# Nutrition Therapy in the Prevention and Treatment of Heart Failure

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# 1. Introduction

There is a growing awareness that the main cause of morbidity and mortality in Africa, and indeed in the rest of the world, has moved away from communicable diseases towards non-communicable diseases (NCD's).[1] Atherosclerotic cardiovascular disease (ASCVD) is the leading cause of morbidity and mortality globally, despite substantial improvements in disease outcomes in recent decades.[2] In South Africa, 43% of total adult deaths are caused by NCD's, of which 18% are due to ASCVD, with 33.7% of adults presenting with hypertension and 31.3% with obesity, with around 37.7 million people affected by HF world wide.[3,4]

Ideal cardiovascular (CV) health factors are increasingly linked to a lower prevalence and incidence of ASCVD events, such as heart failure, atrial fibrillation, cancer, depression and cognitive impairment. It is therefore, of the utmost importance to move individuals towards ideal CV health for the prevention of many adverse health conditions.[2]

Usually, interventions that delay the onset of a disease are defined as primary prevention and those that delay the progression of the disease by treatment and rehabilitation are defined as secondary prevention. However, in the context of CVD, the distinction between primary and secondary prevention is blurred because the reduction of modifiable CVD risk factors is effective for both the prevention of the disease in a general population and the delay of its progress in patients diagnosed with the disease, and similar interventions may be used for both. *Successful prevention strategies must emphasize lifestyle optimization (healthy food choices, being physically active, avoiding the use of tobacco and the exposure to second-hand smoke) to minimize the risk of future ASCVD events, and for both primary and secondary prevention of CVD.*[2]

After decades of decline, a 1% rise in deaths from heart disease was seen by 2015, attributed to the obesity epidemic. Healthy nutrition has the potential to reverse or reduce obesity, high cholesterol, diabetes and hypertension and therefore, a positive impact on ASCVD and its risk factors.[2] Multiple observational studies have focused on the association of CVD mortality with certain dietary patterns and the following specific supportive recommendations;

1. ***Plant-based and Mediterranean diets,*** along with increased fruit, nut, vegetable, legume, and lean vegetable or animal protein (preferably fish) consumption, with the inherent soluble and insoluble vegetable fiber, have consistently been associated with lower risk of all-cause mortality than control or standard diets. Furthermore, several studies indicated that lower mortality rates were associated with replacing animal protein of different origins with plant protein. The evidence with regard to the effectiveness of dairy intake to reduce ASCVD risk factors is, however, mixed and therefore not included in the current recommendations.[2]

2. ***Trans and saturated fats.*** An association has been shown between trans and saturated fats and a higher risk total and cause- specific death.[2] When it comes to fat, it is important to look at the types of fat consumed and rather than adopting a low-fat diet, it is more important to focus on eating beneficial "good" fats and avoiding the harmful or "bad" fats.[6]

Higher olive oil intake was associated with lower risk of CHD and total CVD in 2 large prospective cohorts of U.S. men and women. The substitution of margarine, butter, mayonnaise, and dairy fat

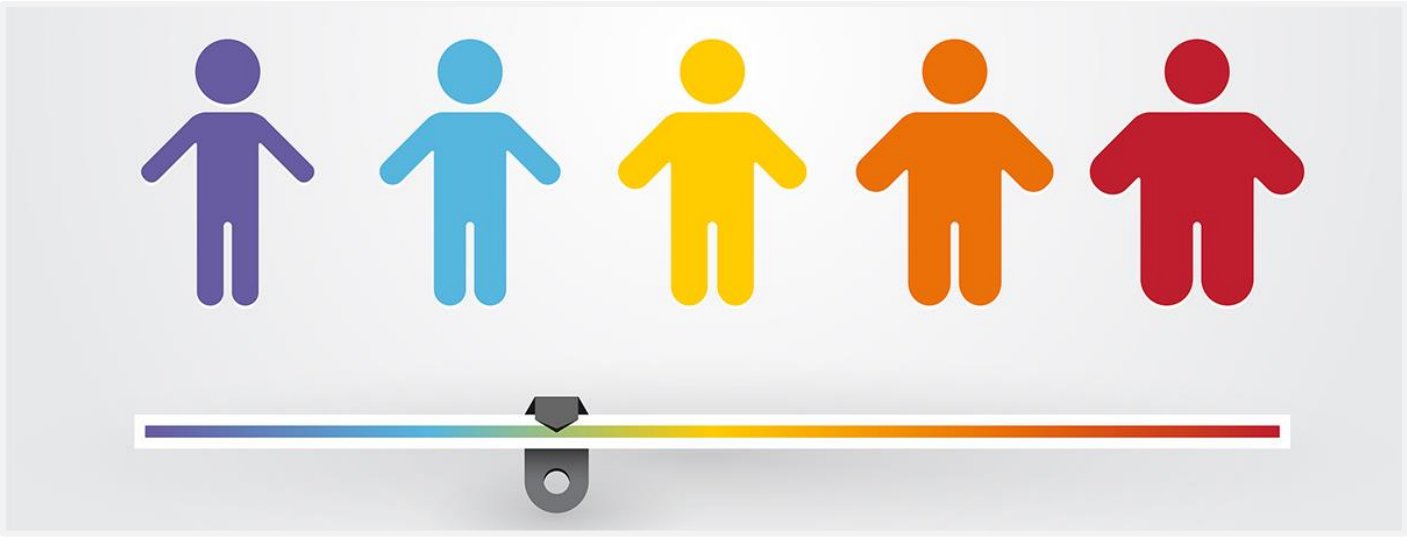
with olive oil could lead to lower risk of CHD and CVD.[7] Therefore, rather choose foods with "good" unsaturated fats, limit foods high in saturated fat, and avoid "bad" trans-fat.[6]

3. ***Dietary sodium reduction*** was found to reduce CV events and blood pressure in the DASH trial and data from the National Health and Nutrition Examination Surveys (NHANES) indicates an association between a high intake of sodium (>2000 mg daily), red meat (>14 g/day), sugar-sweetened beverages and processed red meat, and CV death.[6] The optimal goal for dietary sodium intake is 1500 – 2000 mg daily, but aim for at least a 1000 mg daily reduction in most adults.[2]

4. ***Food products that have been shown to be potentially harmful or might increase risk of ASCVD*** include sugar-sweetened beverages, where an association between an intake of sugar >10% of daily calories and increased mortality has been established by large cohort studies. Furthermore, low-carbohydrate diets, high in animal fat and protein were associated with 31% higher risk of all-cause death, with increased mortality rates, with the optimal carbohydrate intake observed to be 50% to 55%.[2]

Important however, is the quality and type of carbohydrates and focus should be placed on the intake of fiber-rich whole grains and avoidance of refined carbohydrates and sugar-sweetened beverages.

5. Adults diagnosed as *overweight* (BMI=25 to 29.9 kg/m$^2$) and as being *obese* (BMI≥30 kg/m$^2$) are at increased risk of ASCVD, heart failure and atrial fibrillation compared to those within normal weight ranges. It is therefore, strongly recommended that adults who are overweight or obese, are to participate in comprehensive lifestyle programs for at least 6 months, adhering to a low-calorie diet (800 – 1500 kcal/day, increased, preferably aerobic, physical activity (200 – 300 minutes/week), regular contact with the relevant health professionals and weekly weigh-ins.[2]



6. ***Waist circumference*** measurement is recommended in all patients with BMI<35 kg/m$^2$, as central adiposity, captured by using waist circumference, has been associated with ASCVD risk.[2]

Data from sub-Saharan Africa suggests that up to 25% of hospital admissions are due to CVD, including hypertension, with HF being the most common ASCVD disorder and the main driver of adverse health outcomes.[1] Secondary prevention and the treatment of HF should first and foremost be a comprehensive patient-centered approach, and should involve both medical and nutrition management by a multidisciplinary team, determining a treatment plan, that will address all aspects of a patient's lifestyle habits and goals, estimating future risk, and then deciding on the appropriate pharmacotherapy treatment regime.[2] It is also very important to take into consideration andy related socio-economic disadvantages, as failure to address these can impede the efficacy of proven prevention recommendations and intervention strategies.[2,5]

# 2. Nutrition Specific Practice Recommendations for the Management of Heart Failure in adults

## 2.1 The rationale for medical nutrition therapy (MNT) in heart failure

Chronic heart failure (CHF) is characterized by an unstable course of illness and is progressive in nature, often accompanied by debilitating symptoms, such as edema, weight gain or weight loss, dyspnea, fatigue and a loss in functional status and quality of life. As it is a chronic disease, treatment is usually on an out-patient basis, which necessitates frequent follow-ups either at home or at an outpatient clinic to evaluate medication effectiveness, monitoring of symptoms and to promote self-care behavior.[9]

Patients with CHF frequently lose weight, which might increase with worsening symptoms. There might be many reasons for this weight loss, such as patients being less active due to the CHF, which might result in muscle loss, acerbated by the disease itself. In patients with CHF there is a shift towards a catabolic state, with catabolic steroids being elevated and increased relative to anabolic steroids. Another contributing factor to poor nutritional status is gastrointestinal malabsorption possibly due to gut edema, which might negatively affect the absorption of macro- and micronutrients and therefore, negatively affect outcomes in patients with CHF. However, effectiveness of treatment relies substantially on the patient's ability to adhere to the regimen.[9]

CHF patients must usually follow a treatment regimen consisting of multiple components that include medications, dietary and exercise programs, and the management of individual symptoms. There is thus a need for additional approaches to disease management, and a number of studies have demonstrated that among patients hospitalized with CHF, those who received multidisciplinary care had increased medication adherence and appropriate medication prescription, reduced hospitalizations, improved compliance to treatment and reduced costs. Therefore, best-practice management of CHF should involve multidisciplinary care, of which MNT is one of the pillars.[9]

**Recommendation 1:** MNT should provide treatment for the heart failure, as well as contributing comorbidities, such as hypertension, disorders of lipid metabolism, diabetes mellitus and obesity. Every patient should have a clear, detailed and evidence-based plan of care that ensures the achievement of guidline-determined medical therapy goals, effective management of comorbid conditions, timely follow-up with the health care team, appropriate dietary and physical activities,

and compliance with secondary prevention guidelines for CVD as part of a multidisciplinary comprehensive patient-centered care approach.[5,8]

**Recommendation 2:** Energy intake should be monitored for weight maintenance, the prevention of further weight gain or loss, and the prevention of catabolism. For patients, who are obese, once the patient is considered weight-stable and euvolemic (sodium, fluid and medication adherent), intentional weight loss might be considered, via healthy dietary practices and an approriate physical activity regimen.[5,8]

**Recommendation 3:** Patients with heart failure who are either normally nourished or malnourished, should be encouraged to have a daily intake of protein (either animal or plant-based) ranging from 1.1 – 1.4 g/kg actual body weight per day, as this will result in a positive nitrogen balance.[5,8]

**Recommendation 4:** Sodium and fluid intake should be individualized and restricted, within the ranges of 2,000 – 3,000 mg sodium/day and 1 to 2 liters of fluid/day, with the aim to improve quality measures (readmission rate, length of stay and mortality rate), renal function and clinical laboratory measures, symptom burden (shortness of breath, difficulty breathing when lying flat, swelling of legs or ankles, lack of energy and lack of appetite) and body weight.[5,8]

**Recommendation 5:** Consume a nutrient-dense, balanced diet, rich in fruits, vegetables, whole grains, and low-fat dairy products, with a focus on healthy fats and oils. Provide adequate Potassium and magnesium– eat plenty fruits, vegetables and whole grains.

**Recommendation 6:** Prevent gastric distress–you may need small meals with snacks & avoid foods that cause distress. In the acute phase restrict caffeine intake.

**Recommendation 7:** Care should be taken regarding vitamin, mineral and herbal supplementation and only considered in consultation with the multidisciplinary team, due to the many interactions between various supplements and common medications. It is still unclear whether certain supplements, such as coenzyme Q10, n-3 fatty acids, vitamin D, iron and thiamine are approriate for patients with heart failure. [5,8]

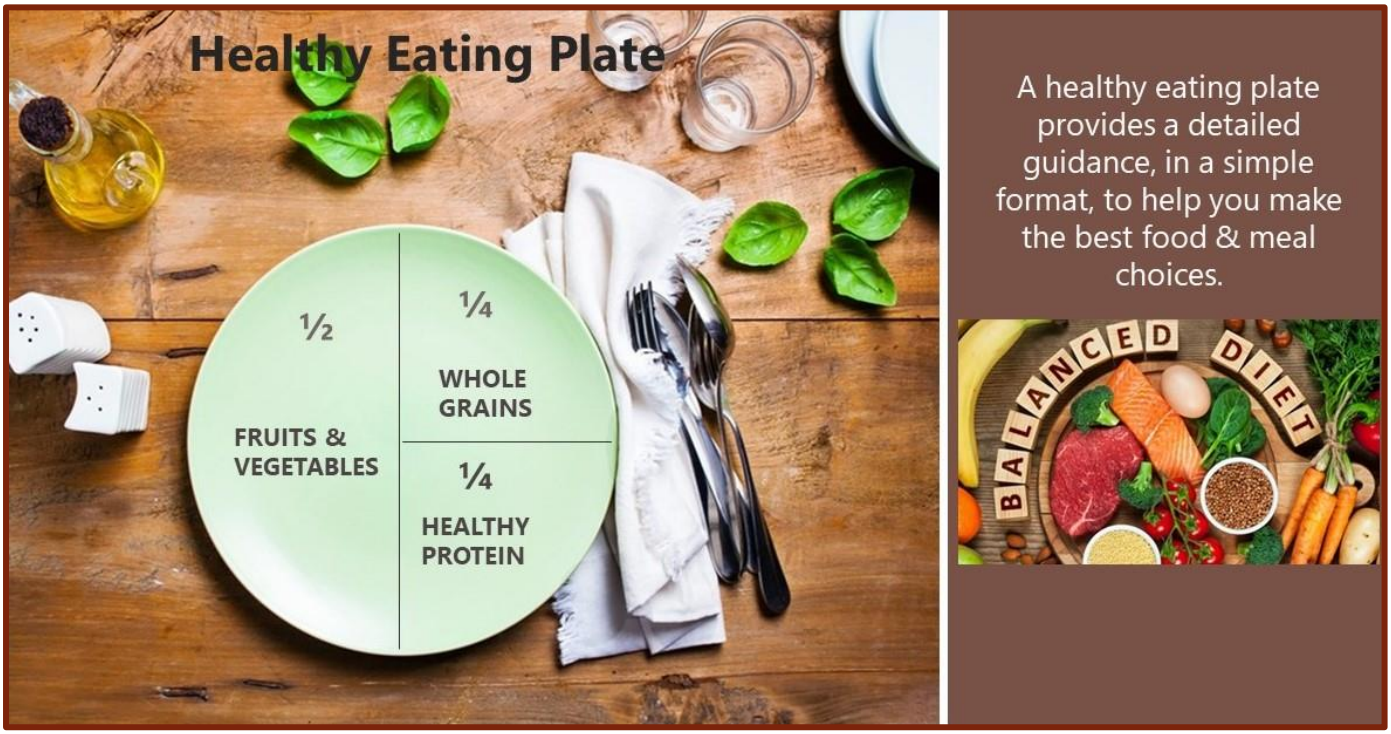
# 3. Practical Science-Based Nutrition Strategies & Culinary Insights

***"Successful, sustainable nutrition intervention strategies depend on how well theory is translated in practice."***

One of the more difficult aspects of self-management of CHF is initiating and maintaining a low-sodium, nutrient-dense, unrefined diet. Research has shown us that, as part of a comprehensive cardiac rehabilitation program, appropriate nutrition intervention and education can lead to long-lasting favorable changes.[9] No nutrition intervention or recommendations, however, will succeed if it is not practical, culturally acceptable, or economical and if it undermines the flavor of foods and the role that food plays in our lives.[10]

## 3.1 The Big Picture: Total Diet Focus

### The Healthy Eating Plate



- **Make most of your meal vegetables and fruits – ½ of your plate:** Aim for color and variety, and remember that potatoes don't count as vegetables on the Healthy Eating Plate because of their negative impact on blood sugar.[10]

- **Go for whole grains – ¼ of your plate:** Whole and intact grains—whole wheat, barley, wheat berries, quinoa, oats, brown rice, and foods made with them, such as whole wheat pasta—have a milder effect on blood sugar and insulin than white bread, white rice, and other refined grains.[10]

- **Protein power – ¼ of your plate:** Fish, poultry, beans, and nuts are all healthy, versatile protein sources—they can be mixed into salads, and pair well with vegetables on a plate. Limit red meat and avoid processed meats such as bacon and sausage.[10]

- **Healthy plant oils – in moderation:** Choose healthy vegetable oils like olive, canola, soy, corn, sunflower, peanut, and others, and avoid partially hydrogenated oils, which contain unhealthy trans fats. Remember that low-fat does not mean "healthy."[10]

- **Drink water, coffee, or tea:** Skip sugary drinks, limit milk and dairy products to one to two servings per day, and limit juice to a small glass per day.

- **Stay active:** Staying active is also important in weight control. Importantly – appropriate activity in consultation with the health profession team.[10]

- **Reduce intake of dietary sodium:** Limit to 2000 mg/day from food or drink (1 teaspoon of salt contains 2000 mg of sodium). Select foods with no more than 140 mg of sodium per serving. Foods with more than 300 mg of sodium per serving may not fit into a reduced-sodium meal plan.

# 4. Reduce the Intake of Sodium

## 4.1 Ten Practical Strategies for Reducing Salt

These strategies will help towards reducing sodium intake with no/or minimal change to food experiences or choices or to rebalancing and re-imagining food choices and introducing new foods that can easily translate into satisfying meals.[10]

1) **Downsize your portions: To scale back the sodium (and the calories).**
A good rule of thumb is that the more calories a meal has, the more sodium it has. Don't supersize your meals, share a dish when eating out.[11]
2) **Produce first: Fill half your plate with fruits and vegetables.**
Our bodies need more potassium than sodium. Most of our diets though, are the opposite, which can contribute to high blood pressure. Fruits and vegetables are naturally low in sodium, and many fruits and vegetables are good sources of potassium. Filling your plate with them will boost your potassium and shift the sodium-potassium balance in your favor.[2,10,11]
3) **Get fresh: Choose unprocessed and minimally processed foods.**
Processed foods and prepared foods can be the greatest sources of sodium in the diet. By choosing fresh foods and preparing meals and snacks from scratch, you can dedice how much or how little salt to add. Processing of foods also often leads to a loss of nutrients and other benefits of whole or semi-intact foods.[2,8,10,11]

### 4) Embrace healthy fats and oils: A savory strategy to lower sodium levels.

Due to the big low-fat/no-fat product demand a few years ago, product developers cut both the good and bad fats our of formulations, and in order to maintain consumer acceptance of their products, sugar and sodium levels were increased. Therefore, be careful when purchasing fat-free products and make sure to read the labels.[10,11]

### 5) Whole grains: Beyond bread and sandwiches.

Bread can be one of the largest contributors of sodium to our diets, even whole grain bread, though healthier than white, can still contain considerable amounts of sodium. Sodium in bread is partly for taste, but much of it is used to help the bread-making process and to preserve the bread. Rather try and include different varieties of whole grains by themselves in your diet. Try a Mediterranean-inspired whole grain salad with chopped vegetables, nuts and legumes, herbs and spices, and healthy oils and vinegar or citrus, for lunch or a light meal and for breakfast, cook up oast or mabella porridge with fresh fruit, and skip the toast.[10,11]

### 6) Target high-volume sodium sources: Prioritize your efforts.

Read labels and get to know which ingredients and individual foods are high in sodium, and eat them sparingly.[8,10,11]

### 7) Scan the label: Look for foods with less than 300 mg sodium/seving.

Canned, boxed, frozen, and prepared foods can all be high in sodium. Read the label for sodium amounts and choose foods with less than 300 mg/serving. Pay attention to serving sizes, as these can sometimes be unrealistically small.[2,8,10,11]

### 8) Compare! Sodium levels vary widely for the same or similar grocery items.

Compare brands of processed food, including breads, processed meat, cheeses and snack foods, choosing those with the lowest level of sodium that still taste good.[11]

### 9) Watch out for hidden sodium: Looks-and taste-can be deceiving.

“Fresh” and “natural” meats and poultry may be injected with salt solutions as part of their processing, and manufacturers are not required to list the sodium content on the label. The best way to find out whether your favorite brand has been treated with a salt solution is to ask the grocer or butcher, or to call the toll-free consumer hotline on the product’s label. Some foods that are high in sodium may not taste especially salty, such as breakfast cereals, bakery muffins, energy drinks and sports drinks.[11]

### 10) Spice it up: Simple flavor additions can enhance food with less salt.

One of the easiest and nicest ways to reduce the need for added salt is through the use of ingredients such as spices, dried and fresh herbs, roots (such as garlic and ginger), citrus, vinegars, and wine. From black pepper, cinnamon and turmeric to fresh basil, chile peppers, and lemon juice, these flavor enhancers create excitement on the palate.[8,10,11]

# 5. Monitoring of Fluid Intake

Adults with advanced HF may need monitoring of fluid. The recommended fluid intake is **1**,500 mL (6 cups) to 2,000 mL (8 cups) per day.

Any food or drink that is liquid at room and body temperature is considered a fluid. 

These items should be counted into your daily fluid intake:

| | | | | | |
|---|---|---|---|---|---|
| Water | Juices | Tea | Alcohol | Ice cubes | Ice cream |
| Milk | Soft drinks | Coffee | Soup | Jelly | Sorbet |

### 5.1 Practical hints to control fluid intake:

- Divide fluid allowance throughout the day.
- Avoid drinking sugary fluids.
- Use a small cup or glass.
- Take medication with a meal (unless instructed not to). Some tablets require little or no fluid to swallow if taken with food.
- Rinse mouth with water if necessary and gargle, but do not swallow.
- Stimulate the production of saliva by sucking a lemon wedge or sweets like sherbet or chewing gum.
- Cool of by wiping your face, neck and under arms with a wet towel. Alternatively, take a shower.

### 5.2 Daily Weight monitoring 

Weight should be taken each morning, after urinating and before eating, and captured in a diary, and taken with to the doctor. Call the doctor or nurse if there is weight gain of 1 kg in one day or 2.5 kg in one week. Remember 1 liter of fluid weighs 1 kg!

The goal of nutrition assessment, intervention and monitoring should include; patients recording daily weight, their sodium intake kept in the range of 2-3 g, guiding a patient through goal setting

that includes a nutrient-rich diet with emphasis on healthy protein and calories to maintain optimal weight and to encourage daily activity at an appropriate level for the patient's NYHA functional class. Adults with advanced HF may need monitoring of fluid limits in the range of 1 – 2 liters per day. Acceptability and uptake of the nutritional plan is key to improved and long-term adherence.

**To dive deeper**

**Refer to the *supplemental workbook, "Living Postively with Heart Failure"* as a comprehensive self-management tool for patients to help keep them on track, including 'Heart Healthy' recipes and a 'Heart Healthy' shopping list.**

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