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Health Connections

LINKING NUTRITION RESEARCH TO PRACTICE

METABOLIC SYNDROME:

Lifestyle Intervention in its Prevention, Treatment and Mitigation

Could the increasing prevalence of metabolic syndrome be the "elephant in the room," draining limited healthcare resources? Metabolic syndrome (MetS)—a group of risk factors that increases the risk for heart disease, diabetes, stroke and perhaps some types of cancer—has emerged as a major public health challenge. Associated with overweight, currently about one-quarter of adults in the United States[1] and about 9 percent of teenagers are considered to have MetS.[2] Those with MetS are twice as likely to develop heart disease and five times as likely to develop diabetes compared to those without MetS.[3] This issue of *Health Connections* outlines the diagnostic criteria for MetS and discusses lifestyle changes that can be effective in treating, preventing or mitigating MetS and its adverse health consequences.

Background

MetS—also referred to as syndrome X, insulin resistance syndrome, or cardiometabolic risk syndrome[4]—consists of multiple, interrelated risk factors including dysfunctional glucose utilization, abdominal obesity, high blood pressure and abnormal blood lipids. Together these factors can promote the development of atherosclerotic cardiovascular disease (CVD). The pathogenesis of MetS remains unknown. Excess abdominal fat and a defect in insulin action and energy storage, however, are thought to be dominant underlying risk factors mechanistically linked to the other individual risk factors.

Diagnostic Criteria

The World Health Organization (WHO 1998), the National Cholesterol Education Program (NCEP 2001/2004) and the International Diabetes Federation (IDF 2005) use different definitions and threshold values in the diagnosis of MetS.[5] The WHO's primary criteria is the existence of glucose dysfunction such as insulin resistance. IDF anchors the diagnosis to a population-specific degree of abdominal obesity. The NCEP Adult Treatment Panel III (ATP III) diagnoses MetS with the presence of defined abnormalities in any three of five clinical measures: waist circumference, triglycerides, HDL-C, blood pressure and fasting glucose level (see Sidebar). Although not currently included in diagnostic criteria, elevated markers of inflammation and abnormalities in the blood coagulation system often are associated with MetS, as are other medical conditions such as fatty liver, gallstones, obstructive sleep apnea, and polycystic ovarian syndrome.[6]

Risk Factors for MetS

The prevalence of MetS depends on the diagnostic criteria used. When NCEP/ATP III criteria are used to compare the National Health and Nutrition Examination Survey data over the years (NHANES 1988-1994 and 1999-2000), MetS increased significantly in U.S. adults, particularly among women ages 20-39 years. Prevalence tends to increase with age. It is agreed that standardized

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criteria to diagnose MetS in children and adolescents need to be developed. However, when age-modified standards of adult measure were applied to NHANES 1999-2000, prevalence ranged up to 9 percent in all teens and 44 percent in obese teens.[2] Youth with components of MetS may be at higher risk for developing cardiovascular disease and type 2 diabetes in adulthood. To prevent the down-aging of diseases to younger ages, it is critical to prevent and treat MetS through early screening, intervention and referral to other disciplines (see *Health Connections* "The Importance of Early Lifestyle Habits" at: http://www.dairycouncilofca.org/PDFs/hp_early_lifestyle.pdf).

Current Intervention and Treatment Strategies

Risk factors identified through diagnostic clinical criteria will differ in severity among clients, necessitating customized intervention. Some experts debate the clinical utility of aggregating individual risk factors into a specific diagnosis of MetS[5] when medically each risk factor is addressed separately. Others question whether those with MetS, based on specific diagnostic criteria and cut points, are truly at greater risk of CVD.[7] There is agreement, however, that the more risk factors present, the greater the risk of developing heart disease, diabetes or stroke.[6]

No single "MetS diet" is recommended at this time, as the focus is on reversing contributory factors such as an atherogenic diet, obesity and a sedentary lifestyle.[8] Weight management and physical activity are recommended as first-line lifestyle interventions; treatment or therapy is often needed to avert or delay the progression of symptoms of MetS.[8-10] Epidemiologic evidence suggests a lower prevalence of MetS associated with dietary patterns that are rich in fruits, vegetables, whole grains, dairy products and unsaturated fats.[8] Research from the Dietary Approaches to Stop Hypertension (DASH) intervention studies demonstrates beneficial effects of an eating plan rich in low-fat dairy foods, fruits and vegetables on blood pressure and blood lipids. A reduced-calorie DASH diet compared to a control and a weight-loss diet reduced most of the MetS risks in both men and women (higher HDL; lower triglycerides; lower blood pressure; lower weight and lower fasting blood glucose) and improved some components beyond that seen in the weight-loss diet.[11] This suggests that the nutrient content of the diet may provide benefits beyond those associated with weight reduction. The DASH diet is rich in calcium, potassium and magnesium, which may lower the risk of hypertension, stroke and heart disease. Fiber and other phytonutrients in fruits and vegetables may be protective by lowering cholesterol or markers of inflammation.

Some studies suggest an inverse association between dairy consumption and risk factors associated with MetS. In young, overweight adults, the incidence of components of MetS were lower by more than two-thirds among individuals in the highest category of dairy intake (≥ 5 servings per day) compared to the lowest category (< 1.5 servings per day).[12] Similarly, a dietary pattern incorporating a higher intake of low-fat dairy products has been associated with a lower risk of type 2 diabetes: each serving-per-day increase in low-fat dairy intake was associated with a 4 percent lower risk of type 2 diabetes in middle-aged or older women,[13] and with a 9 percent lower risk for type 2 diabetes in men.[14]

Although the specific mechanism is unclear, it is thought that vitamin D and calcium status are related to risk of type 2 diabetes and glucose intolerance via their respective roles in pancreatic beta cell function, insulin resistance and inflammation.[15] Continuing research is needed to investigate the role of specific nutrients in preventing, improving or reversing the risk factors of MetS, identifying mechanisms involved and each nutrient's optimum intake for protective effects.

PRACTICE POINTS FOR THE HEALTH PROFESSIONAL

- Be proactive. Identify, prevent and treat MetS through early screening, intervention and referral. An early diagnosis increases an individual's chance of mitigating the symptoms and preventing related chronic disease.
- Encourage consumption of dietary patterns such as DASH that emphasize low-fat dairy products, fruits, vegetables and whole grains. These patterns have beneficial effects on several conditions associated with a diagnosis of MetS—including lowering blood pressure levels and heart disease risk.
- Assess clients' intake of calcium and vitamin D, and offer suggestions on how to increase intake. Recent research suggests these nutrients may help improve insulin sensitivity and weight management.
- Encourage 30-60 minutes of physical activity most days of the week and/or reduced energy intake, both of which significantly improve the major components of MetS.[10]
- Stay abreast of research on other specific nutrients, foods and dietary patterns that may reduce risk of MetS for inclusion into nutrition recommendations.

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Q. What can health professionals do NOW to help stem the increasing prevalence of MetS?

A. Regardless of what MetS is called—a syndrome or a constellation of risk factors or the specific cut points for diagnosis—those who have these symptoms are at risk for cardiovascular disease and type 2 diabetes, and the more risk factors they have, the greater their risk. It is important that health professionals become familiar with the diagnostic criteria, screen clients through measurements commonly collected in clinical practice and begin intervention. For those who do not conduct these measurements, a large waistline is a visible sign indicating the need for referral.

Q. How should nutrition professionals prioritize the MetS conditions to address—do any risk factors 'trump' others?

A. At this time, since there isn't a single 'medicine' to treat MetS, patients are often treated medically for each separate symptom. This may seem to pose a dilemma for nutrition professionals who use a more universal approach by instituting lifestyle interventions involving weight management and activity that benefit all risk factors. However, lifestyle interventions such as reduced energy intake and increased physical activity can be effective. A 7 percent weight loss coupled with 150 minutes of physical activity a week reduced the incidence of type 2 diabetes by 58 percent in high-risk adults.[16]

Because clients' weight loss goals for cosmetic reasons are often unrealistic—50 or more pounds—we need to promote the health benefits of modest weight loss and consistently use the term 'modest weight loss.' Such a goal may be more achievable and sustainable. Research also shows that the pattern of weight loss and maintenance through diet plus exercise at six months is similar to that experienced with weight-management medication.[17] Finally, as nutrition professionals who tend to get tied up in food guidance, let's not forget the other part of the weight-management equation. Independent of weight loss, physical activity improves insulin sensitivity.

Q. Does the composition of the diet influence MetS symptoms beyond effects seen simply from weight loss?

A. Another difficult dilemma to sort out is whether risk (or improvement) in MetS is related to the increase in a particular nutrient or the decrease/absence of another—particularly when manipulating carbohydrate and fat in the diet. I'm cautious about making broad nutrition guidance recommendations based on observational studies or on small and short-term clinical trials. I've not seen evidence that a high intake of carbohydrate increases insulin resistance. In fact, there seems to be benefits to higher carbohydrate intake—the DASH diet, which is relatively high in carbohydrate, improves blood pressure and blood lipids. However, long-term consumption of diets high in fat and saturated fat does increase insulin resistance.

I've found that most clients do not eat a diet excessive in carbohydrate (over 55 percent of calories) unless they are vegetarian or drink a lot of soft drinks. Therefore, advocating ranges of carbohydrate and fat found in the DASH pattern, or Mediterranean type of diet, are good targets for dietary lifestyle intervention.

Q. What additional MetS research is needed?

A. More research is needed to identify the basic etiology of MetS. Although insulin resistance has been suggested, it too may be a symptom triggered by another underlying mechanism. Current research is looking at the role of abdominal obesity and its effect on fatty acid metabolism and insulin resistance. I'd also like to see longer-term clinical trials to help identify optimum intake of dietary patterns or nutrients that provide protective effects against the development or reversal of risk factors associated with MetS.

Sidebar: NCEP ATP III Metabolic Syndrome Diagnostic Criteria

MEASURE	CUT POINT
Increased waist circumference	≥ 35 inches in women ≥ 40 inches in men
Elevated triglycerides	≥ 150 mg/dL
Low HDL-C	≤ 50 mg/dL in women ≤ 40 mg/dL in men
Elevated blood pressure	≥ 130 mm Hg systolic or ≥ 85 mm Hg diastolic
Elevated fasting glucose	≥ 100 mg/dL

Source: AHA/NHLBI Scientific Statement. Circulation 2005;112:e285-e290.