The metabolic syndrome in children and adolescents

The metabolic syndrome in adults is defined as a cluster of risk factors for cardiovascular disease and type 2 diabetes mellitus, which include abdominal obesity, dyslipidaemia, glucose intolerance, and hypertension. In 2005, the International Diabetes Federation (IDF) published its definition of the metabolic syndrome in adults. However, to date no unified definition exists to assess risk or outcomes in children and adolescents.

Early identification of children who are at risk of developing the syndrome, type 2 diabetes mellitus, and cardiovascular disease in later life is important. Circumstances in utero and in early childhood predispose a child to disorders such as obesity, dysglycaemia, and the metabolic syndrome. Furthermore, urbanisation, unhealthy diet, and sedentary lifestyle are major contributors to such disorders. Obesity is associated with increased risk of cardiovascular disease, which may persist from childhood and adolescence into young adulthood.

A clinically accessible diagnostic tool is needed to identify the metabolic syndrome in young people.
globally. This need prompted the IDF to develop a new simple definition. Consistent with criteria for adults, this definition is a starting point that can be changed as information emerges. The new IDF definition for the metabolic syndrome in young people builds on previous studies that used modified adult criteria to investigate prevalence in children and adolescents (panel). Thus a study of adolescents that used modified Adult Treatment Panel III (ATP III) criteria identified 12% with metabolic syndrome. In those aged 12–19 years in the National Health And Nutrition Examination Survey III, which used modified ATP-III criteria, about 10% had the syndrome. A recent study suggested a new set of criteria with age-specific and sex-specific cutoffs, which underlined the need for a consistent definition.

Many variables are used to define obesity in children. However, waist circumference in children, consistent with the situation in adults, is an independent predictor of insulin resistance, lipid levels, and blood pressure. Moreover, in young people who are obese and have similar body-mass index, insulin sensitivity is lower in those with high amounts of visceral adipose tissue than in those with low amounts. Therefore waist measurement is included in the new definition. Percentiles, rather than absolute values, of waist circumference have been used in the new definition to compensate for variation in child development and ethnic origin. Data for percentiles of waist circumference that are specific to ethnic origin are becoming increasingly available. Children who have a waist circumference higher than the 90th percentile are more likely to have multiple risk factors for cardiovascular disease than are those with lower waist circumference. Several studies have used the 90th percentile as a cutoff for waist circumference. These data, and the unequivocal evidence for the dangers of abdominal obesity in adults, lend support to its use as the main and essential component of the new definition for diagnosis of the metabolic syndrome in children and adolescents. The IDF has chosen to use the 90th percentile as a cutoff for waist circumference, which will be reassessed when more data are available.

The new IDF definition is divided according to age-groups because of developmental challenges presented by age-related differences in children and adolescents: age 6 years to younger than 10 years; age 10 years to younger than 16 years; and 16 years or older. Children who are younger than 6 years were excluded from the definition because of insufficient data for this age-group. We suggest that the metabolic syndrome should not be diagnosed in children younger than age 10 years, but that a strong message for weight reduction should be delivered for those with abdominal obesity. For children aged 10 years or older, metabolic syndrome can be diagnosed by abdominal obesity and the presence of two or more other clinical features (ie, elevated triglycerides, low HDL-cholesterol, high blood pressure, or increased plasma glucose). Whereas one definition, albeit with cutoffs specific for sex and ethnic origin, is suitable for use in at-risk adults, use of one definition in children and adolescents is problematic. Blood pressure, lipid levels, insulin sensitivity, and anthropometric variables change with age and pubertal development. However, in the absence of contemporary definitive data, the criteria adhere to the absolute values in the IDF adult definition, except that waist circumference percentiles are recommended and one (rather than a sex-specific) cutoff is used for HDL. For children older than 16 years, the IDF adult criteria can be used. Further research is needed to identify optimum criteria for definition of the syndrome.

Key recommendations from the IDF for future research include: understanding of the relation between body fat and its distribution in children and adolescents;
investigation of whether early growth patterns predict future adiposity and other features of the syndrome; and initiation of long-term studies of cohorts of children of different ethnic origin into adulthood to define the natural history and effectiveness of interventions, especially those relating to lifestyle.

The IDF aimed to develop a simple easy-to-apply clinical definition. Early detection followed by treatment—particularly lifestyle intervention—is vital to halt the progression of the metabolic syndrome in children and adolescents. Such action should reduce morbidity and mortality in adulthood and help keep to a minimum the global burden of cardiovascular disease and type 2 diabetes mellitus. Governments and society must be made more aware of the problems associated with obesity and the likelihood of progression to the metabolic syndrome in children and adolescents.

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