



# Diet and cardiovascular health – What is the data?

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## Abstract

Cardiovascular diseases can probably considered among the most important threat for population health in the 21<sup>st</sup> Century. Healthy lifestyle and diet are key factors for a life free of chronic diseases. Prevention through diet and lifestyle is consequently a health priority. The accepted notion that diet has a significant influence on the development and prevention of cardiovascular disease triggers the studies supporting the benefits of healthy foods (e.g. fruits and vegetables), compared to foods considered less healthy (e.g. saturated fat). In general, for cardiovascular health is considered beneficial to add in daily diet food and nutrients which can have positive cardio protective effect. Nonetheless, the diet's success relies on the patient's ability to adhere to the diet regimen, and aspects like social setting, and ability to accommodate to lifestyle changes when giving dietary recommendations are a challenge to face with for prevention of the onset of cardiovascular and lifestyle related health conditions, which are becoming more and more common in recent years.

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## Introduction

Cardiovascular Diseases (CVDs) are a group of disorders of the heart and blood vessels; they are the leading cause of death worldwide. Based the World Health Organization, 17.7 million people (about 31% of global death) died from CVDs in 2015 [1]. Unhealthy diet, lack of physical activity, tobacco use and harmful alcohol use are major risk factors for CVDs. The manifestations of these risk factors often present as raised blood pressure, increased lipids, and obesity. An estimated 80% of all cases of CVD can be prevented by addressing these modifiable risk factors such as undertaking lifestyle changes, cessation of tobacco use, initiating regular physical activity, and dietary modifications [1,2]. This paper reviews the literature on common diets and assesses the data behind each one to provide an insight

on their potential cardiovascular benefit. Below we review the data on the Dietary Approaches to Stop Hypertension (DASH) diet, Mediterranean diet, low-carbohydrate diet, and caloric restriction diet.

These dietary patterns share some common characteristics, but also have distinctive differences. Both the DASH diet and Mediterranean diets are high in fiber, and moderately high in protein and low-fat dairy. Meanwhile, the Mediterranean diet emphasizes intake of monounsaturated fatty acids largely from olive oil and nuts [3]. It also incorporates the moderate consumption of alcohol, specifically red wine, as a critical component [2,4]. A low-carbohydrate (low-carb) diet, such as the Atkins diet, is designed to promote weight loss by attempting to eliminate carbohydrates and consuming high protein and high



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fat containing meals [5]. Lastly, caloric restriction diets encourage a dietary regimen low in calories, such as fasting and avoiding energy dense foods. They do so without causing malnutrition or a lack of essential nutrients while promoting a net deficit of calories [6].

### Dash Diet

The Dietary Approaches to Stop Hypertension (DASH) diet was designed to normalize blood pressure in patients with hypertension. It is rich in fruits, vegetables, low-fat dairy products, grains, poultry, fish, and nuts. It attempts to decrease intake of saturated fat, sodium, red meat, and high sugar containing foods [7]. In comparison with usual diets, the DASH diet provides lower amounts of total fat, saturated fat, and dietary cholesterol, while providing higher amounts of protective nutrients such as potassium, calcium, magnesium, fiber, and protein [3,7]. A large body of data confirm its beneficial effects on blood pressure levels [3,7,8]. The DASH diet is recommended by the American Heart Association for the non-pharmacological management of hypertension, one of the risk factors for CVD [3,9].

Salehi-Abargouei et al. explored the longitudinal effects of DASH-style diet on heart health by systematically reviewing prospective cohort studies and found that a DASH-style diet can significantly reduce the risk of CVDs by 20% as compared to usual diets. In particular, their meta-analysis showed a reduction in risk for coronary heart disease, stroke, and heart failure by 21%, 19%, and 29% respectively [7]. These positive findings are supported by a meta-analysis conducted by Siervo et al. in 2015 [3]. The investigators reviewed the evidence from randomized controlled trials exploring the effects of DASH diet on blood pressure and concentrations of glucose and lipids. Both systolic and diastolic blood pressure significantly improved in subjects who followed the DASH diet. The greatest blood pressure reduction was observed in participants with higher baseline blood pressure or Body Mass Index (BMI). Moreover, the DASH diet also resulted in lower concentrations of total cholesterol and Low Density Lipoprotein (LDL) [3]. These findings show that the DASH diet can improve cardiovascular health and can make a significant contribution towards the prevention of CVD particularly in patients with uncontrolled hypertension and an elevated BMI.

### Mediterranean diet

Similar to the DASH diet, the Mediterranean diet is high in fruits and vegetables, whole grains, lean meats, fish, low-fat dairy, legumes, and nuts [8]. It includes moderate consumption of red wine during meals, recommends the daily use of olive oil for cooking and taste, and discourages the consumption of sugary drinks, baked goods, and added fats [4,10].

A large amount of data shows that the Mediterranean diet can improve High Density Lipoprotein (HDL) concentrations, blood pressure and glucose concentrations [3]. Estruch et al. reported significant beneficial effects of the Mediterranean diet for the primary prevention of cardiovascular events [11]. The randomized controlled trial showed that among high-risk patients, the Mediterranean diet supplemented with extra-virgin olive oil or nuts reduced the risk for major cardiovascular events (myocardial infarction, stroke, or death from cardiovascular causes) by about 30% and helps to prevent gastro intestinal pathologies [11,12].

### Low-carb diet

A low-carb diet is usually combined with a high intake of fat and protein [12]. For example, the Atkins diet is a commercial weight loss program designed to promote weight loss and improve cardiovascular risk factors. It is a 4-phase diet based on very low carbohydrate intake, with unlimited protein and fat consumption [5]. Other low-carb diets are based on a similar approach [5,12]. The effectiveness of low-carb diets for the prevention of CVDs remains unclear. While a low-carb diet can lead to weight loss, which in turn can decrease the risk for CVDs, dietary patterns like the Atkins diet implicate a reduced intake of fiber and fruits, and an increased intake of animal source protein, cholesterol, and saturated fats, all of which are CVD risk factors [5,13]. Furthermore, Atallah et al. found that the Atkins diet was modestly efficacious for short-term weight loss, reduction of blood pressure and lipid levels. These benefits were not sustained long-term, making the beneficial effects of a low-carb diet in combination with a high-protein/high-fat diet on long term cardiovascular health uncertain [5].

### Caloric restriction

Caloric restriction is a dietary intervention in which total calorie consumption is lower than the usual caloric intake, either as a continuous low-calorie diet or via intermittent fasting periods, without nutritional insufficiency or malnutrition. Studies have shown that a low-calorie diet can normalize blood pressure and improve cardiovascular health through weight loss, as overweight and obesity is an independent risk factor for hypertension [6]. It is also hypothesized that improved blood pressure may be due to lowered insulin resistance, but the direct effect of caloric restriction on cardiovascular risk factors in humans remains controversial as there is no consensus on the direct mechanism of this relationship [6,14]. Short-term medically supervised trials assessing the effect of water-only fasting found positive results in the treatment of hypertension; the greatest blood pressure improvement was seen in patients with highest baseline blood pressure, and 90% of the initially hypertensive study subjects achieved normal blood pressure in less than 3 weeks [6,15,16].

According to recent literature reviews, studies assessing the effects of intermittent or alternate day fasting and those using a continuous low-calorie diet regimen showed equal success in normalizing blood pressure and reducing other CVD risk factors [6,14]. However, as the study duration of these trials was usually 6 months or less, the long-term benefits of caloric restriction are not clear. Research efforts investigating the long-term effects of caloric restriction on health and disease processes have been undertaken in a number of animal models [14]. Different dietary regimens of intermittent fasting in rats and mice resulted in reduced levels of cardiovascular disease markers; findings also suggested that intermittent fasting can be protective against strokes and myocardial infarctions [14]. Furthermore, some animal studies indicate that caloric restriction can also improve longevity and promote healthy aging, supporting that caloric restriction may have a protective role against CVDs [17].

### Conclusion

There is a growing body of data that dietary patterns can influence cardiovascular health. Currently, the DASH diet and Mediterranean diet are amongst the most popular dietary patterns recommended to improve cardiovascular health. There is evidence that the DASH diet can have a greater effect on blood pressure reduction than the Mediterranean diet; however, multiple studies confirm that adherence to either diet provides a

substantial decrease in cardiovascular risk factors [3]. Low-carb diets show favorable effects short term, but there is no evidence that this dietary pattern has any long-term cardiovascular benefits [13]. There is evidence that caloric restriction diets can reduce the risk for CVD even during short-term dietary regimens, but long-term benefits are less clear. While there are studies showing that caloric restriction can promote longevity and healthy aging, including good cardiovascular health, some researchers argue that not the reduction of net calories, but rather the composition of food consumed determines health outcomes [17]. Numerous studies have assessed the relationship between adherence to a dietary pattern and health outcomes, but there is a lack of data comparing the adherence success rates of different dietary patterns [18]. Regardless of which dietary patterns shows most success in reducing CVD in a clinical setting, the diet's success ultimately depends on the patients' adherence. Clinicians recommending dietary changes as a medical intervention should consider the two following factors: access and ease of commitment.

Access to the various components of a diet plays a major role with respect to adherence success. For example, the Mediterranean diet can more easily be implanted in regions where respective ingredients such as olive oil and nuts are readily available and affordable to the user. This may be challenging to patients coming from a low socioeconomic status, indicating that an alternative dietary pattern may be more appropriate for this specific social group. Secondly, the ease of commitment to a dietary regimen should be discussed with the patient. For instance, some dietary patterns require a bigger time commitment for food preparation than others, so patients with large time constraints should be recommended a dietary pattern that only require simple modifications to their current diet. Lastly, implementing slow incremental modifications to one's diet may yield longer lasting adherence than abrupt larger changes, however, the most effective approach to changing patient's diet has not been established and requires further inquiry.

In conclusion, many of the dietary patterns described above have at least some evidence that they can effectively decrease hypertension and reduce the risk for CVDs. Unequivocally; the diet's success relies heavily on the patient's ability to adhere to the regimen [18]. Professionals should be trained in health education and communication techniques to develop a better relationship with their patients, and contribute to patient motivation for diet adherence. Therefore, one should consider the patients' social setting and their ability to accommodate to lifestyle changes when giving dietary recommendations.

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