Lifestyle and pediatric metabolic syndrome

Introduction
Due to a culture in many households that encourages obesity, a relatively new health problem that exposes individuals to a greater risk of morbidity and mortality has been identified in children. The metabolic syndrome has been recognized in adults for the last 20 years, but only recently has been identified in children, as indicated in a 2005 ACSM news release. The syndrome is not a disease, but a group of risk factors for developing chronic diseases such as diabetes, blood vessel and heart diseases. It was originally called “insulin resistance syndrome,” but is composed of a number of metabolic irregularities and was later named the metabolic syndrome. Insulin resistance is a significant contributor to the metabolic syndrome. The pre-culture for type 2 diabetes has only recently been observed in children and the current obesity epidemic, so it is not surprising that “pediatric metabolic syndrome” is a relatively new term.

Definition of the metabolic syndrome
The changing nature of metabolic parameters due to growth and development in children makes establishing a universal definition for pediatric metabolic syndrome difficult. A number of definitions for pediatric metabolic syndrome currently exist and most of them include similar metabolic variables, but have different cutoff points as to when the variable becomes a risk factor (Alberti et al, 2005). In October 2007, the International Diabetes Federation (IDF; www.idf.org) held a workshop with 10 international experts to develop a consensus definition of pediatric metabolic syndrome. The IDF definition is divided according to age group, due to maturation levels. The IDF panel concluded that the metabolic syndrome cannot be identified in children under age 10, but a pre-culture for the development of the syndrome can be identified. The IDF consensus definition for children 10 to <16 years of age include the clustering of any three of the following risk factors: 1) obesity, waist circumference ≥ 90% based on age and gender; 2) triglycerides ≥ 150 mg/dL; 3) HDL- cholesterol < 40 mg/dL; 3) systolic blood pressure ≥ 130/ diastolic blood pressure ≥ 85 mmHg and glucose ≥ 100 mg/dL. For individuals over 16 years old, the adult definition should be applied.

Obesity and the metabolic syndrome
More children experience obesity (15 percent of all children) than any of the other metabolic syndrome risk factors. Therefore, obesity and insulin resistance have greater impacts on the risk of developing the syndrome than the other factors. Obesity can be viewed as a “root disease” (one from which a number of others develop) as health problems presently associated with pediatric obesity were essentially non existent 15 to 20 years ago. According to Ribeiro et al (2004), about 62 percent of boys and girls at risk for obesity are likely to experience other metabolic syndrome risk factors. Obesity has been shown to increase the likelihood of developing the metabolic syndrome in children eight to 10 times (Harrell et al., 2006).

Prevention and treatment of the metabolic syndrome
The metabolic syndrome is due partially to health practices, therefore healthy lifestyle choices can aid in prevention and treatment. These include education, physical activity participation, physical fitness, healthy diets and regular health check-ups. The focus should be on prevention, as all of the metabolic syndrome risk factors are controllable.

Education
The environmental culture that children grow and develop in is essentially determined by parents. Parents must understand the detrimental effects that poor eating habits, a sedentary orientation, and low fitness have on the metabolic syndrome. For parents to provide children with a healthy living environment, they must practice healthy living themselves. This should include regular health check-ups for themselves and their children. The idea of showing the child how to live, rather than telling the child how to live, is important for controlling this syndrome.

Physical Activity
Physical activity has a positive health effect on all of the risk factors of the metabolic syndrome. Physical activity has been shown in our laboratory to decrease systolic blood pressure by as much as eight to 11 mmHg. Physical activity also helps in weight maintenance, as it aids in reducing fat deposits, and in decreasing plasma triglycerides and increasing HDL-C. Physical activity improves muscle cell sensitivity to insulin both acutely and chronically and also aids in reducing the metabolic stresses associated with body fat related inflammation. Physical activity is paramount for children and the type of physical activity that is best for preventing or controlling the metabolic syndrome in children is aerobic or continuous submaximal physical activity.

Physical Fitness
Being physically fit is important for preventing and treating the metabolic syndrome in children. The prevalence of the syndrome is lower in aerobically fit children. Physical fitness is different than physical activity, as fitness is a temporary state of being and physical activity is an energy-expending process. However, if aerobic fitness and physical activity participation are entered and analyzed mathematically, the influence of aerobic fitness on the metabolic syndrome is not recognized.

Dietary Practices
Since one of the treatments for the metabolic syndrome is the reduction of obesity and monitoring blood glucose, diet is important. Children need to reduce their caloric intake while maintaining a balanced diet to ensure that that they consume the nutrients necessary for proper growth and development. High-carbohydrate diets are typically not good, as glucose tolerance may be poor. Increasing intake of fruits and vegetables and non-sugar drinks is encouraged for children.

Summary and conclusions
The prevalence of the metabolic syndrome continues to increase in children. There is a need to recognize its presence and to initiate lifestyle changes early in the child's life to reduce the risk of this syndrome. For children who are at risk or experiencing the syndrome, lifestyle modifications such as those mentioned above are essential. This syndrome can be prevented and successfully treated in children.

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