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Supplementary material

The association of anthropometric parameters with markers of insulin and leptin secretion and resistance in type 2 diabetes mellitus

Supplementary table 1. The metabolic and anthropometric parameters in T2DM patients with normal and high serum leptin levels (F: female; FLI: free leptin index; sObR: soluble form of leptin receptor; REE: resting energy expenditure; BMI: body mass index; TBFM: total body fat mass; %BF: percent body fat; NFM: non-fat mass; Σ 4SF: sum of the four skinfold thickness; WHR: waist-to-hip ratio; WHtR: waist-to-height ratio; BAI: body adiposity index; VAI: visceral adiposity index; data is presented as mean \pm SD or median (min-max)).

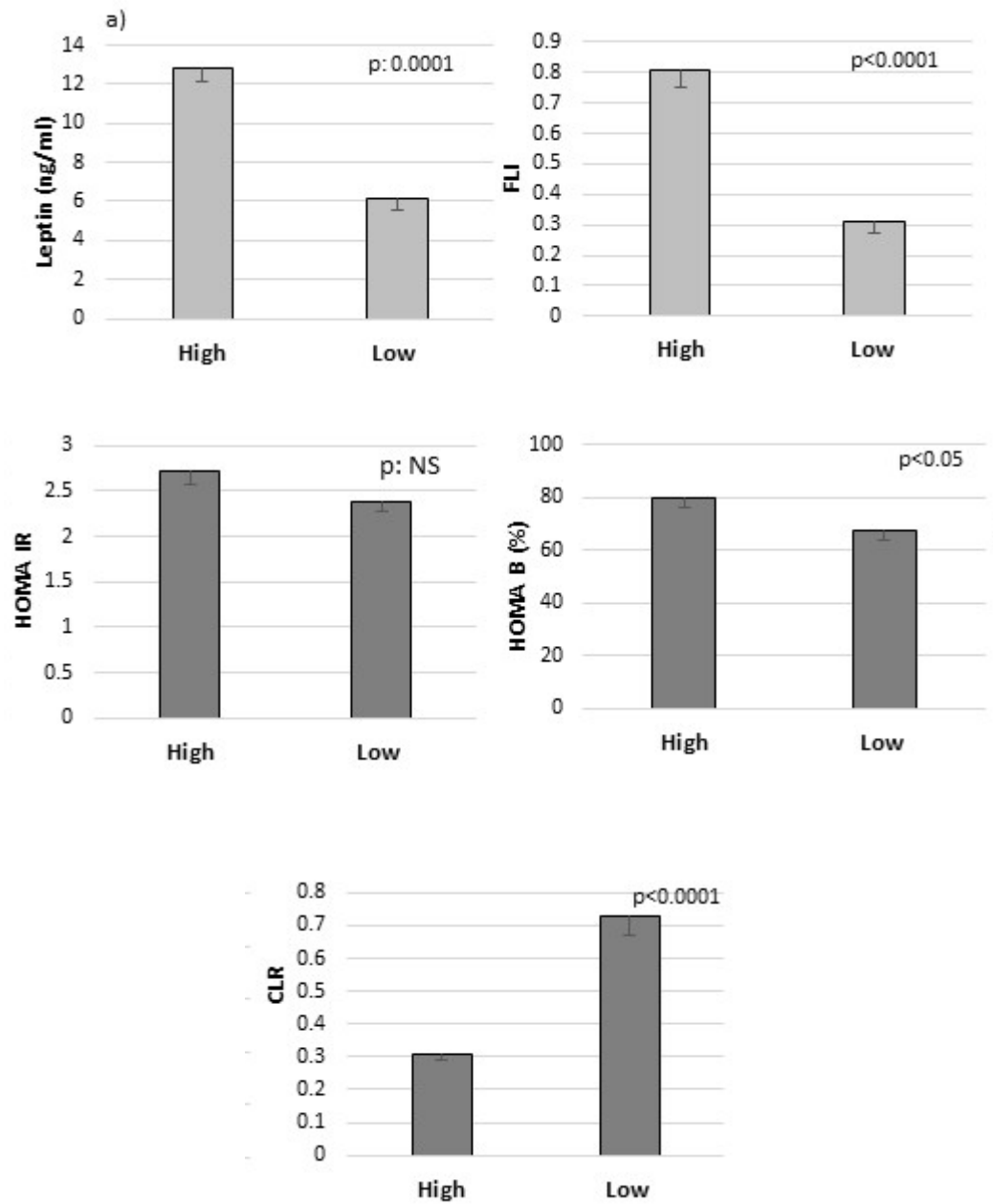
	Normal leptinemia (n=66)	Hyperleptinemia (n=110)	p value
Age (years)	63.2 \pm 8.0	64.3 \pm 8.0	0.381
Duration of diabetes (years)	5.0 (0.0-21.0)	7.0 (0.0-27.0)	0.045
Gender (F, %)	51.5	74.5	0.002
HbA1c (%)	6.4 (5.2-12.4)	6.5 (5.1-10.1)	0.484
Metabolic parameters			
Fasting blood glucose (mg/dl)	138.5 (64.0-297.0)	137 (88.0-289.0)	0.890
Total cholesterol (mg/dl)	167.1 (105.4-306.2)	163.1 (91.7-326.5)	0.121
HDL cholesterol (mg/dl)	41.9 (26.9-81.7)	44.7 (24.0-147.0)	0.088
LDL cholesterol (mg/dl)	94.1 (48.6-193.7)	81.8 (27.5-217.7)	0.016
Triglycerides (mg/dl)	129.5 (47.7-434.9)	140.8 (56.7-410.1)	0.748
C peptide (ng/ml)	2.64 (0.29-6.07)	2.97 (0.33-7.06)	0.136
C peptide/leptin ratio	0.73 (0.12-3.19)	0.24 (0.04-1.02)	<0.0001
FLI	0.14 (0.01-0.55)	0.69 (0.10-3.98)	<0.0001
sObR (ng/ml)	23.0 (13.2-65.7)	16.9 (11.2-39.9)	<0.0001
HOMA-IR	2.40 \pm 1.12	2.65 \pm 1.3	0.182
HOMA-B (%)	68.9 \pm 30.2	76.5 \pm 36.0	0.151
REE (kcal/day)	980.7 (592.6-1286.1)	1113.4 (638.8-1888.5)	<0.0001
Anthropometric parameters			
Body weight (kg)	80.0 (55.5-120.0)	84.5 (60.0-151.5)	0.005
BMI (kg/m ²)	29.4 (21.7-37.3)	33.7 (22.1-49.5)	<0.0001
TBFM (kg)	25.3 (9.8-43.4)	34.4 (17.9-65.9)	<0.0001
%BF	33.8 (14.1-47.6)	42.7 (21.9-51.6)	<0.0001
NFM (kg)	54.3 (34.8-89.5)	47.5 (35.8-102.4)	0.371
TBFM/NFM ratio	0.75 (0.28-1.06)	0.50 (0.16-0.91)	<0.0001
Hip circumference (cm)	103.3 \pm 6.4	110.1 \pm 8.7	<0.0001
Waist circumference (cm)	102.2 (78.0-122.0)	107.0 (92.0-142.0)	0.0001
Σ 4SF (mm)	79.2 \pm 22.5	110.2 \pm 22.5	<0.0001
WHR	1.0 (0.72-1.18)	0.99 (0.82-1.21)	0.870
WHtR (cm/m)	62.0 \pm 5.3	68.5 \pm 6.4	<0.0001
BAI	31.2 \pm 4.5	36.7 \pm 5.8	<0.0001
VAI	2.11 (0.55-7.82)	2.43 (0.72-8.15)	0.790

Supplementary table 2. Gender-based metabolic and anthropometric characteristics of T2DM patients (BMI: body mass index; TBFM: total body fat mass; %BF: percent body fat; NFM: non-fat mass; %NFM: percent non-fat mass; Σ 4SF: sum of the four skinfold thickness; WHR: waist-to-hip ratio; WHtR: waist-to-height ratio; BAI: body adiposity index; VAI: visceral adiposity index; data is presented as mean \pm SD or median (min-max)).

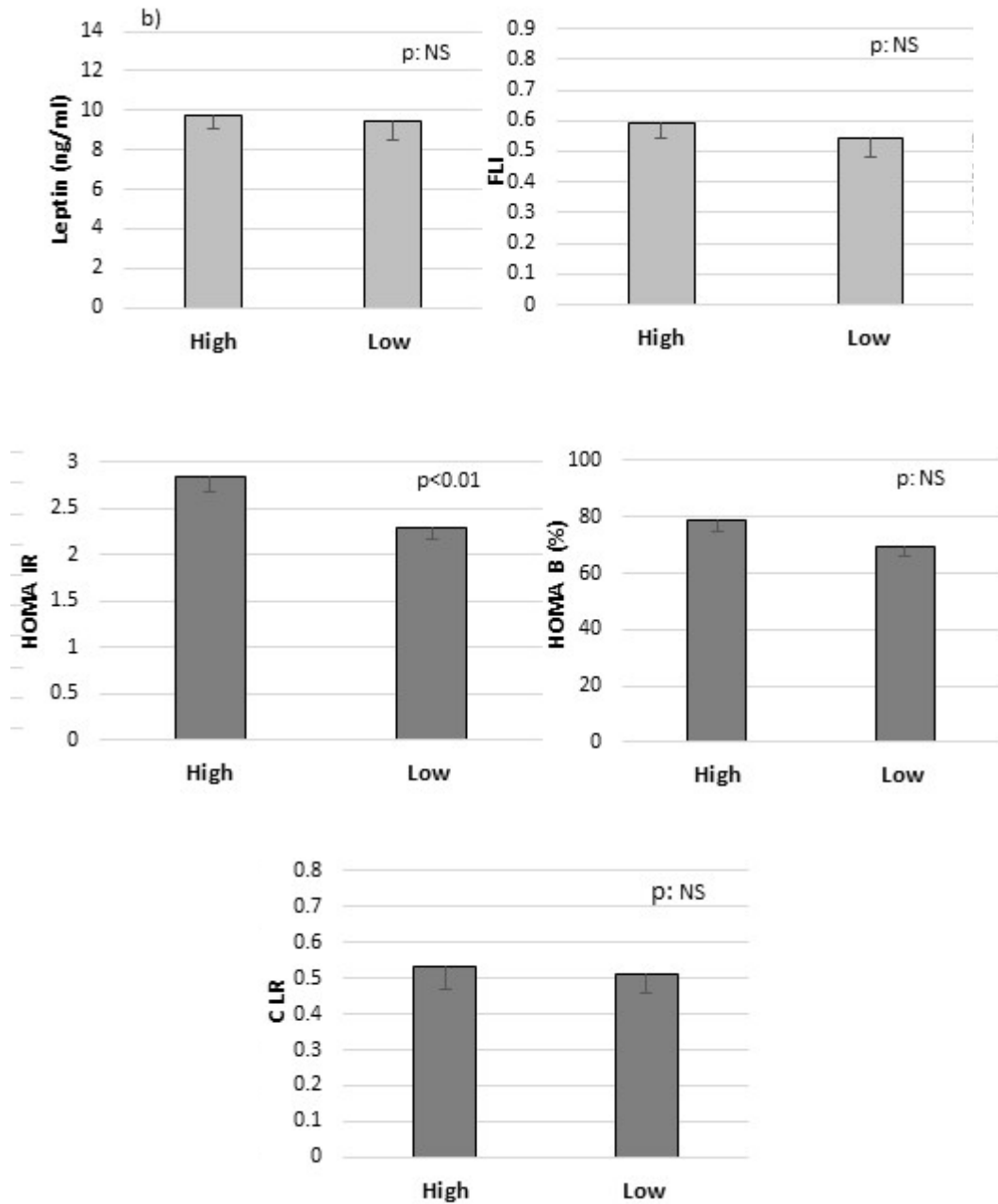
	T2DM females (n=116)	T2DM males (n=60)	p value
Age (years)	64.4 \pm 7.4	62.8 \pm 9.0	0.212
Duration of diabetes (years)	6.0 (0.0-27.0)	5.0 (0.0-21.0)	<0.01
HbA1c (%)	6.4 (5.1-10.0)	6.6 (5.2-12.4)	0.252
Fasting blood glucose (mg/dl)	135.5 (64.0-289.0)	143.5 (84.0-297.0)	0.078
Total cholesterol (mg/dl)	167.7 \pm 39.8	168.8 \pm 36.4	0.856
HDL cholesterol (mg/dl)	46.8 (24.0-81.6)	39.1 (25.9-81.7)	<0.0001
LDL cholesterol (mg/dl)	83.7 (27.5-217.7)	94.9 (37.1-159.1)	0.261
Triglycerides (mg/dl)	133.7 (47.7-434.9)	140.5 (68.6-410.1)	0.256
C peptide (ng/ml)	2.64 (0.33-7.01)	3.0 (0.29-7.06)	0.180
C peptide/leptin ratio	0.25 (0.04-1.10)	0.83 (0.12-3.20)	p<0.0001
HOMA-B (%)	73.7 \pm 33.9	73.7 \pm 34.7	0.998
HOMA-IR	2.26 (0.44-6.06)	2.58 (0.43-5.92)	0.135
leptin/TBFM ratio (ng/ml/kg)	0.31 (0.09-0.98)	0.15 (0.05-0.39)	p<0.0001
leptin/weight ratio (ng/ml/kg)	0.13 (0.04-0.41)	0.04 (0.01-0.11)	p<0.0001
Body weight (kg)	80.0 (55.5-136.5)	92.0 (69.3-151.5)	<0.0001
BMI (kg/m ²)	32.9 \pm 5.3	32.0 \pm 4.8	0.239
TBFM (kg)	34.5 (18.4-65.9)	23.8 (9.8-57.0)	<0.0001
%BF	43.2 (33.1-51.6)	26.0 (14.1-37.6)	<0.0001
NFM (kg)	45.4 (34.8-70.6)	66.8 (53.4-102.4)	<0.0001
%NFM	56.8 (48.4-66.9)	74.0 (62.4-85.9)	<0.0001
TBFM/NFM ratio	0.76 (0.50-1.07)	0.35 (0.16-0.60)	<0.0001
Hip circumference (cm)	107.9 \pm 8.7	106.7 \pm 8.3	0.373
Waist circumference (cm)	103.0 (78.0-137.0)	109.5 (96.0-155.0)	<0.0001
Σ 4SF (mm)	104.5 (49.5-190.5)	75.7 (29.4-152.0)	<0.0001
WHR	0.97 (0.72-1.14)	1.03 (0.93-1.21)	<0.0001
WHtR (cm/m)	66.3 (47.0-88.8)	63.6 (55.1-87.1)	0.101
BAI	36.4 (26.5-53.5)	29.0 (23.7-41.8)	<0.0001
VAI	2.42 (0.55-8.15)	2.12 (0.67-7.82)	0.476

Supplementary table 3. The multiple regression analysis of markers associated with insulin secretion (HOMA-B) and resistance (HOMA-IR). Coefficients, standard errors, t ratios and R2 values are presented (adj.: adjusted; TBFM: total body fat mass; BMI: body mass index; BAI: body adiposity index; VAI: visceral adiposity index; WHtR: waist-to-height ratio; HbA1c: glycated hemoglobin).

	Adj. R ²	β (SE)	r	p value
C peptide – constant	0.227			
TBFM		-0.016 (0.019)	0.220	0.414
BMI		0.109 (0.038)	0.310	0.004
BAI		-0.019 (0.024)	0.153	0.413
VAI		0.169 (0.062)	0.205	0.007
sObR		-0.032 (0.016)	-0.283	0.044
T2DM duration		-0.083 (0.023)	-0.272	0.0004
HbA1c		-0.195 (0.096)	-0.128	0.045
HOMA-B – constant	0.419			
TBFM		-0.120 (0.412)	0.219	0.771
BMI		2.355 (0.797)	0.260	0.003
BAI		-0.677 (0.502)	0.140	0.178
VAI		1.491 (1.315)	0.068	0.258
sObR		-0.569 (0.337)	-0.351	0.093
T2DM duration		-2.033 (0.481)	-0.235	< 0.0001
HbA1c		-15.417 (2.019)	-0.477	< 0.0001
HOMA-IR – constant	0.215			
TBFM		-0.017 (0.017)	0.204	0.312
BMI		0.091 (0.033)	0.307	0.007
BAI		-0.008 (0.021)	0.159	0.692
VAI		0.149 (0.055)	0.211	0.008
sObR		-0.025 (0.014)	-0.229	0.074
T2DM duration		-0.064 (0.020)	-0.256	0.002
HbA1c		-0.034 (0.085)	-0.007	0.690



Supplementary figure 1a. Markers of insulin and leptin secretion and resistance according to BAI levels (BAI; body adiposity index; VAI: visceral adiposity index; CLR: C peptide to leptin ratio; data are means \pm SE).



Supplementary figure 1b. Markers of insulin and leptin secretion and resistance according to VAI levels (BAI; body adiposity index; VAI: visceral adiposity index; CLR: C peptide to leptin ratio; data are means ± SE).