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Dietary patterns in managing cardiovascular disease: A systematic review

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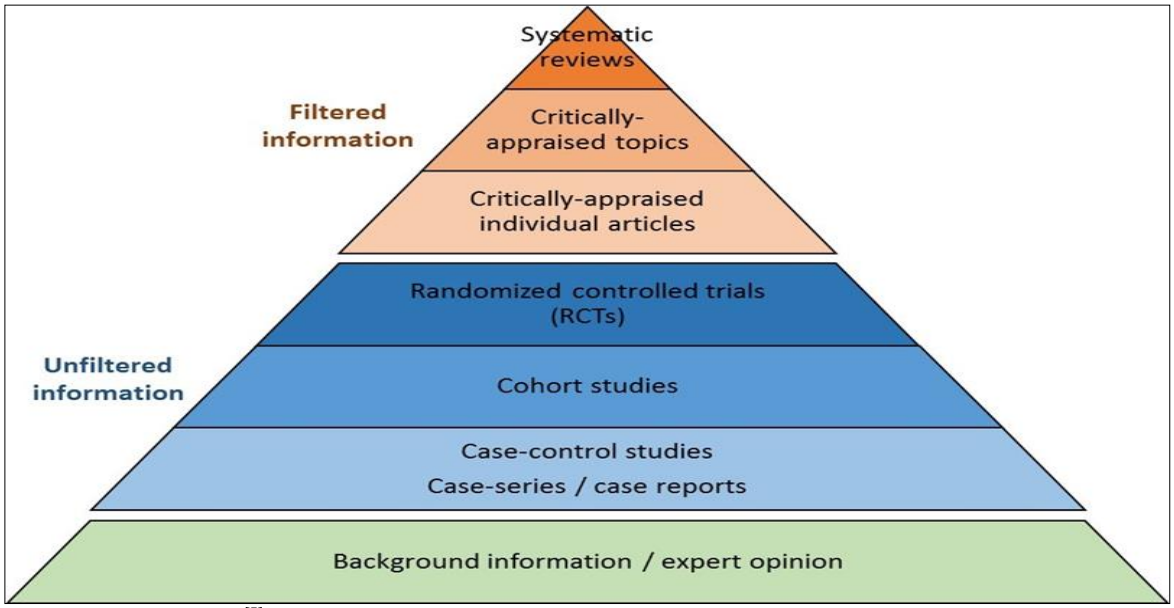
Abstract
Despite substantial possible biological and atomic evidence contrary to the evidence that certain vitamins prevent heart disease. The theoretical preventative effects of completely diets and particular food habits cardiovascular disease have been brought to light by using Nutritional Methods for Heart Disease (DASH) initiative. To ensure a precise evaluation of the correlation between diet and illness, these patterns were assessed in adherence to the latest prevention guidelines for heart disease. Adherence to the "Healthy", "Prudent", "The Mediterranean", and "dash compliant" diets has demonstrated to substantially reduce the incidence of cardiovascular disease by 10-60%, according to extensive observational research. Nevertheless, the statement is devoid of precision due to the omission of the specific research to produce the aforementioned outcomes. While this research seems to lend support to whole-diet approaches for disease prevention, the categorization of dietary scores is based on a limited or erroneous understanding of the correlation between diet and illness. Given the scarcity of high-caliber intervention studies that utilize whole cuisines and condition aims as the primary result, this is particularly concerning. In addition to critiquing diets that are based exclusively on data concerning particular nutrients, this review emphasizes in the notion that general dietary practices reduce the possibility of heart disease. It advocates not only for the adoption of comprehensive dietary and food-based approaches for avoiding heart disease, but also for the enforcement of stricter regulations in this regard, controlled trials.

Keywords: CVD, diet and disease, myocardial infarction, Mediterranean diet, nutrient

Introduction
The relationship between diet and illness can be delineated using an order based on group spectrum of proof as illustrated in Figure 1. Therapeutic research occupies the apex of that pyramid, while cross-cultural and observational studies, which are frequently of a weakened character, are situated at its base (Thiese, 2014) [1]. Despite the abundance of data that future cohort studies have produced establishing associations within particular drugs and ailments, additional research is required. Extra fixed and classified variables have the potential to substantially distort the outcomes (Chen *et al.*, 2022) [2].

We also lack much awareness about the impact of individual meals or entirely diet from study cohorts and therefore we don't know enough information about how distinct diets impact heart health. (Cena & Calder, 2020) [3]. Conversely, yet, several of diet therapy studies have yielded insightful data into the processes behind the linkages associated with CVD; yet, the majority of therapies involving specific nutrients have resulted in either neutrality or unfavourable outcomes. (U.S. Department of Health and Human Services, 2010) [4].

Knowledge on the viability of dietary change in communities that live freely is provided via dietary changes. However, their dependence on indirect indicators rather than clinical outcomes of CVD sometimes limits them.



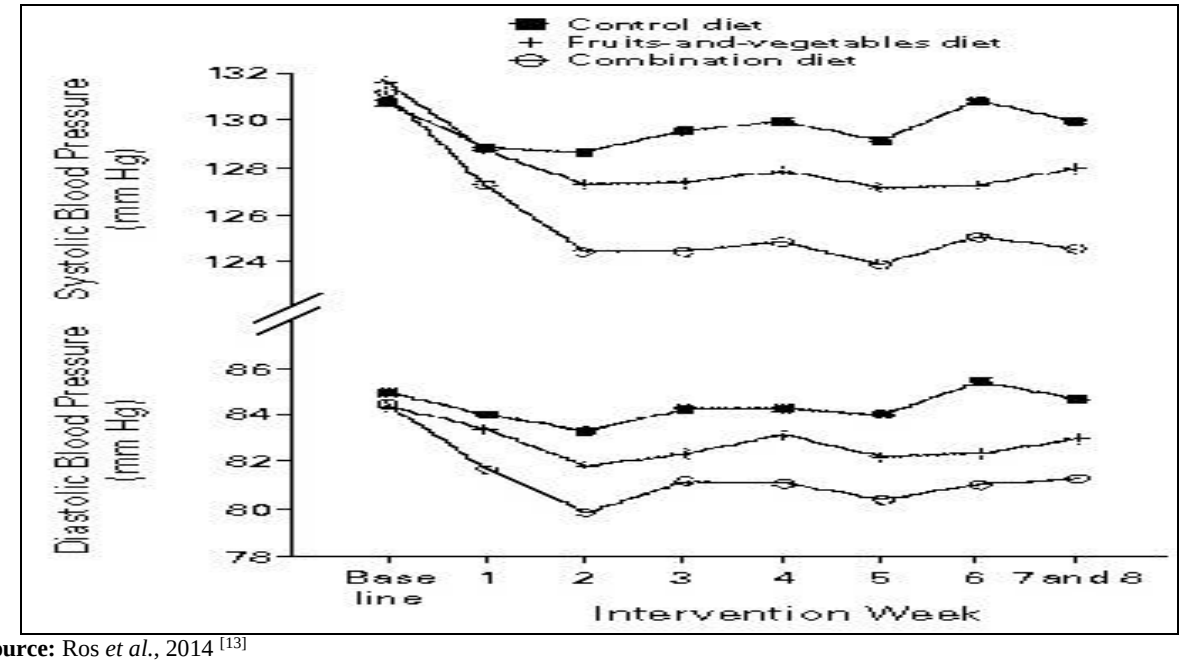
Source: Pan *et al.*, 2018 [5]

Fig 1: Hierarchy of Cohort experimental designs

Differences among nutrient, food, and dietary relationships with cardiovascular disease

Overpowered as breakfasts and diets including a variety of foods, minerals are absorbed via intricate mixes in foods. Associations between a nutrient and other ingredients or foods in the diet may alter the vitamin's biological impact (Gannon & Nuttall, 2006) [6]. As a result, just because a meal includes a nutrient does not mean that it will always have the same impact. The potential health benefits of foods containing micronutrients like folic acid and b-car, as well as the unbiased and unfavorable results of supplementary reduction studies using these single antimicrobial tiny calories, emphasise the discrepancy between the effects of single calories, foods, and meals on wellness (Huang *et al.*, 2012) [7]. The disparity among the effects of particular high-saturated-fat diets, including dairy items, and the following is known is further backed by the cholesterol-raising results observed in experimental feeding trials on nutritional SFA (Dinu *et al.*, 2017) [8]. Recent research indicates that several dairy products are linked to lower rates of cardiovascular disease (CVD) fatality and related risk factors, such as hypertension, while having little to no influence on serum LDL cholesterol. According to these results, suggestions for heart wellness based just on a single vitamin may not be suitable, especially when other supplements are given (Schwingshackl *et al.*, 2019) [53]. Standards based on foods, assets, and entire meals might offer a more logical and thorough method of CVD prevention (Gray, 1999) [10].

A stronger body of research supported by a mix of it requires both empirical data and intervention studies to validate the association between potentially beneficial foods and their impact on illness risk (Parikh *et al.*, 2009) [11]. A stronger body of research supported by a mix intervening and observational data is necessary to collaborate the association between possibly helpful mornings and a decreased likelihood of becoming sick (Young TK, *et al.*, 1993) [12].



Source: Ros *et al.*, 2014 [13]

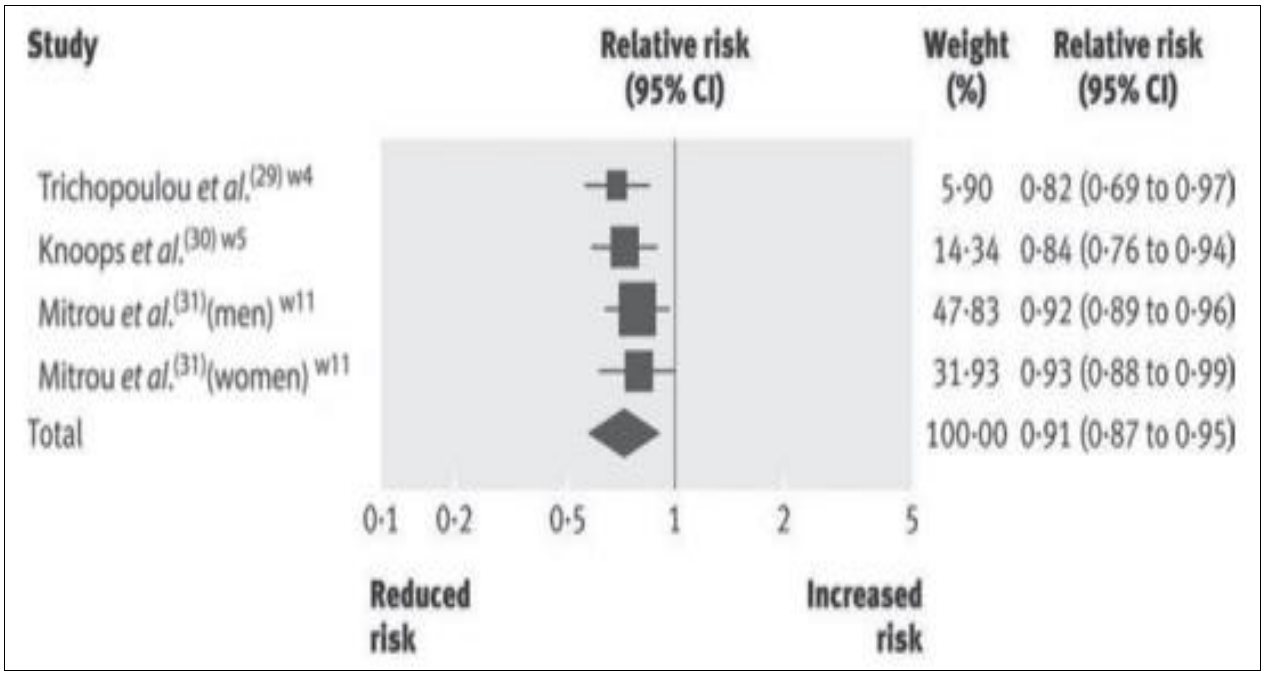
Fig 2: Mean systolic and diastolic must be measured at baseline and throughout each intervention week in order to establish a correlation between potentially beneficial dishes with a reduced risk of ailment

One of the best investigations proving the importance of a diet The Rhône Heart Study helps lower the possibility of CVD. The follow-up trial's objective was to ascertain how the Mediterranean diet affected 605 individuals who had suffered a cardiac event more than five years before (Williams *et al.*, 2013) [14].

For the majority of eating patterns and results, Hana Kahleova's research was graded as having a low to moderate degree of confidence. According to available data, individuals with diabetes might profit from diets such as the Mediterranean diet, DASH, Portfolio, Nordic, fluid meal substitutes, and vegetarianism (Zampelas & Magriplis, 2020) [15]. Paul J. Nestel looks at the data that support suggested diets. Descriptive descriptions of the intake of certain food categories are easier to translate than numbers (Schwingshackl *et al.*, 2018) [48].

Upon integrating primary and secondary endpoints, it was observed that the Mediterranean diet, distinguished by its higher amount of fruits, fish, bread, root and greens when compared to the control diet, the amount of risk was reduced by 76%, thanks to the increased consumption of veggies, fats rich in olive oil, and less red meat. The subject's food was typical of the food habits seen in the USA and Britain as a whole. An improved Mediterranean diet is the one that includes walnuts or extra virgin olive oil was administered to a group of Spanish participants in a more recent trial. Over a 4.8-year follow-up duration, the main endpoint-a composite with heart attacks, stroke, and mortality from heart disease was substantially reduced by both of the diets studied (extra virgin olive oil, n 2543, and nuts, n 2454)., in comparison to the control diet (N 2450), (Mozaffarian, 2016) [17].

A detailed analysis of dietary intake data provided to The American Heart Foundation of Spokane, WA, for evaluation and dietary therapy. The outcomes resulted in trial show that the goals of the Mediterranean-style diet weren't achieved, even if the approach was shown to be as effective with a dietary regimen low in fat for increasing coronary artery bypass graft survivorship (Miller, 2013) [18]. More precisely, the intended objective of doubling the consumption of monounsaturated fats was not achieved. With the exception of marginally increased omega-3 fats consumed, total fat consumption as well as the composition of fatty acids remained unchanged from the low-fat eating pattern following the implementation of the Mediterranean-style diet strategy (Dinu *et al.*, 2017) [8].



Source: Bruce A Griffin, 2013

Fig 3: Risk of mortality from CVDs associated with a two-point increase in adherence score for Mediterranean diet.

Numerous studies have demonstrated the preventive properties of diverse dietary patterns, such as using Nutritional Methods for high blood pressure, the Scandinavia diet, the European diet, the Palaeolithic diet, and vegetarian/vegan cuisines (Lutz, 1984) [21].

Palaeolithic diet

The diets of Homo sapiens throughout the Palaeolithic period (approximately 2.6 million to 10,000 years ago) are illustrated through the Palaeolithic cuisine. (Shirani *et al.*, 2013) [57]. This particular design, which differs substantially from the prevailing dietary practices in Westernised societies, has gained global recognition due to its putative health advantages. The Palaeolithic diet primarily comprised meat that was lean, incorporated fruit, nuts, or veggies, and was devoid of dairy, grains, glucose, and cholesterol (Salehi-Abargouei *et al.*, 2013) [57].

According to information from the ethnographic Atlas does not represent the majority of Palaeolithic humans subsisted primarily on food made from animals extracted from the forest. (Reedy *et al.*, 2014) [24]. 73% of the global societies comprised of hunter-gatherers, relied on hunted and fished animal foods for more than 50% of their living, whereas only 14% relied on obtained crops for more than 50% of their income. Quantitative dietary studies conducted on a minority of these societies unveiled average scores of 65% for subsistence on animal food and 35% for subsistence on plant food. (Smith *et al.*, 2010).

Despite their to the substantial usage of usable animals, a lot of cultures consisted of predators along with hunter-gather have a lesser CVD mortality rate than Western societies, as documented. (Bjerregaard & Dyerberg, 1988) [26]. Increased consumption of animal foods in "Westernized" diets is often linked to CVD. Additionally, Studies comparing the lipid profile of the blood and the diet of Greenland Eskimo people have shown that they maintain healthier blood lipid profiles (lower total and low-density lipid values, and lower-density cholesterol) despite substantially higher consumption of animal-derived foods, as evidenced by their reduced rates of heart disease (CAD) compared to Danish populations and cholesterol, in addition to reduced TAG stages and greater amounts of HDL), (Yokoyama *et al.*, 2014) [27].

Additional factors related to diet, including reduced consumption of fats that are saturated and increased consumption of monounsaturated and polyunsaturated fats, might have also played a role in the population's comparatively low incidence of cardiovascular disease (Bang *et al.*, 1976) [28]. While not all Palaeolithic diets were n-3 linoleic acid-rich derived from aquatic animals, they might have been abundant in long-chain saturated fatty acids from non-traditional sources, like animals. Rather than being widely acknowledged as the proof of Palaeolithic diets' impact on heart attack risk, such results are often met with skepticism (Adamsson *et al.*, 2011) [29]. Not all long-chain saturated fatty acids (SFA) from other animal sources may have been prevalent in Palaeolithic diets, omega-3 fatty acids in fish are ubiquitous in these diets. As a result, it is difficult to conclude with certainty that eating a paleolithic diet lowers the possibility of cardiovascular disease (Levitan *et al.*, 2009) [30].

Additional nutritional variables, including the reduced prevalence of heart disease among the public, may possibly have been impacted by the ingestion of both monounsaturated and polyunsaturated fats in addition to a diet full of basic saturated fats. (Kwok *et al.*, 2014) [31]. The Greenland Eskimos's decreased plasma VLDL and TAG levels are probably attributable to their increased consumption of omega-3 saturated fats. However, they could also be ascribed to a comparatively reduced intake of sugars. While not all Palaeolithic diets were rich in n-3 fatty acids derived from seafood, they might have been high in SFA from lengthy chains. Alternative sources, such as animals (Wang *et al.*, 2015). Therefore, the effects of Palaeolithic diets on the probability of cardiovascular disease (CVD) were not universally accepted, as evidenced by elevated plasma glucose levels. Although derived from distinct national nutrition instructions, the four comparison diets essentially consisted of identical components (Roswall, Sandin, Scragg, *et al.*, 2015). The dietary patterns of the randomised managed trial exemplified modern Palaeolithic nutrition (variable proportions of unadulterated fish, eggs, meat, fruits, veggies, and legumes), (Li ndeberg, 2012) [34]. Specific alterations with regard to the size of the waist, TAG, systolic blood pressure (SBP), diastolic blood pressure (DBP), HDL, and delayed plasma glucose levels, participants who followed the Palaeolithic diet exhibited substantially decreased values when compared to the inactive subgroup. CVD risk factors exhibiting greater short-term gains. (Appel *et al.*, 1997) [35].

Despite the possibility that Palaeolithic diets improved the metabolic syndrome, this investigation has to deal with a number of concerns. (Bhupathiraju & Tucker, 2018) [36]. Specifically, the Confidence intervals (CIs) for a total of four of each of the six outcomes failed to reach statistical significance, and none of the outcomes exhibited any discernible practical effect. (Eilat-Adar *et al.*, 2013) [37]. The predicted median variations were minimal for the majority of the primary outcomes, including SBP 36 mm Hg, DBP 25 mm Hg, HDL-cholesterol 012 mM, and fasting blood sugar 00 mM. The failure of the trial directors to conduct an adverse event assessment appears to be a substantial constraint in each one of these research (Chiavaroli *et al.*, 2019) [38].

There are considerations to consider for people who are attempting to follow a Palaeolithic dietary routine.

Palaeolithic diets are cholesterol, meat and saturated fatty acid-rich. Those adhering to the Palaeolithic diet might fail to meet the daily suggested allowances for specific micronutrients that include calcium, iodine, and fibre in certain instances. Despite the fact that, with the exception of the aforementioned micronutrients, it is possible to fulfil all other micronutrient intake targets, a recent review has revealed supplementary risks that impact diverse systems in the body and organs. (Kahleova *et al.*, 2019) [39]. There are factors that individuals endeavouring to adhere to a Palaeolithic diet should take into account. The Palaeolithic diet was abundant in unsaturated fatty acids, lipids, and flesh. In some cases, those who follow the Palaeolithic diet may not be able to consume the suggested daily intake of particular micronutrients, such as fibre, calcium, and iodine. Not with standing the feasibility of meeting all micronutrient intake objectives, apart from those previously mentioned, a recent review has unveiled additional hazards that affect multiple systems of the body and tissues. (Manheimer *et al.*, 2015) [40]. There is speculation that protein-rich diets may induce calcitic effects, potentially elevating the risk of bone calcification and osteoarthritis in comparison to the intake of fruits and vegetables. The latter leads to a reduced urinary calcium excretion rate and a net neutral renal impact (Reddy & Katan, 2004) [41]. The potential mitigation of this calcitic effect could have occurred in societies of hunters-gatherers that adhered to the Palaeolithic diet and consumed high-protein, fruit-and-vegetable-rich diets. However, it is important to exercise caution when extrapolating these findings, as urine amounts of calcium do not provide a reliable indication of bone health and do not consider the intake and retention (Remer & Manz, 1995) [42].

Table 1: Summary of Paleolithic diet

Section	Summary
Introduction	The Paleolithic diet reflects the eating habits of ancient humans (2·6 million to 10,000 years ago). It gained popularity due to its potential health benefits. This diet includes lean meat, minimal grains, sugar, salt, and dairy; it includes fruit, nuts, and vegetables.
Hunter-Gatherer Diet	As ethnographic data shows, palaeolithic-era humans hunted for food, with most sustenance coming from animal sources (73%). Only 14% relied on gathered plants.
Animal-Based Diet and CVD	Despite high animal food consumption, Paleolithic hunter-gatherers had lower cardiovascular disease (CVD) rates than modern Western societies. Some Eskimos with high animal food intake had healthier blood lipid profiles, attributed partly to n-3 PUFA intake from fish and other factors.
CVD Risk and Paleolithic Diets	Increased n-3 PUFA intake and other dietary factors possibly contribute to reduced CVD risk among Paleolithic diets. However, Not every diet is abundant in n-3 fats; findings aren't universally accepted.
Elevated Glucose Levels	A study on Paleolithic diet effects showed improvements in CVD risk factors, including waist circumference, TAG postprandial glucose levels, high-density blood pressure, and. Some outcomes had non-significant confidence intervals, limiting clinical interpretation.
Micronutrient Concerns	Palaeolithic Plans are heavy in amino acids, lipids, and SFA, potentially lacking micronutrients like calcium, iodine, and fibre. High protein may affect kidney function, but other health benefits are debated. Genetic conditions and certain medications may necessitate caution with the diet.
Osteoporosis Risk	High-protein diets, common in the Paleolithic diet, might increase osteoporosis risk due to calcitic effects. Hunter-gatherers' combined high-protein and fruit/vegetable consumption might mitigate these effects.
Conclusion	While Paleolithic diets show potential health benefits, the complexity of various factors makes their effects on CVD risk and other health outcomes not universally accepted. Micronutrient concerns, kidney function, and other factors need careful consideration. Urine calcium alone isn't a reliable measure of bone health.

Vegetarian-vegan diets

Potential mitigation of this calcitic effect may have taken place in hunter-gatherer societies that followed the Palaeolithic diet, which consisted primarily of high-protein, vegetable-rich, and fruit-rich foods. Nevertheless, it is critical to use prudence when generalising these results, given that calcium levels in urine do not offer a dependable assessment of bone health and fail to account for calcium absorption as well as retainers (Bere & Brug, 2009) [43].

The epidemiological research examining the health effects of veganism have produced data for the past half-century. The majority of the data on the medical advantages of a plant-based diet come from systematic, observed long-term studies (Cordain *et al.*, 2002) [51]. Due to the potential presence of residual confounders given the small sample size in a few of them, there is still ambiguity. Furthermore, several large-scale future investigations used specific study cohorts; for example, some cohorts were mostly made up of individuals from particular ethnic communities. This raises concerns about the generalisation of the findings and the true impact of this trend on CVD. It has been suggested, for instance, that vegetarians are more health-conscious, leaner, and outcome in better health than omnivores; thus, direct comparisons cannot be madev (Azadbakht *et al.*, 2011) [45].

Veganism, an alternative dietary approach that abstains from all animal-derived compounds, has been increasingly embraced by the general populace, alongside the vegan or vegetarian diet. Due to the paucity of research on the health advantages of vegan foods, definitive proof can not be provided. (Chiavaroli *et al.*, 2018) [46].

In relation to a new meta-analysis of intermediate risk indicators for heart disease (CVD) comprising thirty-two study designs and seven clinical trials concluded that adherence to a vegan or vegetarian diet was correlated with reduced blood pressure. Moreover, eating vegetarian diets significantly decreased levels of blood total cholesterol, TAG is not present in LDL, HDL, or non-HDL cholesterol levels extents (Liese *et al.*, 2015) [47].

A synthesis of seven prospective trials with 124 706 participants revealed that vegetarian diets were associated with 29% decreased death from cardiovascular diseases (RR 0·84, 95% assurance interval [CI] 0·56, 0·87), and decreased death with IHD (RR 0·71, 95% credibility range [CI] 0·56, 0·87)[CI] 0·54, 1·14), and 12% lower death from stroke (RR 0·88, 95% confidence interval (0·70, 1·06)), (Schwingshackl *et al.*, 2018) [48]. A more recent meta-analyses found that compared to omnivore people, vegans and vegetarians had significantly smaller amounts of glucose, LDL and total cholesterol levels, and BMI. There were about 130,000 and 15,000 vegetarians in total across the 86 cross-sectional and 10 cohort prospective studies that were incorporated in the evaluation. A review of ongoing research indicated a 25% reduction in the overall considerable risk of morbidity and death associated with IHD (RR 0.075, 95% CI 0.068, 0.082). But there was no appreciable change in the overall mortality rate from heart disease or brain disorders (Folsom *et al.*, 2007) [49].

Particularly vulnerable to primary deficiency of iron, vegans may receive an inadequate amount of specific nutrients, including iron. Iron deficiency is the most widespread nutrient insufficiency on a global scale, impacting approximately 25% of the entire human population. This happens whenever iron absorption from the diet is insufficient to meet the iron needs of the body. This is frequently observed in vegetarians and vegans, whose iron intake is further hindered by the high fibre and oxalate content of their meals, as well as the fact that their iron supply is non-haem, which has a poor solubility. A comprehensive review and meta-analysis of 27 cross-sectional investigations and three interventions found that ferritin levels in the blood are considerably lower in vegan adults than in non-vegetarian adults. Additional results were not substantially altered by the implementation of semi-vegetarian menus (Franz *et al.*, 2002) [50].

Table 2: Summary of vegetarian-vegan diets

Section	Summary
Vegetarian Diet	Vegetarians abstain from consuming any product derived from animals. Low in zinc, haemiron, folic acid, B12, cholesterol, Hydrogenated lipids and total fat, salt, and n-3 polyunsaturated fatty acids Fish-based, it's high in n-6 PUFA, calcium, non-hemeiron, antimicrobial agents, iron, and C and E vitamins...
Epidemiological Studies	The health effects of vegetarianism have been investigated through prospective and cross-sectional studies. Ambiguities persist as a result of possible confounding variables and restricted sample sizes. The specific cohorts of studies cast doubt on the results' generalizability. Direct comparisons are complicated by variations in health consciousness, weight, and health status between omnivores and vegetarians.
Vegan Diet	Veganism abstains from consuming any substance derived from animals. Due to the paucity of studies documenting health benefits, definitive evidence is lacking.
CVD Risk Factors	According to meta-analyses, vegetarianism is linked to reduced High blood pressure. Another meta-analysis indicates that both LDL-cholesterol and overall cholesterol are declining, HDL-cholesterol, and non-HDL-cholesterol levels, but no substantial impact on TAG levels.
CVD Endpoints	Vegetarians have a lower risk of death from IHD (29% reduction), circulatory diseases (16% reduction), and cerebrovascular disease (12% reduction), according to a meta-analysis of seven prospective studies. An additional meta-analysis encompassing more than 130,000 vegetarians and 15,000 vegans has documented a reduction in glucose, cholesterol, LDL-cholesterol, and BMI levels. The study reveals a 25% decrease in the incidence and mortality of IHD, but no statistically significant variations in total cardiovascular, cerebrovascular, or all-cause mortality.
Nutrient Concerns	Vegetarians may be susceptible to developing primary iron deficiency as a result of insufficient iron consumption. Because non-heme iron has a very low bioavailability, this insufficiency affects around 25% of the world's population and is more common within herbivores, which is further hindered by dietary fibre and oxalates. Studies indicate that adult vegans have lower ferritin levels in their blood than people who are not vegetarian.
Semi-Vegetarian Diets	Studies involving semi-vegetarian meals examining iron deficiency among vegetarians does not significantly alter the findings.

Dietary approaches to stop hypertension diet

The DASH diet is a method to stopping edoema that aims to decrease the arterial pressure in individuals who are already hypertensive. It is distinguished by a lower sodium, compared to the average American diet, in terms of cardiovascular and saturates levels. Apart from veggies, vegetables, low-fat dairy products, cereals, fish, poultry, and lentils, DASH discourages the consumption of pork and beef, sweets, and sugary beverages (Cordain *et al.*, 2002) [51].

Consequently, it is rich in dietary fibre, magnesium, potassium, and calcium, in addition to lean protein. A systematic review of sixty-seven papers by the network itself (17,230 participants) examined the implications on blood pressure of the results of (13) dietary RCTs, which includes DASH, on people who had antihypertensive and pre-hypertensive symptoms. Furthermore, the research incorporated a variety of dietary patterns, including but not limited to the following: Tibetan, Mediterranean in nature, Palaeolithic, free from animal testing, low in sodium, insulin index/load, and moderately sweetened, protein-rich, low in carbohydrates, and minimal in sugar and fat. (Houston & Harper, 2008) [52]. The DASH diet, which is low in carbohydrates, Palaeolithic, protein-rich, low in sodium, glycemic index, and originating from the Mediterranean, significantly decreased SBP (873-232 mmHg) and DBP (485-11 mmHg) when compared to the placebo diet. Among these dietary habits, the DASH diet demonstrated the most benefit in regards to this. Despite the absence of validity of the study's results, the Palaeolithic and diets with few carbohydrates second in terms of SBP decline and the cuisine of the Mediterranean diet ranked third for DBP decline (Schwingshackl *et al.*, 2019) [53].

Given the robust correlation between hypertension and cardiovascular disease and the diuretic properties of the DASH diet, a number of randomised investigations have been conducted to explore possibilities for decrease of diverse classifications of CVD. Studies documenting the effects of DASH on the incidence of CHD, stroke CHD, and heart failure produced contradictory findings (Malloy-McFall *et al.*, 2010) [54].

In accordance According to the results of a recent meta-analysis that examined the correlation between adherence to a DASH-style diet and the following health complications in six study cohorts: cardiovascular disease (CVD), stroke, CAD (CHD), and Cardiovascular heart failure is reduced by 29%, while the risk of heart artery illness (CHAD) and coronary heart failure is decreased by approximately 20%. Compliance with a DASH-style diet was also found to have a linear and detrimental association with all CVD (Fung *et al.*, 2008) [55].

In light of the high prevalence of its impact on reducing hypertension and cardiovascular disease (CVD), scholarly investigations have explored the potential of the DASH diet to avert CVD via diverse mechanisms, including control of fasting blood glucose level, modulation of diabetes until later, and increase of lipid levels. The DASH protocol enhanced glycemic control, according to a review of intervention trials; a substantial drop in fasting blood sugar was noted in all trials as well as in an analysis of subgroups at the time of evaluation (Tyson *et al.*, 2012) [56]. When implemented for a duration exceeding 16 weeks, the DASH diet was found to significantly decrease postprandial blood sugar levels, according to the a meta-an in the latter case. Consequently, Additional research is required in regards to ascertain the impact of the DASH diet on controlling glycemic levels (Shirani *et al.*, 2013) [57].

Table 3: Summary of dietary approaches to stop hypertension diet

Section	Summary
Vegetarian Diet	Vegetarians abstain from consuming any product that comes from animals. Low in lipids, total fat, saturated fatty acids, sodium, haemiron, zinc, vitamins A, B12, D, and n-3 PUFA produced by fish, it is rich in anti-oxidants, magnesium, non-haemiron, folic acid, vitamins C and E, and n-6 PUFA
Epidemiological Studies	Studies on the negative health impact of veganism comes from prospective and cross-sectional investigations; results' generality is questioned by studies' specific cohorts; direct comparisons are complicated by differences in health consciousness, weight, and health status between vegetarians and omnivores; and uncertainties persist from potential confounders and small samples..
Vegan Diet	Veganism excludes all animal-derived substances. Limited studies report health benefits, so no conclusive evidence is available.
CVD Risk Factors	Diets containing vegetables are linked to reduced blood pressure, according to meta-analyses. A different meta-analysis shows decreased levels of LDL, HDL, non-HDL, and total cholesterol in the blood, but no discernible change in TAG levels.
CVD Endpoints	Vegetarians had decreased mortality from IHD (29% reduction), cardiovascular disorders (16% reduction), and cerebrovascular disease (12% reduction), As per a systematic review of seven prospective studies. A different meta-analysis including more than 130,000 vegetarians and 15,000 vegans shows lower levels of glucose, cholesterol, LDL cholesterol, and BMI. There is a 25% risk decrease in IHD incidence/mortality, however there are no notable changes in the mortality

	from all causes, cerebrovascular disorders, or the overall cardiovascular system.
Nutrient Concerns	Those who are vegetarians may not consume enough iron, which might result in primary iron insufficiency. About 25% of people worldwide suffer from this deficit, which is more frequent among vegetarians because of the poor bioavailability of non-hem iron, which is further exacerbated by dietary fibre and oxalates. Research indicates that adult vegetarians had lower blood ferritin levels than non-vegetarians.
Semi-Vegetarian Diets	Studies investigating iron deficiency in vegetarians show that include semi-vegetarian diets does not significantly alter the findings.

Nordic diet

Consuming whole grains like oats, rye, and barley together with certain veggies and fruit such as pears, apples, berries, root vegetables, cabbages, and fish are hallmarks of the nutritious Nordic diet style. These present in vegetables and fruit, whole grains, and fish are only a few of these foods in connection with an event decreased Heart disease danger. The Nordic diet examines each of these impacts separately and as part of a dietary pattern, which may have an even bigger impact on lowering the risk of CVD (Engeset *et al.*, 2015) [58].

Depending on the demographic and marker(s) under investigation, several intervention studies have shown the Nordic food habit to have a variety of positive impacts on short-term CVD endpoints. More precisely, the Nordic diet significantly lowered cholesterol levels and body weight of those with moderate high cholesterol levels (Han *et al.*, 2022) [59]. On the other hand, those with metabolic syndrome features saw a drop in heart rate and DBP, while people who were obese had a drop in both their blood pressure and BMI.

The Northern diet is correlated with improved profile of lipids, further enhancing the beneficial impacts of reduced-grade disease and higher lipid levels. (Sarmadi *et al.*, 2023) [60]. In comparison to the untreated team, the Nordic dietary pattern substantially reduced total and LDL cholesterol stages, ranging but was little effect on HDL or TAG levels, according to new meta-analyses based on the combined estimate of five randomised controlled trials (n = 513). The four of the qualified RCTs also showed that the Nordic diet significantly lowers SBP and DBP (Ramezani-Jolfaie *et al.*, 2019) [61].

The Swedish Females Living and Healthcare cohorts (a total a 20-year follow-up of 43,310 women, found no association between overall CVD risk and the Northern eating patterns, nor with any of the subsets examined. (Roswall, Sandin, Adami, *et al.*, 2015) [62]. While there are a lot of issues in contrast to the aforementioned randomised controlled trial, which examined interim variables exclusively, the aforementioned investigations were conducted in real-world contexts and focused solely on distinct CVD outcomes, thereby mitigating potential reporting bias and other forms of bias that are inherent in epidemiology (Althubaiti, 2016) [63].

Table 4: Summary of the Nordic diet

Section	Summary
Healthy Nordic Dietary Pattern	Whole grains (oats, rye, barley), certain fruits and fish, in addition to veggies and fruit (pears, fruit, berries, and kale), and roots all part of the healthful Nordic diet. Each of these elements has shown advantages in lowering the risk of CVD; when combined, the Nordic diet has a stronger effect.
Intervention Trials	Nordic diet intervention studies show a number of beneficial benefits on CVD biomarkers. People with mild hypercholesterolemia lose weight and have lower cholesterol. Subjects with metabolic syndrome had reduced arterial pressure and DBP. Obese individuals report feeling as if their blood pressure and weight had decreased..
Lipid Profile and Inflammation	Low-grade inflammation is decreased and lipid profiles are improved by the Nordic diet. A meta-analysis of five RCTs (N = 513) reveals no change in HDL and TAG levels but a substantial decrease in total and LDL cholesterol. Four RCTs show that the Nordic diet lowers SBP and DBP.
Epidemiological Study	Twenty years of follow-up by the Swedish Females Culture and Health cohort with 43,310 women failed to identify a relationship across a Nordic diet and segment or total CVD risk.. While RCTs concentrate on intermediate biomarkers, epidemiological studies assess particular CVD endpoints and are conducted in real-world environments.

Mediterranean diet

The inception of the Mediterranean-style diet occurred during the early 1960s, wherein the objective was to replicate the customary dietary practices prevalent in Crete, southern Italy, and the majority of the remaining Greek civilization. Although the Mediterranean diet varies about nation to nation, the following are its primary traditional characteristics: little to moderate intake of dairy items and milk; inadequate to moderate amounts of wine (mainly during meals); low to little usage of animal products; high to moderate intake of whole grain products, fruits lentils, seeds and veggies, along with fish; regular use of olive oil for cooking as the main fat, leading to a high ratio of polyunsaturated to saturated fatty acids (Altomare *et al.*, 2013) [64].

There are countless health advantages associated with following a Mediterranean diet, including lower chances of developing hypertension., overweight, a condition known as metabolic syndrome, and hypoglycemia., and hyperlipidemia, as well as a lower overall mortality rate. Additionally, studies have shown that a Mediterranean diet lowers the risk of type 2 diabetes. The Palaeolithic and vegetarian diets were the next most successful in lowering fasting glucose levels, with the Mediterranean diet being the most successful. The low-carb diet was the most successful strategy for lowering HbA1c, followed by the Mediterranean and Palaeolithic diets (Di Daniele *et al.*, 2017) [65].

Studies looking at the connection between the Mediterranean Diet and particular endpoints like stroke and myocardial infarction exist in addition to those examining the relationship between morbidity via every cause and CVD risk variables and nutrition.

The pooled relative risk (RR) A meta-analysis based on these prospective studies yielded estimates for nonspecific CVD of 0.81, while the pooled RR for coronary IHD/acute heart attack risk was 0.70 (95% confidence interval [CI]: 0.62 to 0.80). Remarkably, the negative relationship persisted across all of the research's strata, outcomes (mortality and frequency), sex, region, and a European Diet Assessment. The identical meta-analysis included six studies that looked at strokes without a known aetiology. The total relative risk (RR) for the most severe and lowest categories score for the Mediterranean Plan in these trials was 0•73 (95% CI 0•59, 0•91). For strokes that were ischemic, the equivalent values were 1•01 (95% CI 0•74, 1•37) for four investigations and 0•82 (95% CI 0•73, 0•92) for a total of five studies. That meta-analysis's findings.

An analysis of cause-specific mortality was conducted. Latest long-term research is REGARDS (The Causes of Geographical and Ethnic Disparities in Strokes). The block FFQ was among the inquiries that participants answered in order to ascertain how they started out. Additionally, their bodies were examined every six months. 2513 individuals from the analytic cohort (n = 21,423) decease occurred after an average of 625 years of monitoring. For people in the greatest brackets of the Mediterranean-style diet and the largest compared with the bottom categories of the Palaeolithic diet the overall mortality multivariable-adjusted proportions of risk were 0.77 (95% confidence interval [CI]: 0.67 to 0.89) and 0.63 (95% confidence interval [CI]: 0.54 to 0.73), respectively, and 0.78 (95% faith time [CI]: 0.61 to 1.00] and 0.68 (95% trust interval [CI]: 0. Both diets contributed to a reduction in fatalities from any cause and cardiovascular disease, although the Mediterranean diet may be superior to the Palaeolithic diet in terms of effectiveness (Mitrou *et al.*, 2007) [66].

Another research assessed the relationship between two widely advocated-for healthy diet scores, including the IKEA Scandinavian Diet Score for Wellness and the Modern European Diet Score (MD), in addition to cause-specific and overall mortality. The study comprised 38,428 female participants, with a mean age of 61, who were members of the Swedish Mammography Cohort. On the basis of the Mda and HNFI after era, three distinct groups were established: low, moderate, and high determination. Following that, three additional volunteer studies were generated through the combination of mMED along with HNFI. Throughout the average follow-up interval of seventeen years, 10,478 women expired. The risk ratios for mortality from all causes using HNFI and mMED in the high devotion versus low compliance groups were 0.89 (confidence time: 0.83 to 0.96) and 0.76 (95% believability time: 0.70 to 0.81), respectively. (Lemming *et al.*, 2018) [68].

Higher adherence to MD was linked to decreased fatality in all HNFI categories in the pooled study. Compared to HNFI, MMED had a stronger correlation with decreased cause-specific mortality. Furthermore, there was an inverse relationship between mMED and HNFI and rates of coronary and death from all causes. Nonetheless, both studies showed that following mimed was beneficially (Warensjö Lemming *et al.*, 2018) [68].

Interestingly, not every component lowers risk in the same way. A study by Gallo *et al.* involving averaged evaluations of different dietary components suggested that olive oil, fruit, vegetables, and legumes were largely responsible for the diet's preventative effects. After analyzing information from randomized controlled trials, a significant discovery was made: there was a 40% reduction in the rate of death from cardiovascular disease (CVD) and the occurrence of cardiac events, including strokes. A distinct a Meta-analysis encompassing prospective cohort data that incorporated both death and nonfatal cardiovascular disease (CVD) episodes revealed that a mere two-point increase in adherence to the Mediterranean lifestyle correlated to a 10% decrease in the risk of CVD. Nevertheless, specific outcomes such as the probability of coronary heart disease, heart attack, etc stroke weren't examined (Grosso *et al.*, 2015) [69].

Table 5: Summary of a Mediterranean diet

Section	Summary
Mediterranean Diet	The classic dishes of the country, Southern Italy, and Crete form the basis of the European diet. The main characteristics include a high consumption of legumes, veggies, fruits, grains that are whole, and salmon; frequent use of olive oil; limited use of dairy and alcohol; and low consumption of protein..
Health Benefits	Reduced immortality, the risk of The metabolic disorder and each of its three elements (high blood pressure, being overweight, and glucose), and hyperlipidemia) are all associated with a Mediterranean-style diet. Type 2 diabetes risk is decreased by it.
Glycemic Control	It was demonstrated that the Mediterranean diet, followed by the veggie and especially successful at decreasing fasting glucose levels in individuals with diabetes of the type 2, it was utilised during the Palaeolithic period. A diet with few carbohydrates that reduces HbA1c levels was determined to be the most effective.
CVD Endpoints	The highest vs. lowest Western Diet Score category was linked to a reduced danger of nonspecific CVD (RR 0.81), coronary IHD/acute myocardial infarction (RR 0.70), and stroke (RR 0.73), according to a meta- analysis.

Longitudinal Studies	Palaeolithic and Mediterranean diet scores for all-cause and CVD mortality were compared in a research (REGARDS). While both diets reduced mortality, the Mediterranean diet may have been more successful. A further research that integrated the scores from the Mediterranean and Healthy Nordic diets shown that both had inverse relationships with cardiovascular and overall mortality, with the Mediterranean cuisine having larger impacts.
Key Components	Fruits, veggies, legumes, and olive oil all make a substantial contribution to the beneficial properties of the Western diet. RCT pooled data indicate a 40% lower incidence of cardiac arrest, stroke, and CVD death.
Prospective Cohorts	A 10% lower incidence of events related to CVD was found in a systematic review of prospective cohorts with a two-point increase in the adherent score to the ancient Mediterranean diet. Specific outcomes such as stroke, myocardial infarction or heart failure were not examined.

Dietary Pattern Analysis: A New Direction in Nutritional Epidemiology

It is basically two methods for analysing the connection among cardiovascular disease and diet. The initial approach utilizes the main component and cluster analysis to ascertain associations between diseases and dietary habits. Researchers have utilized this technique greatly to produce hypothesis regarding possible function of dietary patterns in the avoidance of cardiovascular disease. Developing a nutrition score or index that characterizes the quality of the diet or compliance with specific dietary guidelines constitutes an additional approach. This occurs most frequently in those for the Mediterranean Dept and LDL diets. Seven times over a twenty-four-year period, the Nurses' Health Study (NH calculated by calculating a diet called DASH ranking on the basis of eight FFQ food groups for the purpose to track the progression of time (Gholizadeh *et al.*, 2020) [70]. The latest cohort research likely involves 88,517 participants, adjusting for age, cigarette usage, and additional risk factors for coronary artery disease, female nurses aged 34 to 59 discovered that adherence to the DASH diet resulted in a seventeen percent decline in the risk of a stroke and a 22% decrease in the likelihood of nonfatal and fatal CHD, respectively, across expanding the quintiles of the DASH-diet score. Secondary nutritional considerations encompass the Good Product Ranking, the Recommended Food Score, and the aforementioned metrics. Diet Excellence Rating and Score for the Mediterranean Diet. A significant correlation (9%; Fig. 3) was observed in a recent thorough research across reduced overall mortality and a reduction in mortality associated with diseases of the brain (6%), heart failure (CVD), and malignancy (6%). Adopt the Mediterranean diet for greater efficacy), (Ravera *et al.*, 2016) [71].

The physiologically intricate, multi-factor processes of arteries and thrombosis may be influenced by foods working in concert across whole diets, at different disease locations, and at different phases of the illness. Studies investigating single nutrient disease associations aim to identify one cause-effect route among diverse diet-related illnesses, which presents a significant risk of confound and measuring type mistakes. It follows that the failure of several single-nutrient intervention trials to validate the proposed association seen in observational research is not unexpected (Jebari-Benslaiman *et al.*, 2022) [72].

Future directions for nutrition research

It may be claimed there is a dire need for further study in this field given the compelling evidence of the advantages of certain The role that diets play in preventing CVD, the scarcity of well-constructed interventions with clear results, and the significant effects on the health of the public necessitate future legislation focused on promoting health. This legislation must acknowledge the limitations of nutrient-based proposals for heart disease prevention and require clinical trials that employ efficiently achievable approaches in free-living communities. These trials should also aim to clarify the mechanisms of action involving calories and food bio-actives in both wellness and illness. The enormous cost of carrying out high-caliber, managed, controlled nutrition intervention studies and the challenges associated with adopting a fresh way of life in a floating environment will always be a barrier. To succeed, they need to overcome interindividual heterogeneity in nutritional response and behavioural obstacles to dietary adjustment. Above importantly, they ought to encompass treatments affecting the whole diet and, ideally, include disease endpoints as the key result (Casas *et al.*, 2018) [73].

Conclusion

Epidemiological evidence indicates that varying dietary patterns offer protection against the frequency and risk of CVD. Food habits that largely focus on vegetables and fruits along with certain animal-based diets, such as the Mediterranean in flavour diet, the DASH diet, and European health, have demonstrated protective effects against cardiovascular disease (CVD) risk. However, subsequent years cohort studies must account for the potential confounding impact of desire and geographical impact in recall when employing axial and models of case-control research. The majority of this rests on the findings of a small number of carefully planned RCTs with prospective trials and disease endpoints. Dietary regimens like the vegan diet and the palaeolithic diet may have certain benefits, but they are imbalanced because they lack vital minerals.

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