Prevalence of the metabolic syndrome and impaired glucose tolerance in Flemish obese children

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Introduction

Childhood obesity has reached epidemic levels worldwide and is associated with an increased likelihood for developing the metabolic syndrome (MetS) and impaired glucose tolerance (IGT). In parallel, the incidence of type 2 diabetes (T2DM) in the young has increased alarmingly.

Objective

We aimed to assess the prevalence of MetS and IGT among Flemish obese children and adolescents.

Methods

A total of 170 obese children aged 10 – 16 years (BMI SDS ≥ 2.0) who completed an oral glucose tolerance test (OGTT) between May 2004 and April 2011 were included in the study. Height and weight were measured according to the standard techniques. BMI and BMI-SDS were calculated based on Flemish growth charts. Fasting/2h glucose, HDL-cholesterol, triglycerides, systolic and diastolic blood pressure were measured. MetS was defined according to the International Diabetes Federation (IDF) criteria[1] (Table 1).

Table 1 IDF definition for MetS in children and adolescents (10 to < 16 years)

Obesity (WC)	Triglycerides	HDL-C	Blood pressure	Glucose
≥ 90th percentile or adult cut-off if lower	≥ 150 mg/dL	< 40 mg/dL	Systolic BP ≥130/ Diastolic BP ≥85 mm Hg	FPG ≥ 100 mg/dL or known T2DM

Diagnosing metabolic syndrome requires the presence of central obesity plus any two of the other four factors.
BP: blood pressure; FPG: fasting plasma glucose; HDL-C: high-density lipoprotein cholesterol; OGTT: oral glucose tolerance test; T2DM: type 2 diabetes mellitus; WC: waist circumference.

We defined obesity on the basis of a threshold BMI SDS of 2.0 or more, adjusted for age and sex, according to Weiss et al. (2004)[2]. IGT was defined as 2h-plasma glucose level of 140–200 mg/dL[3].

Results

The prevalence of one or more abnormalities of the metabolic syndrome is presented in Figure 1.

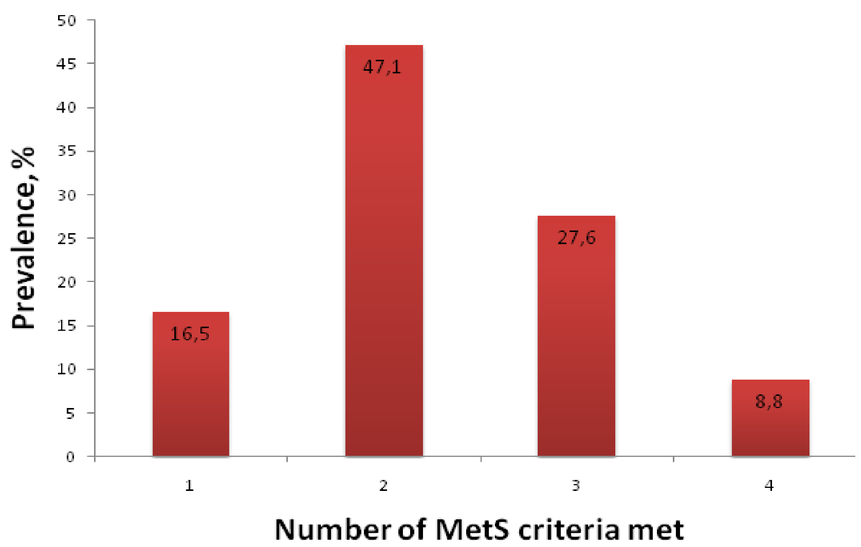

Figure 1 Number of MetS criteria met among Flemish obese children and adolescents

The prevalence of hypertension and low HDL-cholesterol was high compared to elevated triglyceride and increased fasting plasma glucose concentrations (Figure 2).

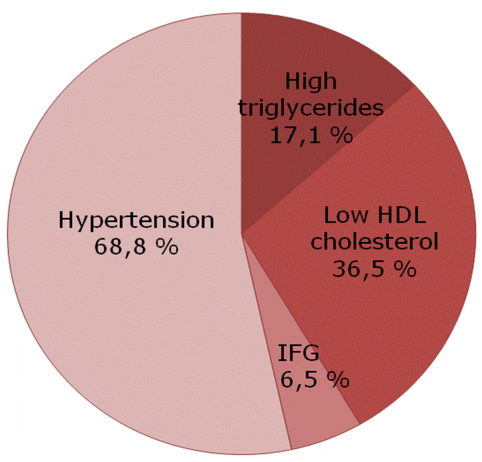

Figure 2 Prevalence of individual metabolic syndrome risk factors among Flemish obese children and adolescents

According to the IDF criteria, the overall prevalence of MetS in Flemish obese children and adolescents was 36.5 %. The clinical characteristics of MetS and non-MetS Flemish obese children and adolescents are presented in Table 2.

Table 2 Comparison of anthropometric measurements and metabolic characteristics in MetS and non-MetS obese children (mean ± SD)

	MetS (n = 62)	No MetS (n = 108)
Male/Female (n)	31/31	45/63
Age (years)	13.4 ± 2.1	13.4 ± 1.7
Height (cm)	164.1 ± 10.7	161.2 ± 9.8
Weight (kg)*	96.7 ± 21.8	86.9 ± 15.5
BMI (kg/m²)*	35.6 ± 6.0	33.3 ± 4.1
BMI SDS	2.9 ± 0.6	2.8 ± 0.5
Fasting glucose (mg/dL)*	90.6 ± 8.2	88.3 ± 6.0
2-hour glucose (mg/dL)	115.9 ± 24.8	115.2 ± 22.7
HDL cholesterol (mg/dL)*	37.5 ± 7.0	47.8 ± 8.0
Triglycerides (mg/dL)*	138.9 ± 73.8	88.7 ± 35.6
Systolic blood pressure (mmHg)*	135.6 ± 13.8	130.8 ± 12.6
Diastolic blood pressure (mmHg)	81.2 ± 11.9	78.5 ± 10.0

* Significantly different between MetS and non-MetS obese children ($P < 0.05$) by independent samples t test

The prevalence of IGT in Flemish obese children was 14.7 %. The clinical characteristics of IGT and non-IGT Flemish obese children and adolescents are presented in Table 3.

Table 3 Comparison of anthropometric measurements and metabolic characteristics in IGT and non-IGT obese children (mean ± SD)

	IGT (n = 25)	No IGT (n = 145)
Male/Female (n)	8/17	68/77
Age (years)	13.7 ± 1.7	13.3 ± 1.9
Height (cm)	161.5 ± 11.3	162.4 ± 10.1
Weight (kg)	93.0 ± 22.8	90.0 ± 17.9
BMI (kg/m²)	35.3 ± 5.6	33.9 ± 4.9
BMI SDS	2.9 ± 0.6	2.8 ± 0.5
Fasting glucose (mg/dL)	91.5 ± 7.8	88.7 ± 6.8
2-hour glucose (mg/dL)*	157.6 ± 13.0	108.2 ± 16.1
HDL cholesterol (mg/dL)	44.7 ± 7.3	43.9 ± 9.4
Triglycerides (mg/dL)	116.7 ± 51.3	105.4 ± 59.1
Systolic blood pressure (mmHg)	134.1 ± 11.9	132.3 ± 13.5
Diastolic blood pressure (mmHg)*	84.2 ± 7.8	78.7 ± 11.1

* Significantly different between IGT and non-IGT obese children ($P < 0.05$) by independent samples t test

Out of all subjects, 5.8 % had IGT together with MetS. Of all children without IGT, 30.6 % also had MetS (Table 4).

Table 4 Prevalence of MetS and IGT among Flemish obese children and adolescents (n=170)

	IGT	No IGT
MetS	10 (5.8 %)	52 (30.6 %)
No MetS	15 (8.8 %)	93 (54.7 %)

Conclusion

MetS is highly prevalent in Flemish obese children and adolescents. It remains to be shown whether MetS or IGT has the highest risk for developing T2DM. Early detection of MetS and/or IGT in obese children is critical for preventing or delaying the development of T2DM.

References

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