

Dietary Patterns and Heart Disease Prevention

Heart disease is a known chronic condition affecting most Americans. In fact, heart disease is known to be a leading cause of death for men, women, and people of racial and ethnic groups in the United States.¹ Healthy People 2030 recognizes “improving cardiovascular health in the US population” as a national health objective and an ongoing multifactorial disease of concern.² According to the CDC National Center for Health Statistics, in 2017 there was a total of 647,457 deaths from heart disease with 198.8 deaths per 100,000 population.³ Diet, smoking cessation, exercise, and stress management are important behavioral modifications that can decrease ones risk for developing heart disease.

It is well established in the literature that an individual’s diet can have a positive and/or negative impact on overall health, specifically cardiovascular disease. According to healthy people 2020 objective NWS 6.1, there has been an increase in the “amount of physician office visits made by patients ages >65 years old with a diagnosis of cardiovascular disease, diabetes, hyperlipidemia that included counseling or education related to diet and nutrition counseling” from an estimated 8% in 2012 to 15.6% in 2015.⁴ This increasing trend in patient nutritional education and counseling is promising. Although nutritional research is evolving, determining which dietary pattern approach is appropriate for an individual with known chronic heart disease remains challenging. There are several dietary pattern interventions that are prescribed to patients that may target specific risk factors including obesity, hypertension, diabetes mellitus, hyperlipidemia. Current literature supports the Mediterranean diet, DASH (Dietary approaches to Stopping Hypertension) and plant-based diet. Each diet is comprised of specific health benefits for Cardiovascular Disease (CVD) prevention and risk factor reduction. In terms of clinical setting, it is important to consider how providers may choose one dietary intervention over another in efforts to reduce patient’s CVD risk and disease progression. There are many factors that may

influence a provider's decision when discussing dietary interventions. Such dietary intervention decision may be based on practicing guidelines, provider familiarity and knowledge base of the diet therapy, relationship they share with the dietician and/or resources provided to the provider by the institution. As illustrated in the literature, each dietary pattern incorporates nutritional and whole food components that set it apart from another, which may influence whether a dietary pattern is attainable or non-attainable to an individual. This paper aims to assess the Mediterranean diet, DASH diet and plant-based dietary patterns to help aid providers that may encompass components from each dietary pattern and/or determine which plan is best for an individual with the ultimate goal of CVD prevention and risk factor reduction.

The relationship between the Mediterranean diet and its benefits on cardiovascular disease was first evident in the 1980 Seven-Countries Study.^{5,6} The study found that in the Mediterranean region, a diet high in unsaturated fat, predominantly olive oil, had lower cardiovascular death outcomes.⁵ The Mediterranean diet is not limited to just high unsaturated fat but supported with high amounts of plant based foods, fish, poultry, wine, fresh fruit, and with limited to low amounts of dairy, and red meat respectively.⁵ The Mediterranean dietary pattern benefits are evident for both primary and secondary prevention.⁵ In 2013, a randomized control trial conducted in Spain, assessed the impact of the Mediterranean diet supplemented with extra-virgin olive oil, mixed nuts, or a control diet that focused on reducing dietary fat.⁷ The study results showed that in high risk participants between ages 50-80 years old with no known cardiovascular disease, a diet supported by the Mediterranean diet with supplementation of either nuts or extra virgin olive oil showed a reduction cardiovascular events such as myocardial infarction, stroke or death from cardiovascular cause.⁷ In a 2019 meta-analysis, authors assessed the Mediterranean diet effects on secondary prevention.⁸ Authors highlighted the Lyons Diet

Heart study which was a randomized control trial of 605 men and women less than 70 years old who survived an MI within 6 months.^{8,9} The participants were randomized into a Mediterranean diet pattern or a typical post-MI diet (not addressed) and were followed-up at 8 weeks (from start of trial randomization) and again annually for 5 years.⁹ In conclusion, the study found that a Mediterranean diet significantly reduced coronary artery events and death noting 20 deaths in the control group compared to 8 in the Mediterranean group.⁹ The research attributed reduced mortality to the high alpha-linolenic acid components of the Mediterranean diet.⁹ The CARDIVEG study published in *Circulation* in 2018, analyzed body weight and individual cardiovascular risk factors including LDL and TG, comparing the Mediterranean diet and a vegetarian diet.¹⁰ Results from this study suggests that both the Mediterranean diet pattern and the low calorie vegetarian dietary pattern are effective in reducing body weight, BMI and fat mass.¹⁰ More specifically, the vegetarian diet showed greater reduction in LDL cholesterol and the Mediterranean diet showed greater reduction in triglyceride levels.⁹

Largely the Mediterranean diet has many heart healthy benefits and is a widely accepted dietary pattern for primary and secondary cardiovascular disease prevention. According to Widmer et al.,⁵ evidence supports that the Mediterranean diet's health benefits are equivalent to medical therapy including statins, renin-angiotensin system blockade, fibrates, aspirin and beta-blockers. As medication reduction is often a primary goal for individuals with heart disease, the Mediterranean diet also shows promising for not only risk factor and disease prevention but potentially medication reduction.⁵

Another dietary pattern that appears to have an inverse relationship with cardiovascular disease is the DASH (Dietary Approach to Stop Hypertension) diet.¹¹ In a 2019 meta-analysis, results demonstrated in participants who were adherent to the DASH diet showed a decrease in

coronary artery disease.¹¹ The DASH diet was initially adapted for hypertension control with an emphasis of restricting dietary sodium and increasing intake of potassium and magnesium for blood pressure control.¹² The diet additionally encourages an intake of “fruits, vegetables, whole grains, beans, fiber, low fat-dairy products, poultry, fish and limiting red meat, sweets and sugar-containing beverages.”¹² In a 1997 randomized clinical trial assessing the effects of the DASH diet on blood pressure, researchers examined 459 adults with based line systolic blood pressures 131.3+/- 10.8 mmHg and diastolic blood pressure 84.7+/-4.7 mmHg.¹³ In the intervention group, after 8 weeks of a combination diet of fruits, vegetables, and low-fat dairy products and with reduced saturated and total fat, the systolic blood pressure decreased by 5.5 mmHg and diastolic blood pressure decreased by 3.0 mmHg.¹³ In addition, authors found that in 133 participants with hypertension defined as greater or equal to 140/90 mmHg, there was a reduction in systolic blood pressure and diastolic blood pressure by 11.4 mmHg and 5.5 mmHg respectively, after 8 weeks of adhering to the dietary DASH pattern.¹³ In another study assessing the effects of sodium on blood pressure in a step wise approach, comparing the typical American diet (control) to the DASH diet, with the following sodium intake levels: high with target of 150 mmol/day (equivalent to the typical American diet; 3,400 mg/day¹⁵); intermediate with target of 100 mmol/day (upper limit of current national recommendations; 2,300 mg/day¹⁵); and low with a target of 50 mmol/day (lower limit; 1,500 mg/day¹⁵). Researchers found that participants who consumed the DASH diet had significantly lower systolic blood pressure at every sodium level (high, 150 mmol/day, intermediate, and low) and significantly lower diastolic blood pressure at high and intermediate levels.¹⁴ Furthermore, reducing sodium intake from a intermediate level to a low level resulting in a decrease in systolic blood pressure by 4.6 mmHg in the control diet and 1.7 mmHg in the DASH diet.¹⁴ Overall, this study found that there was a “greater response of

blood pressure to progressively lower sodium intake.¹⁴ Participants who had known hypertension and were randomized in the DASH diet arm with low sodium intake that was below the recommended 100 mmol per day, resulted in a decrease in systolic blood pressure by 11.5%.¹⁴ With known positive effects on both blood pressure reduction and coronary heart disease, the DASH diet is another dietary pattern that adults with hypertension or CVD would benefit from.

Atherosclerosis development is largely due to inflammation, oxidative stress and vascular immune dysfunction.¹⁶ When triggered by stress, plaque deposition in the vessels results, leading to the progression of CHD.¹⁶ In a randomized open-label blinded end-point study investigating the known benefits of plant based vegan diet to the recommended AHA-diet that most patients are counseled on, Shah et al.,¹⁷ investigated inflammatory markers, hsCRP as well as glucometabolic, and lipid profiles in in patients with known CAD and were medically managed. The study examined 100 patients between the ages 53-68 years old from the New York University Langone Medical Center with known CAD that were randomized into either a vegan diet or AHA-recommended diet and assessed between the years 2014-2017.¹⁷ The authors found that a plant-based vegan diet is effective at reducing inflammatory markers that contribute to CAD progression. More specifically, the vegan diet resulted in a 32% lower concentration of hsCRP compared to the AHA diet.¹⁷ In another study, Satija et al.,¹⁸ provides evidence supporting the benefit of a plant-based diet in preventing CHD and defines it as a “protective” intervention. In this study, authors found an inverse relationship between a healthy plant-based food intake of whole grains, fruits/vegetables, nuts/legumes, oils and tea/coffee and the occurrence of CHD.¹⁸ Conversely, authors found a higher risk of developing CHD was positivity correlated with consuming a less healthy plant based diet including juices, sweetened beverages, refined grains, potatoes/fries and sweets and animal foods which consisted of animal fat (butter),

meat, dairy, egg, fish/seafood, and miscellaneous animal based foods such as pizza, chowder, or cream soup, mayonnaise, or other creamy dressings.¹⁸ In the New Zealand BROAD study, subjects who adhered to a whole food plant-based diet compared to a control group that had no dietary intervention with normal care, showed a 8.5 lb. weight loss after 6 months.¹⁹ Authors also found that there was a reduction in cholesterol at 3, 6 and 12 months compared to the control group which only showed reduction at 3 months.¹⁹ Another important finding is that the intervention group showed a decrease in medication usage compared to the control which resulted an increase in medication use.¹⁹ The results of this intervention suggest that a plant-based diet is beneficial for weight loss in obese or overweight patients, cholesterol as well as medication reduction, therefore improving heart disease risk as a primary and secondary intervention.¹⁹

The dietary patterns examined throughout this paper demonstrate promising benefits for heart disease prevention. According to a review by Houston et al.,¹⁶ when a diet that supports optimal nutrition is modified to the individual and is combined with other lifestyle behavior changes including exercise, weight reduction, tobacco cessation, CHD can be prevented by 80%. There may be several barriers to consider when counseling individuals on optimal nutrition and advocating for dietary pattern change and adaptation. In the review “Nutrition and Cardiovascular Disease: Finding the Perfect Recipe for Cardiovascular Health, Ravera et al.,²⁰ explains that adherence issues surrounding a heart healthy diet are primarily due to food industry trends promoting an increase in poor dietary intake versus low-fat and fresh food, the increased cost of healthier options compared to western diet, availability of fresh produce in urban settings, interest/palatability of food, education, socioeconomic status, other lifestyle behaviors.

Despite the growing evidence supporting the benefits of the Mediterranean, DASH diets and plant-based diets in preventing heart disease, they are truly only successful if the dietary plan is tailored to the individual's needs, ultimately setting them up for success. Satija et al.,¹⁸ found that those who adhered to a healthy plant-based diet were older, more active, and were less likely to smoke compared to other the younger generations. Therefore, approaching each nutritional consult with a patient center approach, with shared decision making, can potentially optimize health outcomes, adherence and patient success.

There is significant research supporting interventions providers can adapt for increasing patient outreach, adherence and long-term follow-up through telemedicine, home delivered meals, and telephone counseling.^{22,23,24} A systemic review from the Community Preventive Service task force on Health information technology suggests that an increase in frequency of telehealth visits regarding vegetable and fruit intake was more effective when they occurred weekly compared to monthly.^{22,23} A major benefit of telemedicine is that it can be done more frequently than in person and therefore limit transportation barriers for patients.^{22,23} It provides more accountability with more frequent follow-up visits. Other clinical outcomes from this review found improvements in blood pressure, total cholesterol, triglycerides, weight and waist circumference.^{22,23} The authors conclude that using telemedicine to provide whole food and dietary pattern education and follow-up was beneficial in improving patient outcomes.^{22,23} They recommend that health care providers implement telehealth visits into their routine care for improved adherence, follow-up and care.^{22,23} In another study, Eakin E. et al.,²⁴ conducted a cluster RCT in the effects of the delivery of telephone counseling over 12 months on physical activity and dietary behaviors in the primary care setting. Results of this study supports utilization of telephone follow-up in improving patient outcomes over a long period of time, 1

year in the primary care setting, as a means of improving behaviors for patients with chronic health conditions.²⁴ In a randomized control trial, Troyer et al.,²⁵ found that in older participants with known cardiovascular disease and who were not adherent to heart healthy dietary recommendations, when meals (that supported the DASH diet) were directly provided, there was a greater adherence with the dietary recommendations. This study holds value in that if we can help patients get access to whole foods through food banks or other food programs within that specific community, it could potentially have the same benefits and help patients adhere to a healthier diet. However, a limitation that the authors identify in this study is that there might have been more adherence rates (beyond the already significant rates from results) if the meals were more personalized to meet the persons taste preference.²⁵ Overall, the benefits of providing meals for people, especially the older population prove to be beneficial.

In conclusion, nutritional education and counseling in patients >55 years old is just as important as smoking cessation and physical activity in efforts to prevent CVD.²¹ Implementing one of the three dietary patterns should be a multidisciplinary approach that involves collaboration between providers as well as close guidance and follow-up of their patients. Using a combination of the dietary patterns may allow the provider and patient to create a plan that is attainable to the patient, encourages collaboration and sets the patient up for success.

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