

Adiponectin and IL-6 in simple childhood obesity with and without hepatic steatosis

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Introduction: Obesity is frequently complicated by a wide range of conditions such as non-alcoholic fatty liver disease (NAFLD) and insulin resistance (IR). High levels of Interleukin-6 and low levels of adiponectin have been already detected in obese children with NAFLD. The link between obesity, hepatic steatosis (HS), IR and these cytokines is not univocally understood, but several associations have been observed. Lower serum adiponectin levels have been described in obese patients and could predict IR and type 2 diabetes. IL-6 levels are dependent on the grade of obesity and the systemic inflammatory status.

Aim of this study is to investigate the relationship between adiponectin and IL-6 in the HS and IR mechanisms in a cohort of obese children.

Patients and Methods: This cross-sectional study was carried out on 35 obese children (13 males and 22 females) recruited at our unit, at Meyer Children's Hospital in Florence, Italy; compared with age-, sex-, and body-size-matched 29 healthy children. Children with a BMI over the 95th percentile were classified as obese according to Italian percentiles.

Exclusion criteria were inflammatory diseases (assessed clinically and by routine blood tests), blood or blood by-product transfusions, infectious hepatic diseases and obesity deriving from genetic or endocrine disorders, metabolic syndrome.

All patients were assessed using fasting blood glucose levels, insulin, total cholesterol, high density lipoprotein (HDL) cholesterol, triglycerides, adiponectin and IL-6, glucose tolerance test, and hepatic ultrasound. After The Homeostatic model assessment of insulin resistance (HOMA-IR) and the whole body insulin sensitivity index (WBISI) were calculated. Blood samples of hormone and biochemical assay are collected after 12-h overnight fast, and serum levels of adiponectin was measured through a quantitative sandwich enzyme immunoassay technique; while serum IL-6 through ELISA; glycaemia through an immunoenzymatic assay.

The statistical assessment was carried out with the unpaired Student's t-test while the correlations by calculating the Pearson's correlation coefficient (r). Besides, we calculated the χ^2 on 2x2 tables for the categorical data. Statistical significance was assumed for $P < 0.05$

Results: The mean BMI value was higher in obese children ($28.20 \pm 3.82 \text{ Kg/m}^2$) than in the control children

(17.93 ± 3.01) ($p < 0.00001$). In obese children IL-6 serum levels were significantly higher ($p = 0.03$) and serum adiponectin levels were significantly lower ($p = 0.04$) than in controls. Serum adiponectin level was inversely correlated with BMI in both groups (obese $p = 0.01$; controls $p = 0.04$). BMI values were significantly higher ($p = 0.0002$) (table 1) and adiponectin levels were significantly lower ($p = 0.01$) in obese children with HS than in those without. IL-6 serum levels were not statistically different in obese patients with or without HS. HOMA-IR and WBISI were significantly correlated with adiponectin, but not with BMI, HS or IL-6.

Table 1

	Without HS (n=25)	With HS (n=10)	P value
Age	10.82±2.79	11.62±1.91	0.41
BMI	26.61±3.79	31.04±3.06	0.002
IL-6	2.84±1.27	2.25±0.47	0.16
Adiponectin	85.13±35.87	53.56±30.50	0.01
HOMA-IR	2.74±1.92	2.86±1.29	0.85
WBISI	5.92±3.31	5.13±3.13	0.52

	β	t	P value		β	t	P value
BMI	-0.10	-0.53	0.59	BMI	-0.33	-1.81	0.08
IL-6	-0.32	-1.98	0.06	IL-6	0.17	1.07	0.29
Adiponectin	-0.42	-2.41	0.02	Adiponectin	0.37	2.15	0.03
HS	-0.16	-0.85	0.39	HS	0.24	1.29	0.20

Multiple regression model (obese subjects)
The dependent variable is Homeostasis Model Assessment (HOMA)-IR.

Multiple regression model (obese subjects)
The dependent variable is Whole Body Insulin Sensitivity Index (WBISI).

Conclusions: We observed that HS patients had higher BMI values and lower levels of serum adiponectin compared to those without HS. No difference in IL-6 levels was detected in our sample. Hypoadiponectinemia could be the result of the increase of fat mass, enhancing IR and HS. Lower levels of adiponectin could be an early marker of metabolic risk linked to obesity in childhood.