldeh and Abbass (2022) present a comprehensive review of the Eastern Mediterranean Region (EMR), documenting a dramatic nutrition transition from traditional, high-fiber diets to Westernized dietary patterns rich in salt, free sugars, saturated fats, and ultra-processed foods. This shift has contributed to some of the highest obesity rates globally, with more than 35% of adults classified as obese in several EMR countries. Childhood obesity is also rising rapidly, signaling a worsening long-term public health crisis. Many EMR countries exceed the WHO recommendation of limiting free sugars to < 10% of daily energy intake, and salt intake often reaches double the recommended 5 g day^{-1}. The EMR has the highest global rates of physical inactivity, particularly among women and adolescents, compounding dietary risks. Low and middle-income countries in the region face disproportionate burdens due to limited healthcare infrastructure and aggressive marketing of unhealthy foods. These findings illustrate how structural and environmental factors drive obesity and NCD risk in the EMR.

3.13. The case of China: rapid urbanization and shifting dietary patterns

Zhao *et al*. (2022) examine dietary patterns in China, a country undergoing one of the world's most rapid nutrition transitions. Their findings highlight a shift from traditional diets rich in vegetables, legumes, and whole grains toward patterns characterized by increased consumption of red meat, refined grains, and processed foods. This transition has paralleled rising rates of obesity, hypertension, and T2D. According to Zhao *et al*. (2022), dietary patterns (DP) high in rice, vegetables, and fish are associated with lower CVD and metabolic risk. Conversely, DPs high in red meat, processed foods, and refined grains are associated with increased obesity and hypertension. Dietary patterns reflecting transitional diets have been influenced by urbanization and income growth. Zhao *et al*. (2022) emphasize that the erosion of traditional dietary habits is a major contributor to China's escalating NCD burden, mirroring trends observed in the EMR.

3.14. The case of Myanmar: dietary diversity and cardiometabolic risk

Xiao *et al*. (2021) provide insights into dietary patterns in Myanmar, a lower-middle-income country where dietary diversity remains limited. The study by Xiao *et al*. (2021) identifies several distinct dietary patterns, including: (i) Traditional Pattern: high in rice and vegetables; (ii) Westernized Pattern: increased intake of processed foods, oils, and animal products; and (iii) Urbanized Pattern: Reflecting greater access to packaged foods and sugary beverages.

According to Xiao *et al*. (2021), Westernized and urbanized patterns were associated with higher BMI, elevated blood pressure, and increased risk of metabolic syndrome. In contrast, the traditional pattern, though limited in diversity, was associated with lower cardiometabolic risk. Xiao *et al*. (2021) highlight that Myanmar's nutrition transition is still in its early stages, presenting an opportunity for preventive interventions before Westernized patterns become fully entrenched.

3.15. The case of Japan: traditional diets and cardio-metabolic protection

Ueno *et al*. (2021) examine dietary patterns in Japan, a country known for its historically low rates of obesity and CVD. Their findings highlight the protective effects of the traditional Japanese diet, characterized by (i) High consumption of fish, seaweed, soy products, and vegetables, (ii) Moderate rice intake and (iii) Low consumption of red meat and saturated fats. This dietary pattern is associated with favorable lipid profiles, lower BMI, and reduced CVD risk. However, Ueno *et al*. (2021) note that Westernized dietary habits, particularly increased intake of red meat, processed foods, and sugary beverages, are becoming more prevalent among younger generations, posing a threat to Japan's historically strong cardio-metabolic health profile.

3.16. Dietary Guidelines, Public Health Frameworks, and Implementation Challenges

Dietary guidelines and public health frameworks play a central role in shaping population-level nutrition behaviors and reducing the burden of obesity, T2D, and CVD. However, the effectiveness of these guidelines depends not only on the scientific evidence underpinning them but also on their clarity, cultural adaptability, and feasibility within real-world food environments. The studies by Snetselaar *et al*. (2021), Gardner *et al*. (2023), Phillips (2021), and AlAufi *et al*. (2022) provide a comprehensive understanding of how dietary guidelines are developed, how popular diets align with evidence-based recommendations, and what barriers hinder widespread adoption.

3.17. The dietary guidelines for Americans (2020–2025): a life-stage approach

Snetselaar *et al*. (2021) offer an in-depth overview of the Dietary Guidelines for Americans (DGA) 2020–2025, marking a significant evolution in U.S. nutrition policy. For the first time, the DGA adopts a life stage approach, providing tailored

recommendations from birth through older adulthood. This shift acknowledges that nutritional needs and dietary impacts vary across developmental stages. The DGA includes:

i. Quantitative limits on added sugars (<10% of daily calories), saturated fats (<10% of daily calories), and sodium (<2,300 mg day^{-1}).

ii. Three core dietary patterns consistently associated with improved health outcomes:

   a. Healthy U.S.-Style Dietary Pattern

   b. Healthy Mediterranean-Style Dietary Pattern

   c. Healthy Vegetarian Dietary Pattern

iii. The 85/15 rule, which states that 85% of daily calories should come from nutrient dense foods, leaving only 15% for discretionary intake.

Snetselaar *et al*. (2021) emphasize that most Americans fail to meet these recommendations, with 85% of adults not consuming adequate vegetables and many exceeding recommended limits for added sugars and sodium. This gap between guidelines and actual dietary behavior underscores the need for stronger implementation strategies.

3.18. Alignment of popular diets with evidence-based guidelines

Gardner *et al*. (2023) evaluate how ten popular dietary patterns align with the American Heart Association's (AHA) 2021 dietary guidance. Their analysis introduces a quantitative alignment score (1–100), offering a standardized method for comparing diverse diets. The findings of Gardner *et al*. (2023) categorize diets into four tiers: (i) Tier 1 (Scores ≥85): DASH, Mediterranean, Pescatarian, Vegetarian (ii) Tier 2 (Scores 71–85): Vegan, Low Fat (iii) Tier 3 (Scores 54–70): Very Low Fat, Low Carbohydrate and (iv) Tier 4 (Scores ≤53): Paleolithic, Ketogenic.

High tier diets align strongly with the recommendations of AHA emphasizing whole grains, fruits, vegetables, lean proteins, and limited intake of added sugars and saturated fats. In contrast, ketogenic and Paleolithic diets scored poorly due to their high saturated fat content and exclusion of fiber-rich foods. Gardner *et al*. (2023) also highlight that even the most cardio-protective diets must be culturally adaptable to be effective. For example, Mediterranean and DASH patterns can be modified into African Heritage or Asian versions without losing their health benefits.

3.19. Evidence-based dietary patterns for cardio-vascular disease prevention-

Phillips (2021) reinforces the importance of dietary patterns in CVD prevention, emphasizing that diets rich in fruits, vegetables, whole grains, and unsaturated fats consistently reduce CVD risk. Phillips (2021) argues that dietary patterns should be viewed as complementary to pharmacotherapy rather than alternatives, particularly for individuals with established metabolic risk factors. This perspective aligns with Nestel and Mori (2022), who highlight the synergistic effects of whole foods on lipid metabolism, inflammation, and blood pressure. Together, these studies support the integration of dietary pattern modification into standard clinical care.

Table 1 Thematic Analysis Table of Findings from Literature

Theme	Key Studies	Major Findings	Critical Insights	Implications for Obesity, T2D, and CVD
1. Healthy Dietary Patterns and Cardiometabolic Risk	Chen *et al*. (2022); Gomez-Delgado *et al*. (2021); Nestel & Mori (2022); Gardner *et al*. (2023)	Mediterranean, DASH, and healthful plant-based diets reduce CVD risk. Higher HEI, aMED, and hPDI scores linked to lower incident CVD. Synergistic nutrient interactions improve lipid metabolism. Tier 1 diets (DASH, Mediterranean) align strongly with AHA guidance.	Whole diet approaches outperform nutrient-specific strategies. Cultural dietary patterns influence adherence and outcomes. Mechanistic evidence supports epidemiological findings.	Strong evidence for promoting whole diet patterns to reduce obesity, T2D, and CVD. Culturally adaptable dietary frameworks are essential.
2. Dietary Fat Composition and Metabolic Outcomes	Brayner *et al*. (2021); Gomez-Delgado *et al*. (2021)	High SFA/low PUFA patterns increase obesity risk. PUFA-rich foods (nuts, seeds) mitigate metabolic risk.	Fat quality matters more than total fat intake. Food matrix influences metabolic effects of fats. Mechanistic pathways explain SFA-driven lipid dysfunction.	Replace SFAs with PUFAs to reduce obesity and CVD risk.
3. Plant-Based Diets, Genetics, and Precision Nutrition	Heianza *et al*. (2021); Milenkovic *et al*. (2021)	Healthful plant-based diets reduce BMI, hypertension, and MI risk. Strong gene–diet interactions: high GRS individuals benefit most. Nuts and vegetables show strong protective effects.	Diet quality is crucial—unhealthful plant diets offer limited benefits. Bioactive compounds (polyphenols, phytosterols) drive cardio-protection. Precision nutrition is feasible and impactful.	Healthful plant-based diets can offset genetic risk for obesity and CVD.
4. Global Nutrition Transition and Regional Dietary Patterns	Al-Jawaldeh & Abbass (2022); Zhao *et al*. (2022); Xiao *et al*. (2021); Ueno *et al*. (2021)	Westernization increases obesity, T2D, and CVD across EMR, China, Myanmar, Japan.	Structural and cultural factors shape dietary behaviors. Traditional diets erode rapidly under globalization.	Public health strategies must preserve traditional beneficial diets.

		Traditional diets (vegetable- and fish-based) are protective. Urbanization and economic growth accelerate dietary shifts.	Regions differ in pace and pattern of nutrition transition.	Interventions must address food environments, not just individual behavior.
5. Dietary Guidelines, Public Health Frameworks, and Implementation Challenges	Snetselaar *et al*. (2021); Gardner *et al*. (2023); Phillips (2021); AlAufi *et al*. (2022); Volek *et al*. (2021)	DGA 2020–2025 adopts a life stage approach. AHA alignment scores identify most cardio-protective diets. Population adherence to guidelines remains low.	Structural barriers (food insecurity, marketing, socioeconomic factors) limit adherence. Guidelines must be culturally adaptable. Dietary counseling should complement pharmacotherapy.	Effective prevention requires multi-level strategies: policy, environment, culture, and clinical care. Guidelines alone are insufficient without structural change.

3.20. Barriers to implementation

Despite strong evidence supporting healthy dietary patterns, multiple structural barriers hinder adherence. According to Gardner *et al*. (2023), limited access to affordable, nutrient-dense foods disproportionately affects low-income populations. Furthermore, systemic inequities influence food availability, marketing, and dietary behaviors. Finally, aggressive marketing of ultra-processed foods, which are often cheaper, more accessible, and heavily advertised, undermines public health efforts. AlAufi *et al*. (2022) further highlight the importance of culturally tailored dietary interventions, noting that dietary behaviors are deeply embedded in cultural norms, religious practices, and social environments. The findings of AlAufi *et al*. (2022) suggest that public health strategies must consider cultural context to achieve meaningful behavior change.

4. Critical Synthesis and Discussion

Across all themes, a consistent finding is that whole diet patterns outperform nutrient-specific approaches in predicting and reducing cardiometabolic risk. Studies examining Mediterranean, DASH, and plant-based diets (Chen *et al*., 2022; Nestel & Mori, 2022; Gardner *et al*., 2023) demonstrate robust associations with reduced CVD, obesity, and hypertension. Mechanistic reviews (GomezDelgado *et al*., 2021; Milenkovic *et al*., 2021) reinforce this by showing that the synergistic interactions among nutrients within whole foods drive improvements in lipid metabolism, inflammation, and endothelial function. This convergence supports the global shift toward pattern-based dietary guidelines, as reflected in the Dietary Guidelines for Americans (DGA) (Snetselaar *et al*., 2021) and the American Heart Association (AHA) alignment scoring system (Gardner *et al*., 2023).

A second major synthesis is the critical role of diet quality, particularly within plant-based diets. Heianza *et al*. (2021) show that healthful plant-based diets, rich in whole grains, vegetables, nuts, and legumes, significantly reduce BMI, hypertension, and myocardial infarction risk, especially among individuals with high genetic susceptibility. Conversely, unhealthful plant-based diets high in refined grains and sugars do not confer these benefits. This distinction is echoed in mechanistic evidence showing that bioactive compounds in whole plant foods (e.g., polyphenols, phytosterols) contribute to cardiometabolic protection (Milenkovic *et al*., 2021). It is obvious that plant-based diets are not inherently protective; their benefits depend on nutrient density and food quality.

The literature reviewed demonstrated that fat type matters more than total fat intake. Brayner *et al*. (2021) show that dietary patterns high in saturated fats (SFAs) and low in polyunsaturated fats (PUFAs) significantly increase obesity risk, while dietary patterns rich in nuts and seeds, despite containing some SFAs, do not. Mechanistic evidence from Gomez-Delgado *et al*. (2021) explains these findings through pathways involving LDL cholesterol elevation, triglyceride metabolism, and postprandial lipid responses. Together, these studies reinforce the importance of replacing SFAs with PUFAs, a recommendation echoed in global dietary guidelines (Snetselaar *et al*., 2021; Nestel & Mori, 2022).

Across diverse regions, westernized dietary patterns consistently correlate with increased risk of obesity, type-2 diabetes, and CVD (Al-Jawaldeh & Abbass, 2022; Zhao *et al*., 2022; Xiao *et al*., 2021; Ueno *et al*., 2021). These transitions involve increased consumption of processed foods, sugary beverages, and animal fats, alongside declining intake of traditional plant-based foods. This pattern highlights the global nature of nutrition-related NCDs and underscores the need for culturally tailored interventions that preserve beneficial traditional dietary practices.

A recurring theme across the reviewed literature is that dietary behavior is shaped by structural factors, including food environments, socio-economic status, cultural norms, and marketing practices. Gardner *et al*. (2023) and Snetselaar *et al*. (2021) emphasize that despite strong evidence supporting healthy dietary patterns, population adherence remains low due to food insecurity, limited access to nutrient-dense foods, and aggressive marketing of ultra-processed products. These findings suggest that dietary guidelines alone are insufficient, requiring effective interventions to address systemic barriers.

5. Conclusion

The reviewed literature demonstrates strong and consistent evidence that dietary patterns are central to preventing obesity, type 2 diabetes, and cardiovascular disease. Across diverse populations and study designs, high-quality dietary patterns (i.e., the Mediterranean, DASH, and healthful plant-based diets) are repeatedly associated with lower incidence of cardiovascular disease, healthier lipid profiles, reduced inflammation, and improved weight outcomes. Mechanistic studies further support these findings by showing that nutrient-dense plant foods and unsaturated fats positively influence lipoprotein metabolism and postprandial lipid responses.

In contrast, westernized dietary patterns high in saturated fats, refined carbohydrates, added sugars, and ultra-processed foods consistently increase metabolic risk. Global evidence from regions such as the Eastern Mediterranean, China, Myanmar, and Japan highlights how rapid nutrition transitions are driving rising non-communicable disease burdens, often replacing protective traditional diets with energy-dense modern foods.

Despite clear scientific consensus, adherence to healthy dietary patterns remains low due to structural barriers such as food insecurity, socio-economic disparities, cultural norms, and pervasive marketing of unhealthy foods. These challenges limit the effectiveness of dietary guidelines like the Dietary Guidelines for Americans and the American Heart Association recommendations. Overall, the literature review emphasizes that improving cardiometabolic health requires not only promoting evidence-based dietary patterns but also addressing environmental, cultural, and policy factors that shape real-world eating behaviors.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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