

Why Metabolic Syndrome Is a Constellation of Risks to the Heart and Beyond

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Understanding metabolic syndrome, which is estimated to affect 35 percent of adults and 10 percent of adolescents in the U.S., is important for recognizing chronic disease risk and for communicating the multidimensional role of a healthy lifestyle. As a cluster of cardiometabolic risk factors, metabolic syndrome doubles the risk of heart disease and increases risk of Type 2 diabetes five-fold.

🔵 Research also ties metabolic syndrome to increased risk of several cancers, including colorectal, liver, endometrial and postmenopausal breast cancers, and more aggressive forms of prostate cancer. Furthermore, metabolic syndrome may contribute to the development of Alzheimer's disease and other types of dementia.

Parameters of Metabolic Syndrome

A diagnosis of metabolic syndrome requires presence of, or undergoing drug treatment for, three or more of these parameters related to blood pressure, glucose levels, HDL cholesterol levels, triglyceride levels and waist circumference:

- fasting blood sugar of 100 mg/dl or more
- elevated blood pressure of 130 mm Hg or higher systolic and/or 85 mm Hg or higher diastolic
- low HDL cholesterol of less than 40 mg/dl in men or 50 mg/dl in women
- high blood triglycerides of 150 mg/dl or more
- elevated waist circumference (for most people in the U.S., at least 40 inches [102 cm] in men and at least 35 inches [88 cm] in women)

Of these factors, waist size may be the most confusing. For example, an international consensus definition uses population- and country-specific waist circumference thresholds that are lower for populations that tend to have more visceral body fat at lower waist size than other groups.

Insulin resistance also plays a central role in metabolic syndrome. Whereas normally after a meal the body goes into "storage mode" — decreasing the breakdown of fat and promoting glucose uptake — insulin resistance disrupts these processes. Uptake by

muscle and fat cells is hindered, resulting in elevated blood sugar, while in the liver, insulin's normal "cue" to turn off glucose production is muted.

The combination of decreased uptake of blood glucose in fat and muscle cells and increased production in the liver promotes hyperglycemia, which triggers increased insulin production, continuing this vicious cycle.

Additionally, because fat breakdown isn't properly reduced, circulating free fatty acid levels rise. These are drawn into the liver, promoting triglyceride production and ultimately increasing risk of both cardiovascular disease from abnormal blood lipids and nonalcoholic fatty liver disease from excessive fat storage.

Insulin resistance can lead to Type 2 diabetes, as the pancreas ultimately fails to produce enough insulin to keep up with increased needs. In addition, insulin resistance can promote hypertension by increased constriction of blood vessels and effects on hormonal and sympathetic nervous system regulation of blood pressure.

Emerging Evidence on Body Fat and Physical Activity

The days of envisioning body fat merely as a storage depot are gone. Body fat, especially visceral fat deep within the abdomen, produces hormones and signaling proteins, including some that promote low-grade inflammation linked to heart disease, cancer and other chronic diseases. Excess body fat also contains immune cells that contribute to inflammation. Current recommendations suggest a 5- to 10-percent weight loss target may be appropriate for overweight individuals. However, losing even 3 percent to 5 percent of body weight can produce clinically meaningful benefits in triglyceride levels and blood pressure for some people.

Regular physical activity supports the key strategy of long-term weight management. But it's a major paradigm shift to recognize that regular physical activity, even independent of weight loss, helps reduce metabolic syndrome and associated conditions. For example, exercise reduces insulin resistance and triggers uptake of blood sugar through carriers that don't depend on insulin. Today's evidence supports a two-part message of increasing moderate or vigorous physical activity and reducing sitting time.

Eating Patterns in Metabolic Syndrome

Traditional Mediterranean-style eating patterns, particularly when combined with physical activity, help reduce the risk of metabolic syndrome. Nutrient- and phytochemical-rich plant foods and healthful sources of fat may act together to reduce inflammation and insulin resistance and support antioxidant defenses and blood vessel function.

Diets emphasizing fruits, vegetables, whole grains, legumes, nuts and seeds also are associated with lower risk of metabolic syndrome. Vegetarian and vegan diets appear to be especially protective. However, research suggests non-vegetarians who eat more plant foods also experience protective benefits compared to Western eating patterns high in meats, refined grains and sweets.

Paleo diets, which encourage eating vegetables, fruit, lean meat, fish, eggs and nuts and exclude dairy, grains, legumes and added salt and sugars, have comparatively less scientific support regarding metabolic syndrome.

Beyond the obvious (for example, people with insulin resistance whose carbohydrate comes mostly as refined grains and added sugars may benefit from eating less of them), one review showed greater reductions in waist circumference, triglycerides and blood pressure on paleo diets compared with heart-healthy diets that include whole grains and dairy.

Studies were small and short-term, and most tested advice without providing food. Recommendations should continue to focus on avoiding extremes and reducing less healthful carbohydrates — not eliminating all types.

Dietary Choices within a Varied Eating Pattern for Metabolic Health

Research on specific food choices is ongoing, and several show potential links that merit further investigation.

- Whole grains: healthy blood pressure and insulin sensitivity, and anti-inflammatory effects
- Vegetables and fruits: nutrients and phytochemicals that support antioxidant defenses and blood vessel health
- Fish (especially those rich in omega-3 fatty acids): consumption linked to lower levels of inflammation, healthy blood pressure and blood vessel function
- Nuts: consumption associated with lower risk of metabolic syndrome, likely through effects on inflammation and oxidative stress; calorie-dense, so let them replace less nutritious foods rather than serve as dietary add-ons.

- Dairy: consumption linked to lower risk of metabolic syndrome components in several observational studies. Fermented dairy, such as yogurt, may provide additional benefits by providing probiotics.
- Coffee: phytochemicals that may reduce inflammation and insulin resistance

Practical Points for Discussing Headlines

Eating patterns that have been shown to reduce the risk for metabolic syndrome include multiple ways to reduce insulin resistance and inflammation and promote blood vessel function. Nutrients and phytochemicals support antioxidant defenses and normal hormonal and cell signaling, and low calorie density helps limit calories.

Fructose

This is a simple sugar that comprises about half of table sugar and high-fructose corn syrup. Headlines that suggest avoiding fruit misinterpret findings from studies in animals or with large amounts of fructose, which have shown stimulation of fat production in the liver and increased blood triglycerides.

However, low doses of slowly digested fructose, as found in fruit, have minimal cardiometabolic effects. Further, fruits provide dietary fiber, antioxidants, potassium, vitamin C and phytochemicals — and, in healthful eating patterns, promote lower levels of metabolic syndrome risk factors. Instead, limit sugar-sweetened beverages to avoid excess calories and high amounts of added sugar that can trigger unhealthy metabolic cascades.

Glycemic Index

This metric, which identifies short-term effects on blood sugar, might seem like a good basis for selecting foods that reduce the risk for metabolic syndrome. However, blood sugar and insulin sensitivity depend on many variables, including overall fiber and fat content of a meal, as well as portion size and cooking method. Controlled clinical trials show that when calories are the same, weight loss does not necessarily improve by reducing dietary glycemic index.

Dietary Fat

Dietary fat may be protective when mono- and polyunsaturated fats replace saturated fat and refined carbohydrates, with controlled trials showing improvements in blood pressure, triglyceride levels and insulin sensitivity. However, unrefined plant foods like whole grains, legumes, vegetables and fruits provide many protective nutrients and phytochemicals. The potential benefits of replacing carbohydrates from those foods are unclear and may vary among individuals.

Alcohol

Consumption of alcohol also may affect the risk of metabolic syndrome. In studies that followed people over time, very light drinkers (consuming no more than two or three alcoholic drinks a week) developed less metabolic syndrome than nondrinkers. But drinking more than two and a half drinks daily nearly doubled risk of metabolic syndrome.

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