

Winter 12-15-2022

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Evaluating the Role of the Mediterranean Diet in the Progression of Heart Failure

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DMSc 734: Advanced Research Project III

December 15th, 2022

## INTRODUCTION

The prevalence of heart failure (HF) in the United States has been increasing for years. Many individuals, especially our older population, are ending up hospitalized, causing financial burden and worsened quality of life for our patients. HF is one of the leading causes of hospitalization and death in older adults in the United States.<sup>1</sup> Nearly one million patients are hospitalized due to HF every year and of those, many will be readmitted within a month of discharge.<sup>5</sup> The American College of Cardiology Foundation/American Heart Association (ACCF/AHA) and Heart Failure Society of America (HFSA) guidelines define HF as “a complex clinical syndrome that results from any structural or functional impairment of ventricular filling or ejection of blood leading to cardinal manifestations of dyspnea, fatigue, and fluid retention and resulting in a reduced cardiac output and/or elevated intracardiac pressures at rest or during stress.”<sup>6</sup> Currently, the overall 5-year survival following the diagnosis of HF has been reported as approximately 50%.<sup>6</sup>

The management of HF is focused on the use of multiple medications including ACE inhibitors, beta blockers, diuretics, and sodium-glucose cotransporter 2 (SGLT2) inhibitors. When medication alone isn't effective enough, patients with an ejection fraction equal or less than 35%, device usage such as implantable cardioverter defibrillators are considered. In addition to these treatments, many cardiologists recommend patients begin following a particular diet, such as the Mediterranean diet. It has been proved that the adherence to the Mediterranean diet is a useful tool in primary prevention of HF. However, since millions of Americans are already diagnosed with HF, it would be worth investigating if the same diet can be useful to prevent worsening of an already diagnosed HF. This diet might be helpful in slowing the progression of

HF in individuals who are already being treated with the standard recommendations. It has been noted that if a patient has heart disease, their risk of future cardiovascular events may decrease by 72% with a Mediterranean diet and by 47% with exercise.<sup>7</sup> These outcomes can be noted through various mechanisms that will be discussed in this article, including decreasing obesity, hypertension, inflammation, diabetes, and dyslipidemia. These are known risk factors for worsening HF due to the increased strain they put on the heart. Learning more about the impact of diet on the bodies of those with HF, medical providers will expectantly feel more comfortable encouraging patients to focus on healthy living to slow progression of HF and decrease overall mortality risk.

## **REVIEW OF LITERATURE**

A study conducted by Thanasis G. Tektonidis et al<sup>1</sup> aimed to evaluate if high adherence to the Mediterranean diet reduces the risk of death from HF. Although this study only included men who were free from cardiovascular disease at baseline, which posed as a major limitation of this study, it provides valuable insight into the effect that the diet has on overall cardiovascular health. This study followed roughly 37,000 men in the final study population which lasted about 11 years, with an age range of 45–79 years old and average of 59 years. The study used a 96-item semi-quantitative food frequency questionnaire before implementing diet changes in order to get a baseline of the participants' overall health from the prior year. Throughout the study, the mMED score is utilized to determine the participant's adherence to the Mediterranean diet. The mMED score includes vegetables and fruits (excluding fruit juices and potatoes), legumes and nuts, non-refined/high fiber grains (whole-meal bread, crispbread, oatmeal, and wheat bran), fermented dairy products (cultured milk, yogurt, and cheese), fish, red and processed meat, use

of olive oil and/or grapeseed oil, and alcohol.<sup>1</sup> Each person was then given a score based on a predetermined scoring system with zero implicating low adherence and eight implicating high adherence to the Mediterranean diet. The rates of hospitalization of HF were tracked by record linkage using the ICD10 codes I50 and I11 from the years 1998 and 2008. After ten years, HF incidents were reported and sorted based on the individual's mMED score. It was found that those with a higher mMED score had a lower risk of HF and death from HF “every two-point increment in the mMED score was associated with a 15% reduction in risk of HF... and a 22% lower HF mortality.”<sup>1</sup> Proposed mechanisms from this study included the consumption of high anti-oxidant index foods such as fresh vegetables and fruits, and nuts, as well as anti-inflammatory foods like olive oil and oily fish (which has also been shown to be rich in omega-3 and complex long-chain polyunsaturated fats). These aspects of the Mediterranean diet suggested to “improve systolic and diastolic blood pressure, endothelial and left ventricular function, and lipid profile; it also reduces oxidative stress, coronary atherosclerosis/thrombosis and inflammatory markers”.<sup>1</sup> The research was highly suggestive that this diet would be useful in slowing progression of HF and no data showed that use of the Mediterranean diet would pose risk to individuals who chose to practice it.

The study by Òscar Miró et al<sup>2</sup> evaluated the correlation between adherence to the Mediterranean diet and all-cause mortality in patients who recently had an exacerbation of HF. Participants were recruited through multiple emergency departments after they had visited for an acute HF exacerbation. A total of around 1,000 participants with an average age of 80 were recorded at the end of the study, being reassessed after 3 years.<sup>2</sup> This study used a questionnaire with information about dietary intake called the PREDIMED questionnaire. The researchers gathered information about the participants from their emergency department visit, including

vital signs, comorbidities, and adherence to a Mediterranean diet. The researchers also collected data at follow-up a year later to see how many participants required readmission to the hospital during that year and who was adherent to a Mediterranean diet at that time. The study showed that decreasing sodium intake to less than 2,300 mg per day was associated with a reduced risk of all-cause mortality.<sup>2</sup> Although the Mediterranean diet does not specifically focus on decreasing salt intake to less than 2,300mg/day, it emphasizes low sodium and low processed foods which ultimately achieve the same goal. Interestingly, those who adhered to this diet also showed to have decreased hospitalizations throughout the study. It was proposed that “intervention with the MedDiet reduced plasma concentrations of several HF biomarkers such as non-terminal pro-B-type natriuretic peptide, oxidized low-density lipoprotein cholesterol and lipoprotein (a)” which could explain the decrease in hospitalizations.<sup>2</sup> It was also described that extra virgin olive oil or nuts can reduce plasma concentration of oxidized low-density lipoprotein cholesterol and several inflammatory biomarkers related to atherosclerosis.<sup>2</sup> Another mechanism proving helpful for slowing progression of HF is by targeting blood pressure with consumption of some key foods such as walnuts or red wine which increase plasma nitric oxide.<sup>2</sup> Seeing a decrease in hospitalizations of those with HF who maintained high adherence to the Mediterranean diet suggests lesser severity of HF compared to the other participants in this study.

Gabriela Dos Reis Padilha et al<sup>3</sup> aimed to clarify the relationship between dietary patterns, including the Mediterranean diet, and secondary prevention of HF. This meta-analysis reviewed over 1,000 articles and ended up including research from 12 articles in their research, four of which specifically included the Mediterranean diet. Each of the participants in the studies reviewed had previously been diagnosed with HF. One of the studies concluded a positive

association between higher adherence scores to a Mediterranean diet and systolic function, left ventricular ejection fraction, and left atrial ejection fraction when observing echocardiograms at the beginning and the end of the study. An additional study that was reviewed showed an inverse relationship between circulating inflammatory cytokines (IL-6 and TNF-a) and adherence to this diet. One study that was analyzed showed a 15% reduction in mortality rates of individuals with greater adherence while another study showed that “individuals with greater adherence to a Mediterranean diet had 34% lower all-cause mortality when compared to those with low dietary adherence<sup>3</sup>.” One mechanism proposed for preventing exacerbations of HF was a decrease in inflammatory cytokines, which was shown in those following this diet. Olive oil, a significant component of the Mediterranean diet, was associated with improved endothelial function and is rich in monounsaturated fatty acids and phenolic compounds. Phenolic compounds have anti-inflammatory properties, which may explain the observed association between diet and disease exacerbation.<sup>3</sup> While some articles that this author reviewed showed minimal significance in mortality when following a certain diet, there was agreement across all the observed articles that there was less severe progression of HF and improved quality of life associated with adherence to a Mediterranean diet.<sup>3</sup> While diet modifications have little to no risk for the patient with HF, this may be an important recommendation for those willing to try a diet for possible prevention of progressing HF. Overall, there was less severe HF progression in those following a Mediterranean diet across each individual study that was analyzed but there was no clinically significant correlation with mortality.

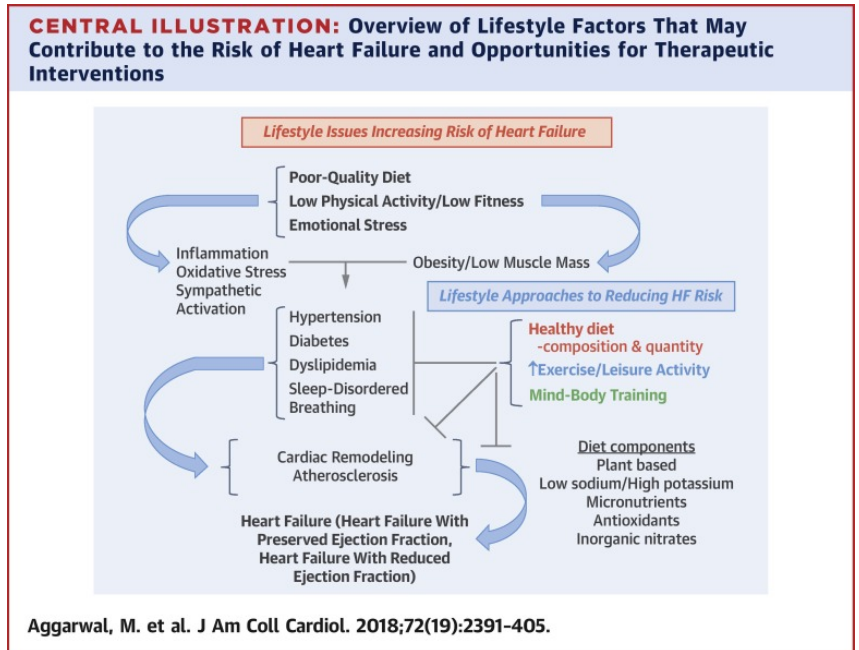
A study by Aggarwal et al<sup>4</sup> looked at how lifestyle modifications could potentially prevent or treat HF. The authors review the evidence behind weight management, exercise, nutrition, dietary composition, supplements, and mindfulness and their effects on the disease

process in HF patients. Their studies indicated that “poor dietary quality, including excess caloric

intake and unhealthy food choices, low physical activity, and mental stress, are major, modifiable lifestyle factors that are likely contributing to the rapidly changing epidemiology of HF.”<sup>4</sup>

Obesity specifically had been shown to increase risk of HF and increase exacerbation occurrences. It was shown that maintaining a BMI below 30 is helpful in reducing the risk of

developing HF and that decreasing weight can reduce the strain on the heart, which can be helpful to slow progression of HF. Many mechanisms were proposed in the study including inflammation, myocardial injury, hypertension, impaired glucose homeostasis, dyslipidemia, sleep-disordered breathing, and left ventricular hypertrophy<sup>4</sup>. A major limitation was that in order to have a meaningful decrease in hospitalizations from HF, the patient would have to achieve a 10% decrease in weight. Unfortunately, this drastic decrease can be challenging for many patients to achieve especially if only utilizing lifestyle modifications. This article also discussed how the components of the Mediterranean diet including increased whole foods, especially vegetables, and decreased consumption of red meats effect the body. The diet has a high concentration of vegetables, containing an estimated 400 to 550 g of nitrate versus 77 g in the typical Western diet which has been linked to a decrease in blood pressure and increase in exercise capacity. “Meats, particularly processed red meat, may increase inflammation, as shown





by increasing serum levels of C-reactive protein.”<sup>4</sup> It was also shown that “diets higher in phosphatidylcholine (contained in red meat, cheese, and eggs) appear to promote an increase in the intestinal metabolite trimethylamine-N-oxide, a risk factor for myocardial infarction, stroke, heart failure, and death.”<sup>4</sup> Another correlation between HF and the Mediterranean diet that this article discussed is with diabetes. Diabetes and insulin resistance are associated with adverse cardiac remodeling. The Mediterranean diet is associated with low prevalence of diabetes which would result in less adverse cardiac remodeling. Those who followed any diet that recommended increased fruit and vegetable intake while decreasing red meat and processed foods, such as the Mediterranean diet, seemed to have better cardiovascular outcomes in general.

## **CONCLUSION**

With approximately 6.2 million adults in the United States affected by HF, it is crucial to investigate what actions can be taken for secondary prevention of exacerbations and slowing the progression of this chronic disease. Lifestyle modifications can be an option to prevent worsening of HF in patients who are already diagnosed with HF. The Mediterranean diet has multiple mechanisms in which it provides support to the heart. This dietary pattern has antioxidant and anti-inflammatory effects and has been shown to have favorable changes in cardiac function. Obesity, hypertension, inflammation, diabetes, and dyslipidemia have all been associated with worsening HF. The components of the Mediterranean diet, such as vegetables, olive oil, and low red meat or processed food intake, have been linked to eliminating these factors that worsen HF. With more evidence revealing the power behind lifestyle modifications, hopefully more providers will feel empowered to recommend and encourage their HF patients to

begin diet modification, particularly using the Mediterranean diet, to slow progression of their disease.

## References

1. Tektonidis TG, Åkesson A, Gigante B, Wolk A, Larsson SC. Adherence to a Mediterranean diet is associated with reduced risk of heart failure in men. *European Journal for Heart Failure*. 2016;18(3):253-259. doi:10.1002/ejhf.481
2. Miró Ò, Estruch R, Martín-Sánchez FJ, et al. Adherence to Mediterranean Diet and All-Cause Mortality After an Episode of Acute Heart Failure: Results of the MEDIT-AHF Study. *JACC Heart Failure*. 2018;6(1):52-62. doi:10.1016/j.jchf.2017.09.020
3. Dos Reis Padilha G, Sanches Machado d'Almeida K, Ronchi Spillere S, Corrêa Souza G. Dietary Patterns in Secondary Prevention of Heart Failure: A Systematic Review. *Nutrients*. 2018;10(7):828. doi:10.3390/nu10070828
4. Aggarwal M, Bozkurt B, Panjra G, Ostfeld R. Lifestyle Modifications for Preventing and Treating Heart Failure. ScienceDirect. [https://www.sciencedirect.com.georgefox.idm.oclc.org/science/article/pii/S0735109718383517](https://www.sciencedirect.com/georgefox.idm.oclc.org/science/article/pii/S0735109718383517). Published 2018. Accessed April 20, 2022.
5. Roger VL, Véronique L. Epidemiology of Heart Failure. *Circulation Research*. <https://www.ahajournals.org/doi/10.1161/CIRCRESAHA.113.300268>. Published August 30, 2013. Accessed April 10, 2022.
6. Givertz MM, Mehra MR. Heart Failure: Pathophysiology and Diagnosis. In: Loscalzo J, Fauci A, Kasper D, Hauser S, Longo D, Jameson J. eds. *Harrison's Principles of Internal Medicine* 21e. McGraw Hill; 2022. Accessed August 06, 2022. <https://accessmedicine-mhmedical-com.georgefox.idm.oclc.org/content.aspx?bookid=3095&sectionid=265451573>

7. Hassell M, Hassell M. *Good Food, Great Medicine: Ruminations & Recipes from a Medical Practice*. M. Hassell; 2009.