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Omega-3 and Vitamin D May Reduce Heart Failure Complications

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STORY AT-A-GLANCE

- People with Type 2 diabetes who use omega-3 supplements have a lower incidence of hospitalization for heart failure. Despite advances in drug therapy, the prognosis for heart failure continues to remain poor with a mortality of 60% over one year in people with severe disease
- Factors that can lead to heart failure include high blood pressure, coronary artery disease and atherosclerosis, all of which place additional stress on the heart leading to dysfunction and enlargement
- Multiple studies have demonstrated that vitamin D also plays a significant role in heart health as it has an impact on mineral metabolism, myocardial function and inflammation. Deficiency is highly prevalent in people with heart failure and is a prognostic indicator of poor outcomes
- Two other nutrients essential to heart health are sulfur and magnesium. Sulfur is a key component of glutathione, a powerful antioxidant that is crucial to heart health. Magnesium plays a vital role in controlling blood pressure, which is a significant factor in heart failure
- Although low sodium diets have been a cornerstone in heart failure management, data demonstrate that they are associated with an increased risk of failure and death

Data from a study[1] published in April 2022 in JACC: Heart Failure reveals that people with Type 2 diabetes who used omega-3 supplements had a lower incidence of

hospitalization with heart failure. Heart failure is a form of heart disease in which the heart experiences ventricular dysfunction.

The heart is separated into four chambers. The bottom two chambers called the ventricles, pump blood to the lungs or the body.[2] When there is left ventricular failure, a person experiences fatigue and shortness of breath. With right ventricular failure a person may experience abdominal and peripheral fluid buildup.

Heart failure can affect one or both sides of the heart. Experts believe there are more than 15 million new diagnoses of heart failure globally each year.[3] In the U.S., more than 600,000 new cases are diagnosed each year. Additionally, it's estimated that 10 times that number of Americans currently have heart failure.

Despite advances in drug therapy, the prognosis continues to remain poor. Individuals with severe heart failure have a mortality rate of up to 60% over one year and up to 30% mortality rate in mild to moderate failure.[4] Heart failure develops as the ventricles become inefficient. This can happen from a variety of different factors that place excessive demand on the heart.

One factor that can lead to heart failure is long-term, uncontrolled high blood pressure or hormonal disorders such as hyperthyroidism. But, the primary cause of heart failure is coronary artery disease, which reduces the delivery of oxygen and nutrients to the heart muscle. Over time, this leads to impaired function.

There's also a relationship between chronic high blood pressure and coronary artery disease,[5] which means that high blood pressure may have an effect on the development of heart failure through at least two pathways. The primary focus of the featured study was to evaluate whether an omega-3 supplement could reduce the risk of hospitalization for heart failure in participants with or without Type 2 diabetes.

Omega-3 Supplements Lower Risk of Heart Failure Admission

The data were gathered from the vitamin D and omega-3 trial (VITAL)[6] that started in 2010. VITAL, the parent trial for this study, engaged 25,871 men and women to evaluate

their dietary supplementation of vitamin D3 or omega-3 fatty acids and the impact it had on developing heart disease, stroke or cancer in people who did not have a history of these health conditions.

Participants took the supplements for a five-year intervention phase and researchers have continued with ongoing follow-up. The ancillary study began in 2014, in which the researchers assessed the role that race and Type 2 diabetes had on supplementation with omega-3 fatty acids.

There were four arms to the study.[7] The first group received 2,000 international units (IU) per day of vitamin D3 and 1 gram per day of fish oil. The researchers compared results against three other groups who received either two placebos, or a placebo for vitamin D or fish oil. The primary outcome measure was new heart failure with hospitalization and the secondary outcome measure was recurrent hospitalization.

When the researchers evaluated the results[8] they found that omega-3 supplements could reduce hospitalization rate for the first heart failure by 0.69 in participants who had Type 2 diabetes when compared to taking a placebo. They also found that omega-3 effectively reduced recurrent hospitalization in black participants. The results did not show a benefit for individuals who did not have Type 2 diabetes.

However, the researchers did not measure the omega-3 index for these individuals, thus it is difficult to determine if omega-3 levels were low in those who experienced the greatest benefit. There is evidence to suggest from past studies that individuals with Type 2 diabetes have significantly lower omega-3 indices than those who do not have Type 2 diabetes,[9] suggesting increasing dietary intake may help prevent the condition.

Data[10] also suggests that omega-3 supplementation may help lower inflammatory levels in people with diabetes, which also contributes to better heart health.[11]

Vitamin D Significant Factor in Heart Failure Outcomes

One arm of the study included participants who took only vitamin D and a placebo to replace omega-3 fatty acids. In this cohort, the researchers did not find that only vitamin

D could help reduce hospitalization rates in people with heart failure. However, there is evidence from multiple past studies that vitamin D has a significant effect on protecting heart health.

Data from one study showed an anti-inflammatory effect from vitamin D in patients with congestive heart failure (CHF) suggesting it may serve as "a new anti-inflammatory agent for the future treatment of the disease. Our data provide evidence for the involvement of an impaired vitamin D–parathyroid hormone axis in the progression of CHF."[12]

Evidence also suggests that vitamin D has an impact on mineral metabolism and myocardial dysfunction in patients with CHF. Researchers wrote in the American Journal of Cardiology that deficiency may be "a contributing factor in the pathogenesis of CHF."[13]

Epidemiological studies have also provided strong support that vitamin D has cardioprotective effects[14] and data also show that most patients with CHF have insufficient vitamin D levels, lower than 20 ng/mL.[15] Researchers hypothesize that this may be related to the sedentary lifestyle of people with CHF and that insufficient levels contribute to the etiology of the disease.

More data indicated that low concentrations of vitamin D3 contribute to a poor prognosis in patients with heart failure, which may be related to inflammation.[16] Furthermore, deficiency is highly prevalent, including in patients with heart failure and is "a significant predictor of reduced survival."[17]

Researchers found that supplementing with vitamin D was independently associated with a reduction in mortality and that lower vitamin D levels were associated with high body mass index, diabetes, decreased calcium and hemoglobin levels and female gender.[18]

Sulfur and Magnesium: Two Crucial Nutrients for Heart Health

Sulfur has been a "forgotten" nutrient and you don't hear it mentioned very often. Yet it's very important for optimal body function and health. You get most of your sulfur from

certain proteins in your diet, specifically, those that contain the amino acids methionine, cysteine, cystine, homocysteine, homocystine and taurine.[19] Of these, the two most important are methionine and cysteine.

Neither of these is stored in the body, although glutathione is a key storage form of sulfur.[20] Glutathione keeps many other antioxidants performing at peak levels and cysteine availability is thought to be a rate-limiting factor for glutathione synthesis.[21] According to Stephanie Seneff, Ph.D., who has written several papers on sulfur,[22,23,24] deficiency appears to play a role in a wide range of health problems and diseases, including heart disease.

In 2011, during an interview with Seneff,[25] we discussed the influence that sulfur has on health and disease. She talked about the crucial connections between sulfur, cholesterol and vitamin D, suggesting that sensible sun exposure plays an important role in heart and cardiovascular health as it regulates not only vitamin D3 but also cholesterol sulfate in circulation.

Magnesium also plays a crucial role in high blood pressure and cardiovascular disease. Because serum magnesium is not a reflection of the total amount your body has available, experts believe that most cases of deficiency go undiagnosed.[26] Additionally, because of a decrease of magnesium in the soil, medications and the number of processed foods eaten by the majority of people, many are at risk for deficiency.

Low levels of magnesium have been associated with Type 2 diabetes, high blood pressure, atherosclerotic vascular disease and sudden cardiac death.[27] Some estimates are that nearly half the U.S. population eats less than the required amount of magnesium-rich food and that the prevalence and incidence of Type 2 diabetes rose while consumption of magnesium declined.

Magnesium is a natural calcium channel blocker that also increases nitric oxide production to relax the arteries and improve endothelial dysfunction.[28] These functions reduce the risk of high blood pressure.[29]

Researchers have been studying the effect of magnesium on blood pressure for many years, but not always with the same results. One literature review of 44 human trials proposes that the dissimilar results are a function of study designs that are not uniformly matched between studies.[30] When a uniform subset of the 44 studies was combined, the scientists found a strong effect of magnesium against high blood pressure.

Low Sodium Diet Increases Risk of Heart Failure

In this video, James DiNicolantonio, Pharm.D, discusses the parallel between the rise of high blood pressure, diabetes and obesity with the reduction in salt consumption that began in the early 1900s. He goes on to explain that one of the body's ways of retaining salt is to increase insulin. With a low salt intake, your body becomes insulin resistant, which helps explain the rise in triglyceride levels in people who eat a low salt diet.

Guy Johnson, Ph.D., principal at Johnson Nutrition Solutions LLC, filed a petition with the FDA to request a qualified health claim for conventional foods and dietary supplements that contain 20% of the daily value of magnesium.[31] He proposed, based on hundreds of studies and papers,[32] that magnesium could reduce the risk of high blood pressure.

Six years later, in January 2022,[33] the FDA responded with a 42-page letter,[34] in which they concluded there wasn't enough evidence[35] after reviewing just 38 intervention studies. After documenting their reasons for discounting the results, the letter identified a secondary factor that must be met for the qualified health claim to be used — the conventional foods must also meet the "low sodium" criteria, writing:[36]

> *"Sodium attracts water, and a high-sodium diet draws water into the bloodstream, which can increase the volume of blood and subsequently your blood pressure. High blood pressure or hypertension is a condition that makes the heart work too hard, and the high force of the blood flow can harm arteries and organs (such as the heart, kidneys, brain, and eyes)."*

However, this is a rather simplistic view of how the body works. Sodium balance is impacted by several nutrients and kidney health. Your body uses magnesium, calcium[37] and potassium[38] to balance sodium, which in turn affects other aspects of your health, such as bone destiny, blood pressure, and heart and kidney health. When one level changes, it affects the others.

Sodium restriction has been a cornerstone of heart failure management. To move the focus to the other more damaging white crystal — sugar[39] — one paper[40] from Rush University Medical Center found salt restriction was associated with an increased risk of heart failure and death.

A second study[41] demonstrated the risk of cardiovascular events decreased as the potassium level increased. There have been hundreds of studies across nearly every bodily system that shows maintaining overall health is not a singular function but, rather, a complex interaction between nutrients, enzymes and bodily systems.

Sleep Is Another Factor That May Raise Risk of Heart Disease

Your heart health depends on multiple factors, including how many hours of sleep you get each night. Researchers with the National Center for Cardiovascular Research[42,43] in Madrid, Spain found people who slept less than six hours each night were 27% more likely to have subclinical atherosclerosis than those who slept for seven or eight hours each night.

Subclinical atherosclerosis can trigger congestive heart failure as it increases the exercise load on the heart muscle. People who have fragmented sleep, which means they wake up often or have trouble falling asleep, also had a 34% increased risk of subclinical atherosclerosis compared to longer sleepers.[44] In the study, the researchers found there was a sweet spot since sleeping either too little or too much increased risk.

Women who slept for more than eight hours a night doubled the risk of subclinical atherosclerosis compared to those who slept seven or eight hours each night. The participants who were an average age of 46 years had a 5.9% risk of having a heart

attack or stroke in the next 10 years or 17.7% in the next 30 years.[45] Yet, when the women slept for less than six hours a night, that risk increased to 6.9% for 10 years and 20.9% for 30 years.

"[T]his study emphasizes we have to include sleep as one of the weapons we use to fight heart disease — a factor we are compromising every day," senior study author José M. Ordovás, Ph.D., said.[46] What's more, he added, "This is the first study to show that objectively measured sleep is independently associated with atherosclerosis throughout the body, not just in the heart."

The link between sleep and heart health is not new, and it could be that even seven hours is just barely enough. People who sleep less than seven hours a night have an increased risk of heart disease,[47] and this is true regardless of other factors that influence heart health, like age, weight, smoking and exercise habits.

People who struggle with sleep apnea, which causes frequent nighttime awakenings, often have heart trouble as well. Women with sleep apnea tend to have higher levels of the protein troponin T, which is a marker for heart damage and are more likely to have an enlarged heart,[48] which is a risk factor for heart failure. Too little sleep may also increase the inflammation in your body.

"Sleep-deprived people have higher blood levels of stress hormones and substances that indicate inflammation, a key player in cardiovascular disease. Even a single night of insufficient sleep can perturb your system," according to Dr. Susan Redline, of the Division of Sleep Medicine at Harvard Medical School.[49]

Lack of sleep also increases your risk of several health problems that take a toll on heart health, including high blood pressure, Type 2 diabetes and obesity, which are all risk factors for heart failure.

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