Metabolic Syndrome and Inflammatory Markers in Obese Children at Chiang Mai University Hospital

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Background: Inflammatory markers in obesity with metabolic syndrome (MS) have been postulated to be associated with development of CVS diseases in adults. An elevated hs-CRP (>3 mg/L) was associated with increased 10-year risk of coronary heart disease, regardless of the presence or absence of cardiac risk factors [1]

Method: A cross-sectional study of obese children was conducted. Children with history of endogenous obesity, chronic diseases, drug ingestion/any acute illnesses within two weeks prior to enrolment were excluded. Fasting blood sugar (FBS), OGTT, insulin, lipid profiles, and inflammatory markers were studied.

Results: Fifty eight obese children (20F/38M) with a mean BMI z-score of 5.1 ± 2.2 were enrolled. The prevalence of pre-diabetes was 17.2%. No case met the definition of diabetes. The prevalence of metabolic syndrome was 31%.

Glucose homeostasis in 58 obese children

Blood sugar	
FBS (mg/dL)	85.0 ± 7.9
• Impaired fasting glucose • Diabetes	1 (1.7) 0 (0)
2-hour glucose during an OGTT(mg/dL)	117.0 ± 18.6
• Impaired glucose tolerance • Diabetes	9 (15.5) 0 (0)
Insulin	
Fasting insulin (μU/mL)	21.8 ± 13.3
• Fasting insulin ≥ 15 μU/mL	36 (62.1)
2-hour insulin during OGTT (μU/mL)	150.7 ± 113.4
• 2-hour insulin during OGTT ≥ 75 μU/mL	44 (75.9)
Index for insulin resistance	
HOMA-IR	4.6 ± 2.8
HOMA-IR >3.16	35 (60.3)

Lipid profiles in 58 obese children

Variables	n=58
Triglyceride (mg/dL)	117.2 ± 65.4
• Hypertriglyceridemia	14 (24.1)
Cholesterol (mg/dL)	183.0 ± 42.4
• Hypercholesterolemia	17 (29.3)
LDL (mg/dL)	121.4 ± 39.5
• High LDL	18 (31.0)
HDL (mg/dL)	41.4 ± 8.1
• Low HDL	26 (44.8)

Metabolic syndrome and inflammatory markers in 58 obese children

Variables	n=58
Metabolic syndrome	18 (31.0)
hs-CRP (mg/L)	6.37 ± 6.68
hs-CRP >3 mg/L	40 (69.0)
IL-6 (pg/mL)	39.1 ± 77.5
TNF-alpha (pg/mL)	12.1 ± 38.6 (n=53)

Participants were categorized into 2 groups based on metabolic syndrome status. Obese children with the metabolic syndrome were older and had higher BMI z-score than those without the syndrome.

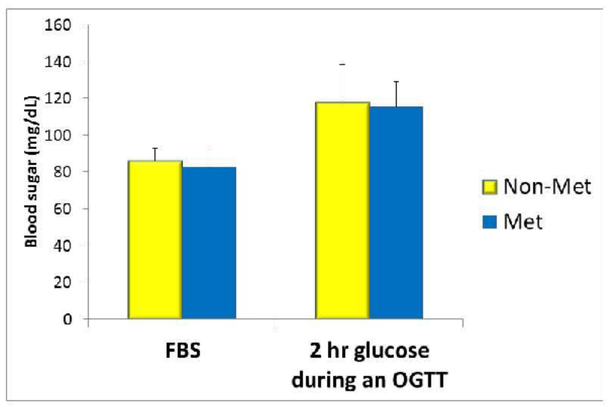
Characteristics in 58 obese children stratified by metabolic syndrome status

Variables	Nonmetabolic syndrome (n=40)	Metabolic syndrome (n=18)	*P value*
Characteristics			
Male*	26 (65.0)	12 (66.6)	0.902
Age (yr)	10.9 ± 3.0	13.2 ± 2.1	0.009
BW (kg)	65.6 ± 20.1	88.9 ± 21.8	0.001
Ht (cm)	145.5 ± 14.6	159.8 ± 10.7	0.000
BMI z-score	4.7 ± 2.1	6.1 ± 2.4	0.025
Prepuberty**	18 (45.0)	2 (11.1)	0.016

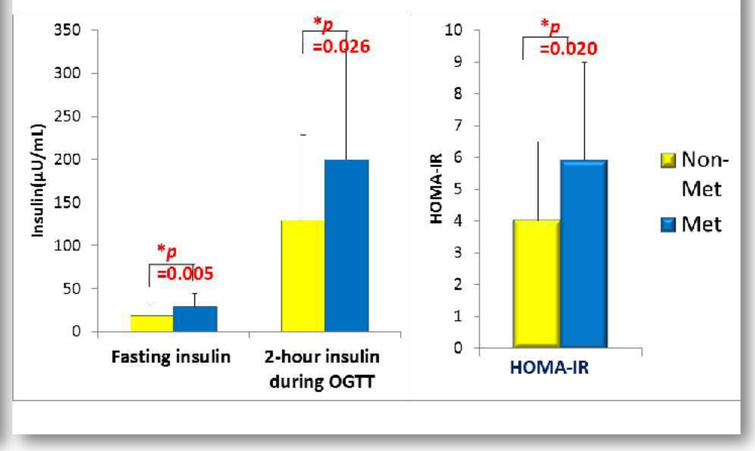
* Chi-square
** Fisher exact test

Data are mean ± SD or number (%)

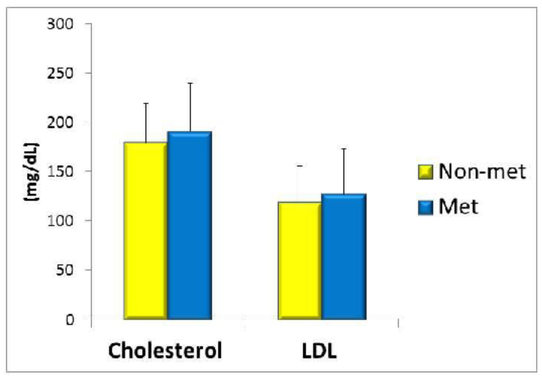
Glucose homeostasis in 58 obese children stratified by metabolic syndrome status



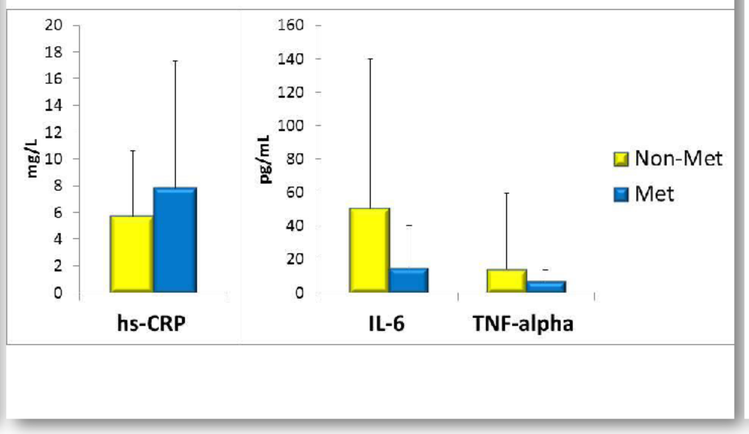
Glucose homeostasis in 58 obese children stratified by metabolic syndrome status



Lipid profiles in 58 obese children stratified by metabolic syndrome status



Inflammatory markers in 58 obese children stratified by metabolic syndrome status



Inflammatory markers in 58 obese children stratified by metabolic syndrome status

	Nonmetabolic syndrome (n=40)	Metabolic syndrome (n=18)	P value
hs-CRP>3 mg/L *	28 (70.0)	12 (66.6)	0.800

* Chi-square

Data are mean ± SD or number (%)

Participants with metabolic syndrome had significantly higher insulin level and HOMA-IR. Although FBS, OGTT, lipid profiles, and hs-CRP level were not statistically different between obese children with and without MS, 69% of the cases had high hs-CRP level compared to normal values.

Conclusions:

- We demonstrate an increased hs-CRP level indicating inflammatory process in obese children regardless of the presence of metabolic syndrome.
- Obesity without MS could be at risk to develop CVS diseases due to high level of the inflammatory marker.
- Early weight reduction in children with obesity should be emphasized on primary care physicians and their families.

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Reference
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