

# Role of Nutrition in Heart Disease

BS BAL

## CONCERNS

- Unhealthy dietary patterns (i.e., excessive intake of sodium and processed foods; added sugars; unhealthy fats; low intake of fruit and vegetables, whole grains, fiber, legumes, fish and nuts) increases the probability of developing cardiovascular disease (CVD).<sup>1</sup>
- CVD often presents with multiple comorbidities, such as obesity, diabetes, hypertension or dyslipidemia.<sup>1</sup>
- CVD includes a spectrum of disorders affecting the heart and blood vessels, like hypertension, stroke, atherosclerosis, peripheral artery disease and vein diseases.<sup>1</sup>
- Other factors like lack of exercise, overweight and obesity, stress, alcohol consumption or a smoking habit also contributes.<sup>1</sup>

## SOLUTION

- The surge in the incidence of CVD has made it a public health priority, particularly the prevention of CVD (or cardiovascular [CV] events) through lifestyle interventions.<sup>1</sup>
- Scientific evidence proves nutrition might be the most preventive factor of CVD death, and may even have the potential to reverse heart disease.<sup>1</sup>
- Additionally, diet also helps to manage other risk factors like excess weight, hypertension, diabetes or dyslipidemia.<sup>1</sup>

## DIETARY PATTERNS

- Healthy dietary patterns are associated with lower plasmatic concentrations of pro-inflammatory markers.<sup>1</sup>
- A Western-type diet (meat-based dietary pattern) is associated with higher levels of low-grade inflammation.<sup>1</sup>
- Thus, CVD guidelines recommend a healthy diet.<sup>1</sup>

- Dietary intervention renders a preferable combination of multiple foods and nutrients.<sup>1</sup>
- Thus, healthy dietary patterns have a greater spectrum of benefits than the potential effects of a single nutrient supplementation.<sup>1</sup>
- All healthy dietary patterns encourage a high intake of fiber, antioxidants, vitamins, minerals, polyphenols, monounsaturated and polyunsaturated fatty acids (MUFA and PUFA, respectively); low intake of salt, refined sugar, saturated and trans fats and carbohydrates of low glycemic load.<sup>1</sup>
- This can be simplified as high intake of fruits, vegetables, legumes, fish and seafood, nuts, seeds, whole grains, vegetable oils (mainly, extra-virgin olive oil [EVOO]), and dairy foods together with a low intake of pastries, soft drinks and red and processed meat.<sup>1</sup>
- Mediterranean and Dietary Approaches to Stop Hypertension (DASH) interventions reduces the incidence CVD by down-regulating low-grade inflammation and better control of body weight, which also helps to improve other risk factors.<sup>1</sup>

### Mediterranean Diet

- Mediterranean diet (MedDiet) benefits CVD by controlling the risk factors to improve blood pressure (BP), lipid profile, glucose metabolism, arrhythmic risk or gut microbiome.<sup>1</sup>
- MedDiet also has an anti-inflammatory effect on the vascular wall.<sup>1</sup>
- MedDiet also modulates the expression of pro-atherogenic genes as cyclooxygenase-2 (COX-2), monocyte chemoattractant protein (MCP)-1 and low-density lipoprotein receptor-related protein (LRP1), reducing plasmatic levels of plaque stability and rupture-related molecules as matrix metalloproteinase (MMP)-9, interleukin (IL)-10, IL-13 or IL-18.<sup>1</sup>

### DASH Diet

- DASH dietary pattern is associated with improvements in BP, body weight, glucose-insulin homeostasis, blood lipids and lipoproteins, inflammation

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grade, endothelial function, the gut microbiome, CVD risk and total mortality.<sup>1</sup>

- The DASH diet recommends a high intake of fruits and vegetables, legumes, low-fat dairy, whole grain products, nuts, fish and poultry; a reduced intake of saturated fat, red meat and processed meats, and sweet beverages; and a low intake of sodium and refined grains.<sup>1</sup>
- DASH diet protects from CVD by reducing the inflammatory markers and oxidative stress.<sup>1</sup>

## FOODS

### Fruits and Vegetables

- The European Society of Cardiology (ESC) and American Heart Association Nutrition Committee firmly support the daily consumption of multiple servings of both fruits and vegetables to reduce the risk of CVD.<sup>1</sup>

### Olive Oil

- Olive oil rich diets have anti-inflammatory effects.<sup>1</sup>
- Bioactive components of EVOO cause improvements in inflammatory status, oxidative stress and endothelial dysfunction.<sup>1</sup>

### Nuts

- Nuts, particularly peanuts and walnuts have the potential to reduce the CVD morbidity and mortality.<sup>1</sup>
- Consuming 20-30 g/day of unsalted nuts and almonds, or 150 g/week is recommended to improve blood lipids and reduce CVD risk.<sup>2</sup>

### Wine and Other Fermented Alcoholic Beverages

- Some epidemiologic studies and randomized controlled trials (RCTs) have shown that regular moderate consumption of fermented alcoholic beverages, mainly red wine and beer, has cardio-protective effects.<sup>1</sup> They can also exert a positive effect on CV risk factors.<sup>1</sup>
- There exists no recommendation to start drinking alcohol for health benefits.<sup>2</sup>

## NUTRIENTS

### Fiber

- Dietary fiber intake decreases cholesterol concentrations and BP, while deficiency of fiber intake is associated with CVD development.<sup>1</sup>

- Higher dietary fiber intake lowers the relative risk of total all-cause mortality.<sup>1</sup>

- Dietary fiber decreases glucose absorption, down-regulates the expression of oxidative stress-related cytokines or the inflammatory response mediated by gut microbiota exposed to fiber.<sup>1</sup> It is recommended to consume 14 g/1000 kcal, or 25 g dietary fiber for adult women and 38 g for adult men.<sup>2</sup>

### Micronutrients

- Micronutrients have protective effects in CVD by reducing endothelial cells damage, improving the production of nitric oxide (NO) and inhibiting the oxidation of low-density lipoprotein cholesterol (LDL-C).<sup>1</sup>
- Deficiency of dietary antioxidants (Zn, Se and vitamin C & E) leads to a higher CVD risk.<sup>1</sup>

## BIOACTIVE COMPOUNDS

Bioactive compounds have a beneficial effect on atherosclerosis development by reducing levels of LDL-C, improving inflammatory and oxidative stress biomarkers.<sup>1</sup>

### Omega-3 Fatty Acids

- PUFAs, like omega-3 fatty acid ( $\Omega$ -3 PUFA),  $\alpha$ -linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are known to be the potential antiatherogenic agents.<sup>1</sup>
- They reduce CV risk by improving the lipid and lipoprotein profile, oxidation, thrombosis, endothelial function, BP, plaque stability, CV mortality, platelet aggregation, modulating concentration or expression of pro-inflammatory markers (adhesion molecules, cytokines, etc.) and immune cells.<sup>1</sup>

### Lycopene

- Lycopene reduces atherosclerotic risk, particularly in early stages of atherosclerosis, by preventing endothelial dysfunction (NO bioavailability and blood flow) and LDL oxidation.<sup>1</sup>
- Lycopene also improves the metabolic profile (by impairing cholesterol synthesis) and BP, through reductions in arterial stiffness, and modulation of the expression of pro-inflammatory markers and platelet aggregation.<sup>1</sup>

### Phytosterols

- A daily dose of 2-3 g of plant sterols or phytosterols causes LDL-C reduction of early 6% to 15% of the total concentration.<sup>1</sup>

**POLYPHENOLS**

- Polyphenols are obtained from food sources like fruit and vegetables, red wine, black and green tea, coffee, EVOO, chocolate, nuts, seeds, herbs and spices.<sup>1</sup>
- Polyphenols delay the progression of atherosclerosis by regulating signaling and transcription pathways, like nuclear factor kappa B (NF-κβ); antioxidant systems; preventing leukocyte migration and later infiltration inside plaque; reducing adhesion molecules levels; inhibiting encoding of pro-inflammatory cytokines; reducing BP because of the enhanced NO production; and improving lipid metabolism, coagulation activity and endothelial function.<sup>1</sup>
- There exists a negative association between the consumption of polyphenols or polyphenols-rich foods and CVD.<sup>1</sup>
- Polyphenols cause significant reductions of LDL-C, systolic BP, fasting glucose, body mass index (BMI), hemoglobin A1c or tumor necrosis factor (TNF)-α

levels and significant increments of high-density lipoprotein cholesterol (HDL-C).<sup>1</sup>

- They also have anti-inflammatory and immunomodulating effects.<sup>1</sup>

**CONCLUSION**

- There exists an intimate relationship between nutrition and CVD.
- Thus, healthy dietary habits along with an active lifestyle should be promoted as early as possible in children and young adults.
- The evidence supports consumption of healthy dietary patterns, like the MedDiet or DASH diet, against other unhealthy dietary patterns, like the Western diet.

**REFERENCES**

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**Frailty: A Predictor of Hospitalization in COPD Patients**

Frail patients with chronic obstructive pulmonary disease (COPD) are more likely to be hospitalized for acute disease exacerbations, suggests a recent study presented at ATS 2023, held last month in Washington, DC. The study findings were also published in the *American Journal of Respiratory and Critical Care Medicine*.<sup>1</sup> In this prospective study, 172 patients with COPD were enrolled from May 2018 to January 2019 to determine the factors that were predictive of hospitalization. The median age of the selected patients was 68 years and they were followed up for 12 to 15 months. Symptoms were evaluated with the COPD assessment test (CAT) score and modified Medical Research Council (mMRC) dyspnea scale; the FRAIL scale was used to measure frailty, while comorbidities were examined with the Charlson Comorbidities Index.

Twelve percent of the patients were smokers, 22% had asthma-COPD overlap syndrome. Almost half (48.3%) of the patients were found to be frail. The median CAT score was 15, the median MRC score was 3, while the median score on the FRAIL scale was 2. The median FEV1% post-bronchodilator was 51.3%. Majority (86.6%) were taking the prescribed treatment; of these, 75% were also using inhaled steroids along with long-acting bronchodilators. Nearly 20% of the participants gave a history of being hospitalized for exacerbation of COPD at the time of their recruitment. The hospitalization rate was found to be 0.33 per patient during the follow-up. At the time of the first assessment, the hospitalization rate was 9.4% and at the last evaluation, this had reduced to 3.8%. “Only frailty and “time in follow-up” were statistically and clinically relevant”.

For every 1 unit increase in frailty on the FRAIL scale, the likelihood of COPD hospitalization increased 41% with aOR of 1.41. This study therefore demonstrated that frail COPD patients are at greater risk of related hospitalization. Identification of frail patients may allow targeted interventions to reduce the risk of exacerbations and subsequent hospitalization.

**Reference**

1. Ferreira AG, et al. Abstract 408. Frailty is a risk factor for chronic obstructive pulmonary disease hospitalization. *Am J Respir Crit Care Med.* 2023;207:A1136.