Metabolic Syndrome in Children and Adolescents: A New IDF Definition, A Significance to Recognize

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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, dyslipidemia, glucose intolerance and hypertension.[1] The findings from studies in adults, coupled with the obesity epidemic in childhood, have a resulted in a renewed interest in the study of the metabolic syndrome in youth and its potential impact on the health and well being of children and adolescents.[2,3] Several studies of data demonstrated type 2 diabetes and cardiovascular risk factors in childhood obesity.[2-5] Early identification of children who are at risk of developing the syndrome, type 2 diabetes mellitus and cardiovascular disease in later life is important. Urbanization, unhealthy diet and sedentary lifestyle, are major contributors to these disorders.

Currently, no unified definition exists to assess risk or outcome in childhood and adolescent metabolic syndrome. The ranges of the criteria[3] used by different investigators as shown on Table 1. Meanwhile, current information about cardiovascular risk factors in obese children, their progression into adulthood and their correlation with atherosclerosis have been demonstrated.[3,6,7]

In Thailand, the awareness of obesity has already been recognized, but the long term intervention program does not seem to be a success. The majority of childhood obesity turns to be adolescent and adult obesity. The prevalence of childhood and adolescent type 2 diabetes mellitus is increasing,[8,9] as well as in other developing countries,[10] and the clinical picture of childhood type 2 diabetes has been found to be related to metabolic syndrome features.[11] One-third of obese Thai children and adolescents aged 6-18 years had metabolic syndrome and 3.2% had silent type 2 diabetes.[12] The consensus of most experts agrees on the value of using this syndrome collection of risk factors in children, for evaluation of their importance in early cardiovascular risk, and assessing the safety and efficacy of intervention in early life. Therefore, the suitable and accessible diagnostic tool for global use is urgently required. Recently, IDF developed a new simple childhood definition consistent with the criteria for adults. The new IDF definition[13] is divided according to age-group 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

TABLE 1. Comparison of criteria used by different investigators for diagnosis of the metabolic syndrome in children and adolescents

Risk factor	Cook et al.[6]	de Ferranti et al.[15]	Cruz et al.[7]	Weiss et al.[5]
Abdominal obesity				
Males	≥90 percentile	>75 percentile	≥90 percentile	BMI Z-score of ≥2.0 for age and sex
Females	≥90 percentile	>75 percentile	≥90 percentile	
Triglycerides	≥110 mg/dL	≥100 mg/dL	≥90 percentile	≥95 percentile
HDL cholesterol				
Males	≤40 mg/dL	<45 mg/dL*	≥10 percentile	<5 percentile
Females	≤40 mg/dL	<50 mg/dL	≥10 percentile	<5 percentile
Blood pressure	≥90 percentile	>90 percentile	≥90 percentile	>95 percentile
Fasting glucose*	≥110 mg/dL	≥110 mg/dL	IGT†	IGT†

*Males 15-19 yr.
†IGT = OGTT 2 h glucose ≥140 mg/dL and <200 mg/dL.
BMI, body mass index; IGT, impaired glucose tolerance; OGTT, oral glucose tolerance test.

TABLE 2. Panel: IDF definition of at-risk group and of metabolic syndrome in children and adolescents[13]

Age 6 to < 10 years
● Obesity ≥ 90th percentile as assessed by waist circumference
● Metbolic syndrome cannot be diagnosed, but further measurements should be made if family history of metabolic syndrome, type 2 diabetes mellitus, dyslipidaemia, cardiovascular disease, hypertention, or obesity
Age 10 to < 16 years
● Obesity ≥ 90th percentile (or adult cutoff if lower) as assessed by waist circumference
● plus any two or more :
1 Triglycerides ≥ 1.7 mmol/L (150 mg/dl)
2 HDL- cholesterol < 1.03 mmol/L (40 mg/dl)
3 Blood pressure ≥ 130 mm Hg systolic or ≥ 85 mm Hg diastolic
4 Glucose ≥ 5.6 mmol/L (100mg/dl) (oral glucose tolerance test recommended) or known type 2 diabetes mellitus
Age >16 years
● Use existing IDF criteria for adults as demonstrated on Table 3

TABLE 3. Panel: International Diabetes Federation: adult metabolic syndrome definition[1]

● Central obesity : waist circumference, men ≥ 90 cm, women ≥ 80 cm If BMI> 30kg/m2, central obese can be assumed, waist circumference doesnot need to be measured
● Plus any two:
1. Raised triglycerides ≥ 150 mg/dl or specific treatment for this lipid abnormality
2. Reduced HDL-C, ≤ 40 mg/dl in men, ≤ 50 mg/dl in women or specific treatment for this lipid abnormality
3. Raised blood pressure, systolic ≥ 130 mmHg, diastolic ≥ 85 mmHg or treatment of previously diagnosed hypertension
4. Raised fasting plasma glucose, fasting plasma glucose ≥ 100 mg/dl or previously diagnosed type 2 diabetes : if fasting plasma glucose ≥ 100 mg/dl, oral glucose tolerance test is strongly recommended, but is not necessary to define presence of syndrome

TABLE 4. The primary intervention recommendation for metabolic syndrome[13]

Primary intervention : IDF recommends that primary management for the Metabolic syndrome is a healty lifestyle which includes:
1. Moderate caloric restriction : to achieve a 5-10 percent loss of body weight in the first year
2. Moderate increase in physical activity
3. Change in dietary composition

years, and 16 years or older as shown in Table 2 and Table 3. Because of insufficient data, children who are younger than 6 years were excluded. Even-though, children who are younger than 10 years of age should not be diagnosed as metabolic syndrome by IDF consensus. Instead, the recommendation for weight reduction should be done especially for those with abdominal obesity. For those children aged 10 years and older, metabolic syndrome can be diagnosed by abdominal obesity and the presence of two or more other clinical features include elevated triglycerides, low HDL-C, high blood pressure or increased plasma glucose. Early detection followed by treatment particularly lifestyle intervention is urgently required to prevent the progression of metabolic syndrome in children and adolescents. The primary intervention recommendation for metabolic syndrome is a healthy lifestyle including moderate caloric restriction, moderate increase in physical activity and change in dietary composition as show on Table 4.

Thus, in order to prevent these pan-epidemic non infectious diseases in our Thai population, a criteria for metabolic syndrome should urgently be addressed country-wide and followed by developing an applicable prevention program for each age groups as recommended by the new IDF criteria.[13] Also guidelines are required for primary prevention of atherosclerotic cardiovascular disease beginning in childhood.[14]

CONCLUSION

The metabolic syndrome in children and adolescents is a syndrome which is valuable to recognize for safety and efficacy of intervention in early life. The definition still needs to be properly identified, recently there has been a new IDF consensus definition which is simple and easy-to-apply. However, future research is needed to identify optimum criteria for definition of the syndrome. Henceforth, public health, medical professionals and societies must recognize not only on the problems associated with obesity and progression to the metabolic syndrome in children and adolescents, but also build up the successful intervention program for prevention of these future harmful diseases in our Thai populations.

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