ANGPTL2 and ANGPTL3 in children with obesity and metabolic syndrome

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Introduction: Angiopoietin-like proteins (ANGPTLs) play critical roles in metabolism and are implicated in metabolic consequences of obesity. ANGPTL2 is a key adipocyte-derived inflammatory mediator that links obesity to systemic insulin resistance. ANGPTL3 directly regulate lipid metabolism. In this study, we aimed to investigate the levels of ANGPTL2 and 3 in obese children and adolescents and their association with metabolic parameters.

Methods: Seventy children and adolescents (35 obese; 35 control), were selected after thorough clinical evaluation and anthropometric measurements. Serum ANGPTL2 and 3 and insulin were assessed using ELISA, and insulin resistance (IR) was calculated by the homeostatic model assessment of insulin resistance (HOMA-IR). Fasting plasma glucose (FPG), triglyceride (TG), total cholesterol (TC), LDL-C and HDL-C were also measured colorimetric assay.

Results: ANGPTL2 and 3 levels were significantly elevated in obese children compared with controls; however, they were not significantly different in obese children with or without IR. ANGPTL3 was significantly higher in children with metabolic syndrome (MetS) compared to those without MetS. Both ANGPTL2 and 3 were positively correlated with BMI, TC and LDL-C as well as systolic (SBP) and diastolic (DBP) blood pressure. In partial correlation, controlling for BMI, the relationship between ANGPTL3 and TC and LDL-C remained significant.
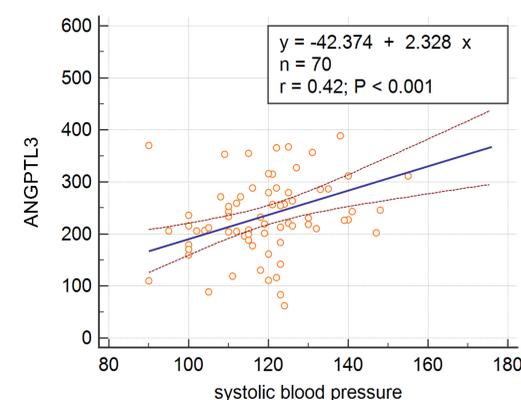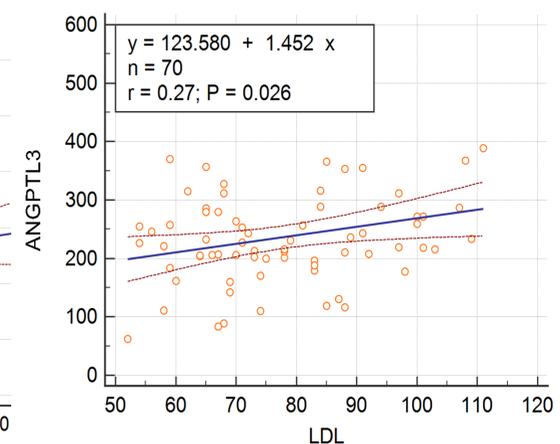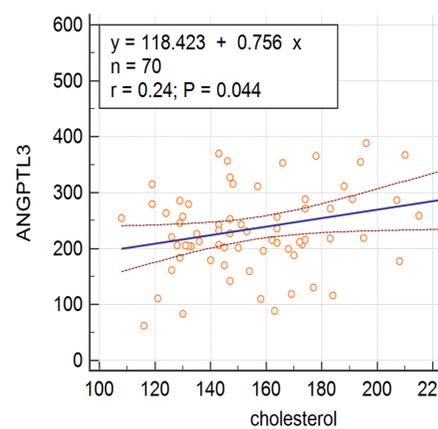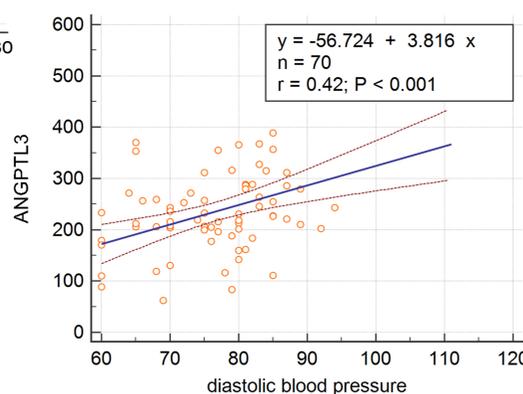
Table 1- Anthropometric and biochemical characteristics of the children and adolescents in the control and obese groups.

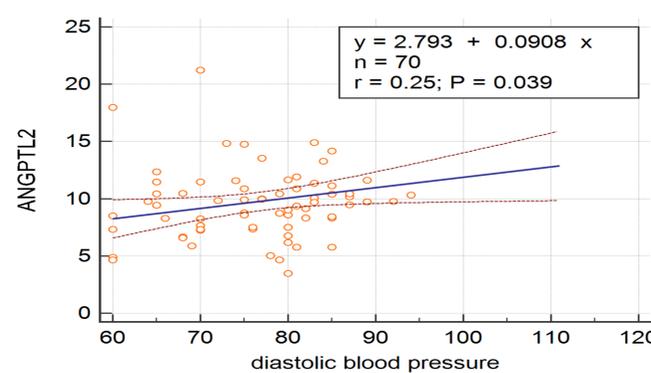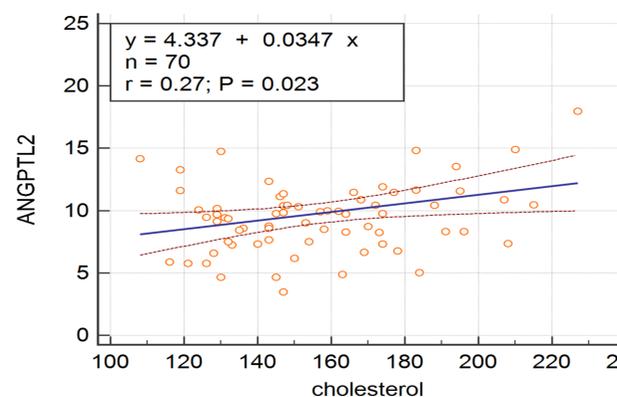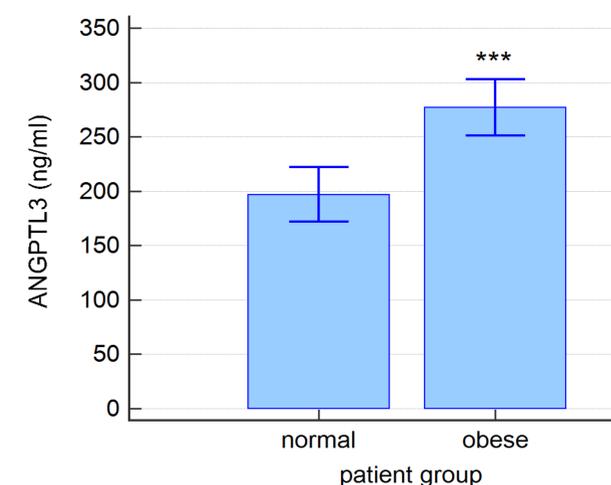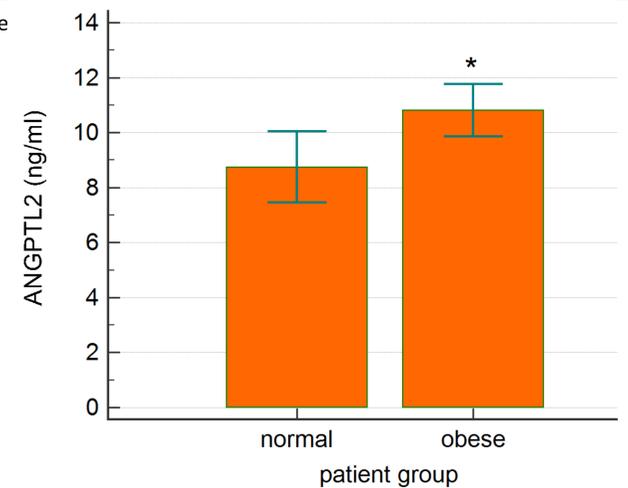|	Control	Obese	P value
Female/male	16/19	12/23	N.S.
Age (years)	11.11 ± 2.3	11.17 ± 2.3	N.S.
BMI (Kg/m²)	18.01 ± 1.9	29.67 ± 4.9	< 0.001
BMI z-score	0.14 ± 0.7	2.2 ± 0.3	< 0.001
WC (cm)	67.47 ± 8.4	93.82 ± 11.3	< 0.001
HC (cm)	78.03 ± 7.5	100.13 ± 10.7	< 0.001
WC/HC ratio	0.85 ± 0.05	0.93 ± 0.06	< 0.001
SBP (mmHg)	112.51 ± 10.28	127.37 ± 15.38	< 0.001
SBP z-score	-0.13 ± 0.6	1.5 ± 0.7	< 0.05
DBP (mmHg)	73.4 ± 7.7	80.46 ± 9.5	< 0.001
DPB z score	-0.2 ± 0.3	0.93 ± 1.2	N.S.
FPG (mg/dl)	86.95 ± 6.5	93.7 ± 5.5	< 0.001
TG (mg/dl)	81.08 ± 39.6	105.97 ± 41.9	< 0.001
TC (mg/dl)	151.68 ± 27.3	161.74 ± 25.62	N.S.
LDL-C (mg/dl)	74.08 ± 13.27	81.94 ± 16.56	< 0.05
HDL-C (mg/dl)	53.17 ± 12.7	47.17 ± 8.9	< 0.05
Insulin (µIU/dl)	6.5 ± 3.1	14.05 ± 9.3	< 0.001
HOMA-IR	1.4 ± 0.7	3.2 ± 2.17	< 0.001
ANGPTL-2 (ng/ml)	8.7 ± 3.7	10.81 ± 2.7	< 0.05
ANGPTL-3 (ng/ml)	196.78 ± 73.0	276.94 ± 75.2	< 0.001

Table 2. Correlation coefficients of ANGPL2 and 3 with anthropome and biochemical parameters of metabolic syndrome

Variable	ANGPTL2	ANGPTL3
BMI	0.235*	0.411***
WC	0.165	0.317*
HC	0.225	0.329*
WC/HC ratio	0.023	0.231
SBP	0.237*	0.416**
DBP	0.247*	0.424**
FPG	0.127	0.208
TG	0.063	0.103
TC	0.271*	0.241*
LDL-C	0.279*	0.267*
HDL-C	0.098	0.082
Insulin	0.106	0.168
HOMA-IR	0.016	0.176

BMI: Body mass index; WC: Waist circumference; HC: Hip circumference; SBP: systolic blood pressure; DBP: diastolic blood pressure; FBS: fasting plasma glucose; TG: triglycerides; TC: total cholesterol; LDL-C: Low density lipoprotein cholesterol; HDL-C: High density lipoprotein cholesterol; HOMA-IR: Homeostasis Model Assessment-Insulin Resistance; * p < 0.05; ** p < 0.01. *** p < 0.001

$y = 4.337 + 0.0347\ x$
$n = 70$
$r = 0.27; P = 0.023$

$y = 2.793 + 0.0908\ x$
$n = 70$
$r = 0.25; P = 0.039$

$y = 3.276 + 0.0542\ x$
$n = 70$
$r = 0.24; P = 0.048$

$y = 4.938 + 0.0621\ x$
$n = 70$
$r = 0.28; P = 0.019$

$y = -42.374 + 2.328\ x$
$n = 70$
$r = 0.42; P < 0.001$

$y = -56.724 + 3.816\ x$
$n = 70$
$r = 0.42; P < 0.001$

$y = 118.423 + 0.756\ x$
$n = 70$
$r = 0.24; P = 0.044$

$y = 123.580 + 1.452\ x$
$n = 70$
$r = 0.27; P = 0.026$
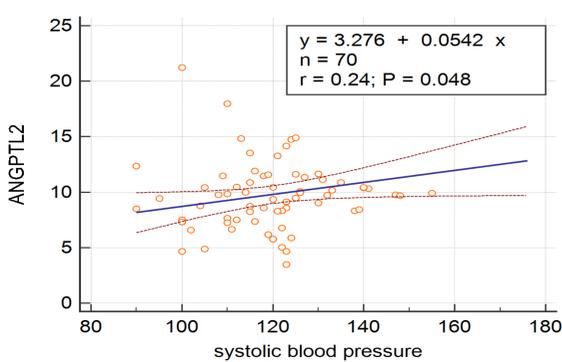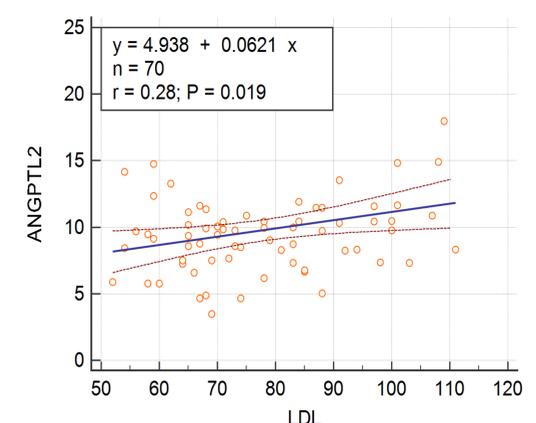
Conclusion: Serum levels of ANGPTL2 and 3 were high in obese cases and the study showed that they might be involved in the development of obesity-associated metabolic syndrome and endothelial dysfunction.