# Correction of therapeutic nutrition and diet in comorbidity of COPD with arterial hypertension.

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Building Educational and Research Capacities in Nutrition and Dietetics in Central Asia

## Learning Objectives:

- Develop dietary plans for comorbid conditions commonly associated with COPD.
- Explain how the diet plan may change depending on the comorbid disease in patient with COPD:  COPD+Arterial hypertension

# Frequency of comorbidity in COPD

The most frequent COPD comorbidities were: hypertension (range, 17%–64.7%), coronary artery disease (19.9%–47.8%), diabetes (10.2%–45%), osteoarthritis (18%–43.8%), psychiatric conditions (12.1%–33%), and asthma (14.7%–32.5%).

Several comorbidities had an impact on the frequency and severity of COPD exacerbations, quality of life, and mortality risk, in particular malignancies, coronary artery disease, chronic heart failure, and cardiac arrhythmias.

Comorbidities, especially cardiovascular diseases and diabetes, are frequent in COPD patients, and some of them are associated with higher mortality.

Santos NCD, Miravitlles M, Camelier AA, Almeida VDC, Maciel RRBT, Camelier FWR. Prevalence and Impact of Comorbidities in Individuals with Chronic Obstructive Pulmonary Disease: A Systematic Review. Tuberc Respir Dis (Seoul). 2022 Jul;85(3):205-220. doi: 10.4046/trd.2021.0179.

- Hypertension exerts a staggering worldwide burden on human quality of life and health care system resources via contribution to increased mortality and risk of cardiovascular diseases such as myocardial infarction, angina pectoris, heart failure, and stroke
- Clinical hypertension can be grouped into 2 broad categories. Primary (or essential) hypertension represents between 85% and 95% of human cases and has an unidentified cause. In contrast, secondary hypertension is caused by identifiable underlying conditions, including renal artery stenosis, pheochromocytoma, adrenal adenoma, or single-gene mutations.

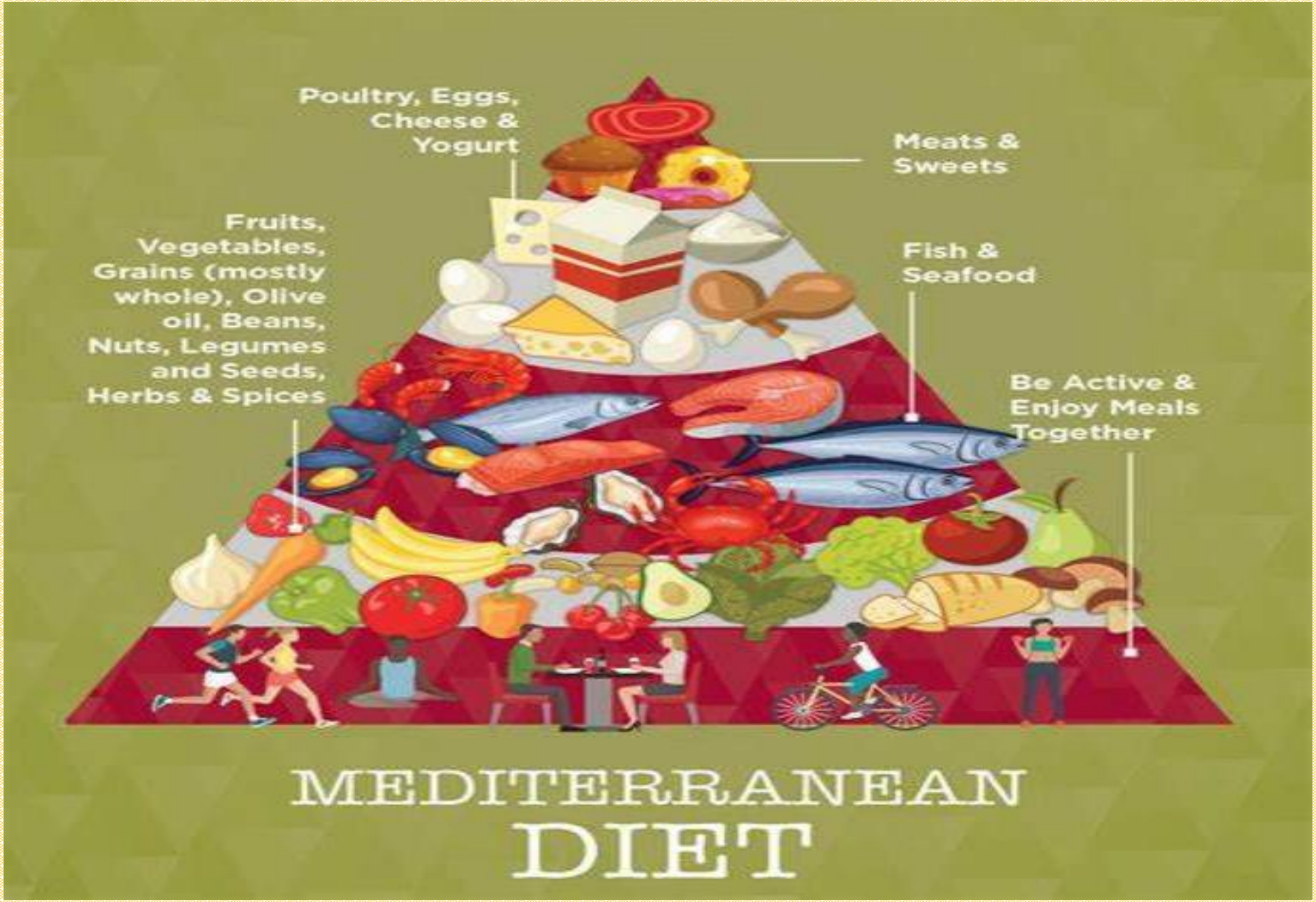
David G. Harrison, Thomas M. Coffman and Christopher S. Wilcox. Pathophysiology of Hypertension The Mosaic Theory and Beyond. Circulation ResearchVolume 128, Issue 7, 2 April 2021; Pages 847–863
https://doi.org/10.1161/CIRCRESAHA.121.318082

- ✓ Controlling hypertension is a major focus of public health initiatives, and dietary approaches have historically focused on sodium. While the potential benefits of sodium-reduction strategies are debatable, one fact about which there is little debate is that the predominant sources of sodium in the diet are industrially processed foods.
- ✓ Processed foods also happen to be generally high in added sugars, the consumption of which might be more strongly and directly associated with hypertension and cardiometabolic risk.
- ✓ Evidence from epidemiological studies and experimental trials in animals and humans suggests that added sugars, particularly fructose, may increase blood pressure and blood pressure variability, increase heart rate and myocardial oxygen demand, and contribute to inflammation, insulin resistance and broader metabolic dysfunction.
- ✓ Thus, while there is no argument that recommendations to reduce consumption of processed foods are highly appropriate and advisable, the arguments in this review are that the benefits of such recommendations might have less to do with sodium—minimally related to blood pressure and perhaps even inversely related to cardiovascular risk—and more to do with highly-refined carbohydrates.

- It is time for guideline committees to shift focus away from salt and focus greater attention to the likely more-consequential food additive: sugar.
- A reduction in the intake of added sugars, particularly fructose, and specifically in the quantities and context of industrially-manufactured consumables, would help not only curb hypertension rates, but might also help address broader problems related to cardiometabolic disease.

# Dietary strategies for the prevention of hypertension

- reducing sodium intake,
- limiting alcohol consumption,
- increasing potassium intake,
- and adopting an overall dietary pattern such as the DASH (Dietary Approaches to Stop Hypertension) diet or a Mediterranean diet.


Poultry, Eggs, Cheese & Yogurt
Meats & Sweets
Fruits, Vegetables, Grains (mostly whole), Olive oil, Beans, Nuts, Legumes and Seeds, Herbs & Spices
Fish & Seafood
Be Active & Enjoy Meals Together
MEDITERRANEAN
DIET

# DASH(Dietary Approaches to Stop Hypertension) diet includes:

- Vegetables: about five servings per day
- Fruits: about five meals per day
- Carbohydrates: about seven servings per day
- Low-fat dairy products: about two servings per day
- Lean meat products: about two or fewer servings per day
- Nuts and seeds: 2 to 3 times per week

# Carbohydrates

Carbohydrates in the diet are mainly composed of cellulose and starches. The human body cannot digest cellulose. It is mainly present in plant fiber. Healthy starches or “carbs” have to be included in the diet, not just for the energy supply but also for the protective micronutrients.

Low carb diets are not as healthy as that may lead to decreased caloric intake than recommended or consumption of unhealthy fats as a substitute.

# Healthy carbohydrates included under DASH include:

- ✓ **Green leafy vegetables: kale, broccoli, spinach, collards, mustards**
- ✓ **Whole grains: cracked wheat, millets, oats**
- ✓ **Low glycemic index fruits**
- ✓ **Legumes and beans**

## Starchy Vegetables

Butternut Squash, Potatoes, Pumpkin, Sweet potatoes

## Whole Grains

Amaranth, Barley, Buckwheat, Oats (steel cut or rolled), Quinoa, Rice (brown, red or wild), Sorghum, Spelt, Sprouted grains or Breads, Wheat berries

## Legumes

Beans, Chickpeas, Lentils, Peas, Pulses

## Fruit

Apples, Apricots, Bananas, Berries, Cherries, Grapefruit, Grapes, Guavas, Lemons, Limes, Mangoes, Melons, Oranges, Peaches, Nectarines, Persimmons, Pineapple, Plums, Pomegranates, Watermelon, Figs, Pears, Kiwifruit.

# Fats

Fats have been a prime suspect for some time now in the development of the chronic disease epidemic. However, research has now shown otherwise. Fats are now classified as good fats and bad fats.

Bad fats, which include margarine, vegetable shortenings, partially hydrogenated vegetable oils, cause an increase in small LDL particles, which promote atherogenesis.

Fats are a highly condensed source of energy and therefore have to be consumed in moderation. The serving sizes are much smaller than those for other nutrients on the DASH recommendations.

Good fats prevent inflammation, provide essential fatty acids, and promote overall health. When consumed in moderation, these fats have been shown to increase HDL and lower small dense LDL particles.

Some of the sources of good fats also included in DASH include:

**Olive oil**

**Avocados**

**Nuts**

**Hempseeds**

**Flax seeds**

**Fish rich in omega-3 fatty acids**

# Sodium

- Sodium is ubiquitous among most foods and beverages. Therefore, the amount of sodium intake among a population is primarily dictated by a complex interaction of cultural context and dietary habits.
- Sodium is a main chemical component in common table salt, but only 11 % of sodium intake is attributable to salt added during cooking or at the table. These levels are in excess of the 2 g/day (equivalent to 5 g/day of salt) recommended by World Health Organization (WHO) or 2.3 g/day recommended by the Institute of Medicine (IOM) as a tolerable upper intake level [*,**].

*IOM (Institute of Medicine) Sodium intake in populations: Assessment of evidence. Washington: The National Academies Press; 2013.
**WHO. Guideline: sodium intake for adults and children. Geneva: World Health Organization (WHO); 2012.

To improve blood pressure control, the American Society of Hypertension (ASH) and the 2010 Dietary Guidelines for Americans recommended reducing sodium intake to a goal of <2,300 mg/day in the general population and a lower goal of <1,500 mg/day for populations predisposed to salt sensitivity: African Americans, middle- and older-aged persons, and individuals with hypertension, diabetes, or chronic kidney disease [*].

However, there is significant difficulty in achieving these dietary sodium reductions. Furthermore, there is an unequal probability of adherence to reducing dietary sodium with respect to sex and race suggested by studies using sodium excretion as an index of sodium intakes[**].

*Appel LJ American Society of Hypertension Writing G. ASH position paper: dietary approaches to lower blood pressure. J Am Soc Hypertens. 2009;3(5):321–31. doi: 10.1016/j.jash.2009.08.003.

**Dietary Guidelines Advisory Committee. Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2010, to the Secretary of Agriculture and the Secretary of Health and Human Services. Washington, DC: Agricultural Research Service

# Carbohydrates are more important for hypertension than salt

Animal studies have shown that high-fructose diets up-regulate sodium and chloride transporters, resulting in a state of salt overload that increases blood pressure.

Excess fructose has also been found to activate vasoconstrictors, inactivate vasodilators, and over-stimulate the sympathetic nervous system.

Further work is required to determine the relevance of these findings to humans and to establish the level at which dietary fructose increases the risk of developing hypertension

Klein AV, Kiat H. The mechanisms underlying fructose-induced hypertension: a review. J Hypertens. 2015 May;33(5):912-20. doi: 10.1097/HJH.0000000000000551.

# Carbohydrates are more important for hypertension than salt

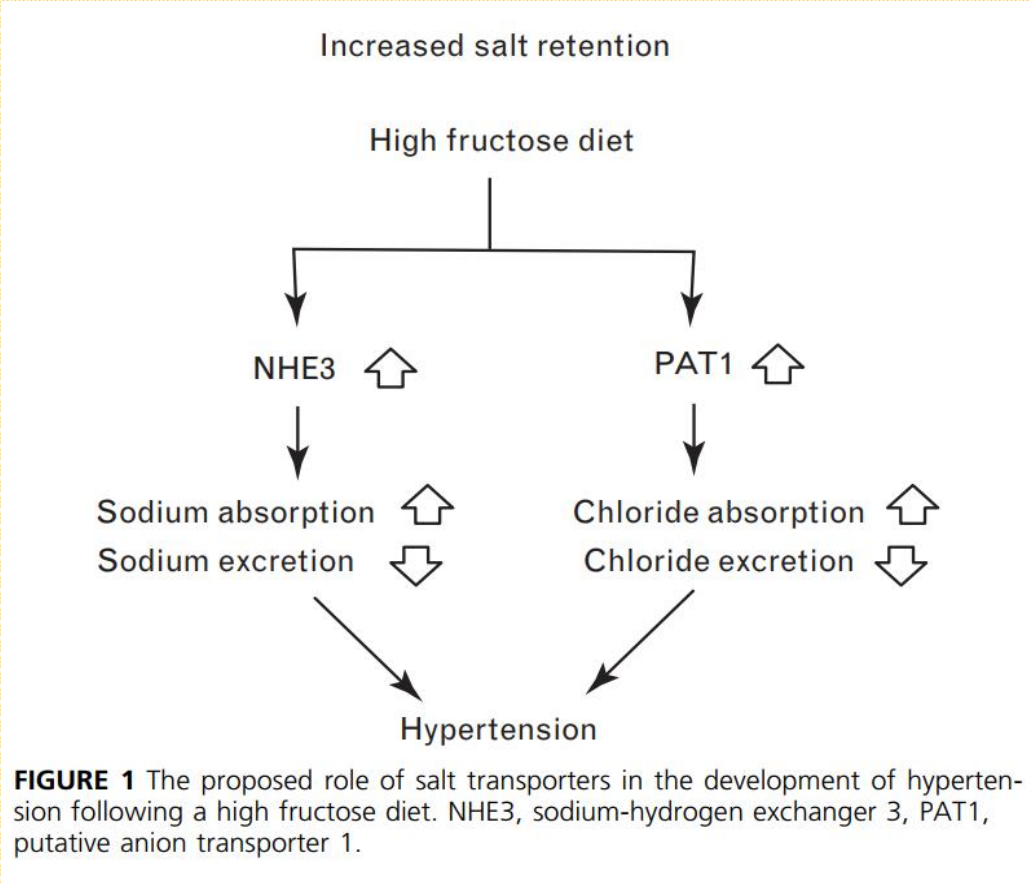



**FIGURE 1** The proposed role of salt transporters in the development of hypertension following a high fructose diet. NHE3, sodium-hydrogen exchanger 3, PAT1, putative anion transporter 1.

Klein AV, Kiat H. The mechanisms underlying fructose-induced hypertension: a review. J Hypertens. 2015 May;33(5):912-20. doi: 10.1097/HJH.0000000000000551.

# According to last investigations, patients with arterial hypertension should definitely limit simple carbohydrates and eat complex


DiNicolantonio JJ, Lucan SCThe wrong white crystals: not salt but sugar as aetiological in hypertension and cardiometabolic diseaseOpen Heart 2014;1:e000167. doi: 10.1136/openhrt-2014-000167

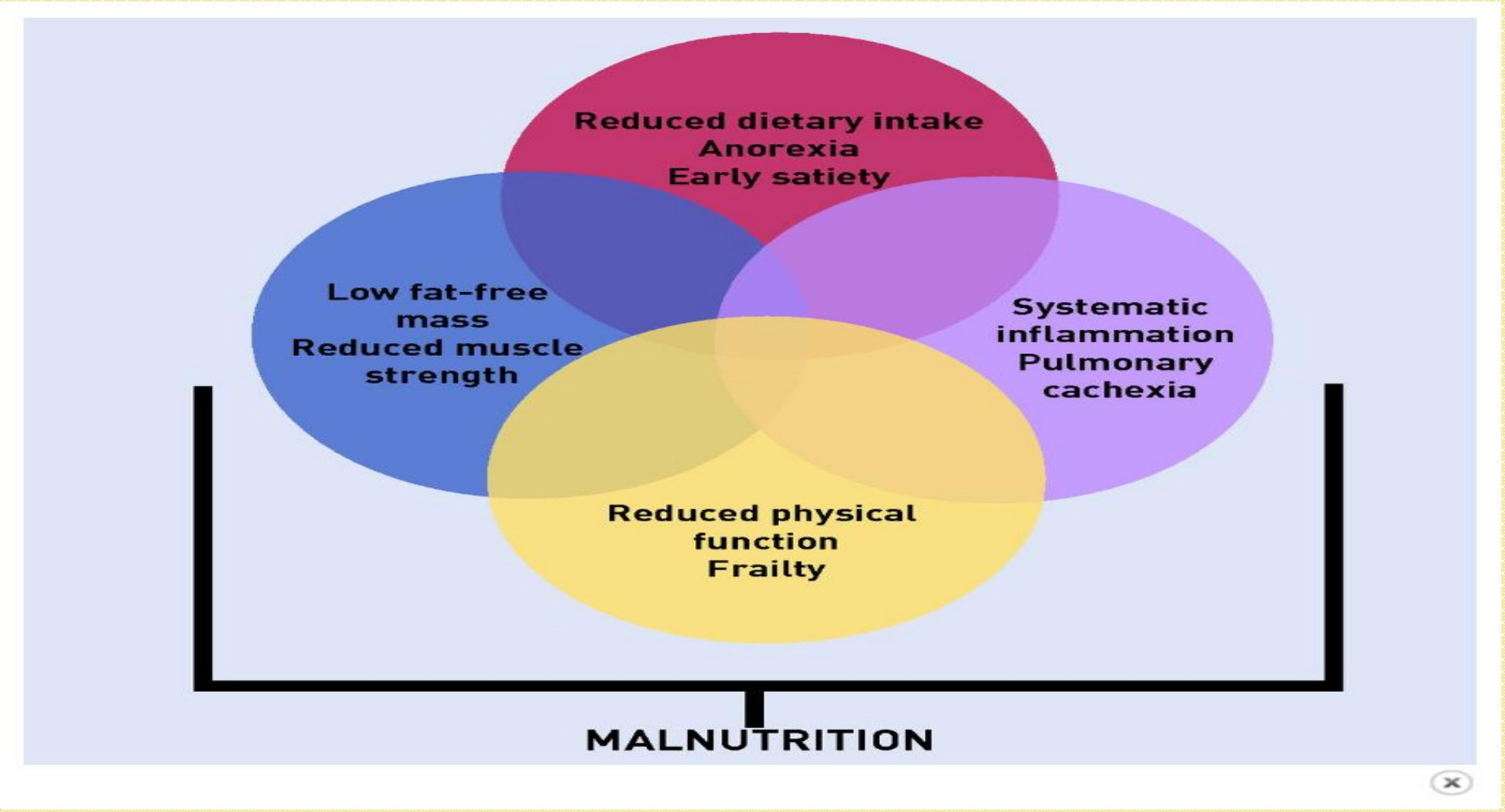
# Nutrition Plan for COPD patients with arterial hypertension comorbidity

**Aim of nutrition plan:** replenish all the energy needs of the body, while maintaining protein balance, including products with an anti-inflammatory effect, and also influence the risk factors for arterial hypertension through nutrition

# basic nutritional recommendations includes:

- Protein-rich Foods
- Complex Carbohydrates
- Fibre
- Mono and Poly Unsaturated Fats
- Vitamins and Minerals
- Fluids
- Potassium-rich Foods
- high-calorie nutrition therapy in patient with malnutrition

Collins PF, Yang IA, Chang YC, Vaughan A. Nutritional support in chronic obstructive pulmonary disease (COPD): an evidence update. J Thorac Dis. 2019 Oct;11(Suppl 17):S2230–S2237. doi: 10.21037/jtd.2019.10.41. PMID: 31737350; PMCID: PMC6831917




Effective nutrition support for patients with chronic obstructive pulmonary disease: managing malnutrition in primary care

Peter F Collins, Anita Nathan, Shelley Roberts, Tom Wilkinson

British Journal of General Practice 2021; 71 (710): 427-428. DOI: 10.3399/bjgp21X717053

# Recommendations for COPD patients with malnutrition

- It is common practice for high-calorie nutrition therapy using dietary supplement beverages to be undertaken as nutritional supplement therapy in COPD patients
- High-fat, low-carbohydrate diets are recommended for lean COPD patients, however, it is not necessarily true that the greater the caloric intake, the more beneficial it is for the patients. In a study on COPD patients treated with a high-calorie dietary supplement solution at 125 mL/day (2380 kJ = 6.35 kJ/mL; 20% energy from protein, 60% from carbohydrate and 20% from fat) or 200 mL/day (3350 kJ = 4.19 kJ/mL; 22% energy from protein, 60% from carbohydrate and 18% from fat) for 8 weeks, the 125 mL dose group exhibited greater body weight gain than the 200 mL dose group

Broekhuizen R., Creutzberg E.C., Weling-Scheepers C.A., Wouters E.F., Schols A.M. Optimizing oral nutritional drink supplementation in patients with chronic obstructive pulmonary disease. Br. J. Nutr. 2005;93:965–971. doi: 10.1079/BJN20051437.

# Restrictions
# List of Foods to Avoid for a COPD+Arterial hypertension Diet

- Simple Carbohydrates
- Trans Fats and Unsaturated Fats
- Sodium

# Composition of diets often prescribed for COPD

**Table 1 | Description of named dietary programme categories used in this systematic review**

| Named dietary programme category | Description |
|---|---|
| Low fat | Total fat intake reduced to 20-30% of caloric intake; saturated fat intake reduced to <10% of caloric intake |
| Very low fat | Total fat intake reduced to 10-20% of caloric intake |
| Combined low fat and low sodium | As in low fat diet, plus sodium reduction (<2.4 g/day) |
| Modified fat | No decrease in total fat intake, but increase in polyunsaturated to saturated fat ratio |
| Mediterranean | Increased fish, fruit, and vegetable intake; increased intake of monounsaturated fats (eg, olive oil) |
| Ornish | Total fat intake reduced to <10% of caloric intake; primarily plant based |
| Pritikin | Total carbohydrate intake 70-75% of caloric intake; total protein intake 15-20% of caloric intake; total fat intake 5-10% of caloric intake; fibre intake 40-45 g/1000 kilocalories |
| Minimal intervention | Usual diet or no advice, referral to own physician, usual care, non-dietary programming, or minimal dietary advice |

# Impact of COPD Diet on the Risks of Comorbid Conditions

| Dietary programme *v* minimal intervention | All cause mortality | Cardiovascular mortality | Stroke | Non-fatal myocardial infarction | Unplanned cardiovascular intervention |
|---|---|---|---|---|---|
| Mediterranean | -17 (-26 to -5) | -13 (-17 to -6) | -7 (-11 to -1) | -17 (-21 to -11) | -1 (-12 to 16) |
| Low fat | -9 (-15 to -3) | -6 (-11 to 1) | 0 (-5 to 6) | -7 (-13 to -1) | -13 (-20 to -2) |
| Very low fat | -3 (-14 to 10) | 0 (-10 to 14) | -1 (-7 to 9) | 6 (-4 to 20) | -2 (-14 to 19) |
| Modified fat | 3 (-12 to 22) | 3 (-7 to 17) | 13 (-9 to 74) | -4 (-13 to 11) | NA |
| Combined low fat-low sodium | 1 (-11 to 15) | 2 (-12 to 25) | -8 (-14 to 5) | 21 (-2 to 59) | 10 (-12 to 59) |
| Ornish | 76 (-46 to 553) | 13 (-22 to 179) | NA | NA | -2 (-22 to 60) |
| Pritikin | -48 (-61 to 207) | NA | 30 (-19 to 561) | NA | NA |

# Example of a daily diet of a patient with COPD and comorbidity with arterial hypertension

- **Breakfast:** oatmeal pancake or eggs wth avocado toast
- **Lunch:** Durum wheat pasta with seafood and green salad
- **Dinner:** Meat and brown rice with salad from Dark Leafy Vegetables
- **Snack:** Nuts and greek yogurt with fruits