

Accumulation of abdominal fat in relation to selected proinflammatory cytokines concentrations in non-obese Wrocław inhabitants

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Introduction:

Metabolically obese normal weight (MONW) subjects, despite their normal BMI, present metabolic disturbances characteristic of abdominal obesity. One of the reasons might be subclinical inflammation caused by the fat tissue excess. The aim of the study was to assess the association between accumulation of fat (especially abdominal) and concentration of selected proinflammatory cytokines – interleukins (IL-6, IL-18) and C-reactive protein (CRP).

Methods and Procedures:

342 subjects: 218 women, 124 men
 age 20-40 years
 BMI <27 kg/m²
 Wrocław inhabitants

HOMA > 1,69

90 subjects - MONW group

HOMA <1,69

252 subjects - control group

Results

- body weight, height, body mass index, waist/hip ratio
- body composition (Dual energy X-ray absorptiometry)
- glucose serum concentration
- insulin serum concentrations
- IL-6, IL-18, CRP concentration
- insulin sensitivity/resistance indexes (HOMA, FIRI, QUICKI)
- exclusion criteria: presence of known diabetes, hypertension, or any other metabolic disorders, oral contraception, other drugs

Table 1. Comparison of selected anthropomorphic and carbohydrate parameters in the MONW group and control subjects.

	Control (n=252)		U Mann – Whitney test p-value	MONW (n=90)	
	Means	SD		Means	SD
Age (years)	30,85	5,55	0,073831	29,67	5,66
Body weight (kg)	63,75	11,67	<0,001	69,95	11,40
Height (cm)	170,35	9,45	<0,001	173,67	8,77
BMI (kg/m ²)	21,82	2,47	<0,001	23,06	2,35
Waist (cm)	75,89	9,57	<0,001	82,00	9,57
Hip (cm)	98,38	5,67	<0,005	100,47	5,96
WHR	0,77	0,07	<0,001	0,81	0,07
Total fat (g)	15729,29	4424,00	<0,05	17052,12	6199,77
Total fat (%)	25,49	6,57	0,080	24,47	7,33
Abdominal deposit (g)	1139,91	543,25	<0,001	1402,58	631,38
Abdominal deposit (%)	21,59	6,78	<0,050	23,31	7,58
Gynoidal deposit (g)	4819,74	1449,42	0,226	4583,86	1551,04
Gynoidal deposit (%)	30,95	8,66	<0,01	27,45	9,25
Abdominal/gynoidal dep.	0,24	0,11	<0,01	0,33	0,14
Glucose (mg/dl)	79,21	6,99	<0,001	84,61	8,21
Insulin (uIU/ml)	5,99	2,71	<0,01	8,11	4,21
HOMA	1,07	0,43	<0,01	2,33	0,77
FIRI	0,95	0,35	<0,001	1,49	0,87
QUICKI	0,40	0,05	<0,01	0,31	0,03

Table 2. Serum concentrations of interleukin-18 (IL-18), interleukin-6 (IL-6), C-reactive protein (CRP) in metabolically obese normal weight (MONW) women and men and controls groups

	WOMEN					MEN				
	MONW (n=35)		Control (n=183)		U Mann-Whitney test p-value	MONW (n=55)		Control (n=69)		U Mann-Whitney test p-value
	Means	SD	Means	SD		Means	SD	Means	SD	
IL-6	17	6	17	6	0,94	16	5	15	5	0,52
IL-18	240,5	65	248	84	0,72	276,5	75	292	99	0,51
CRP	3,2	3,7	1,9	2,3	0,03	2,4	2	2,1	2,1	0,11

- MONW individuals in our study presented higher accumulation of abdominal fat, both in grams and percentages, and lower accumulation of gynoid adipose tissue expressed as percentages, compared to normal controls.
- CRP level was correlated with insulin resistance, especially in the group of non-obese women.
- Serum IL-6, IL-18 levels in males and females did not differ between MONW and control group. IL-6 showed significant correlation with the abdominal to gynoidal fat tissue deposit ratio in women. IL-18 level was positively correlated with body mass, waist circumference and WHR in women

Conclusions:

1. The accumulation of central fat in normal weight subjects promotes production of proinflammatory cytokines, especially CRP. This might be one of the causes of accelerated atherosclerosis and its clinical consequences in MONW subjects.
2. Serum CRP assessment may be helpful in establishing proper diagnostic standards that would allow early identification of subjects with an increased risk of cardiometabolic complications. Then, it would be possible to undertake preventive actions.

Table 3. The correlations between IL-6, IL-18, CRP and anthropometric parameters, glucose, insulin levels, insulin resistance and insulin sensitivity indices in women

	Body weight (kg)	BMI (kg/m ²)	Waist (cm)	Hip (cm)	WHR	Fasting glucose (mg)	Insulin (uIU/ml)	HOMA	QUICKI	FIRI
IL-6	NS	NS	NS	NS	NS	0,27	NS	0,39	NS	0,39
IL-18	0,15	NS	0,17	NS	0,15	NS	NS	NS	NS	NS
CRP	0,25	0,27	0,36	0,27	0,17	NS	0,23	0,23	-0,19	0,23

Table 4. The correlation between IL-6, IL-18, CRP levels and anthropometric parameters, glucose, insulin levels, insulin resistance and insulin sensitivity in men

	Body weight (kg)	BMI (kg/m ²)	Waist (cm)	Hip (cm)	WHR	Fasting glucose (mg)	Insulin (uIU/ml)	HOMA	QUICKI	FIRI
IL-6	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
IL-18	NS	NS	NS	0,20	NS	NS	NS	NS	NS	NS
CRP	NS	0,17	0,21	NS	0,18	NS	NS	NS	NS	NS

Table 5. The correlations between adipose tissue and its abdominal and gynoidal deposit and cytokine concentrations in the group of women

	Total fat (g)	Total fat (%)	Abdominal deposit (g)	Abdominal deposit (%)	Gynoidal deposit (g)	Gynoidal deposit (%)	Abdominal /gynoidal deposit
IL-6	NS	NS	NS	NS	NS	NS	0,16
IL-18	NS	NS	NS	NS	NS	NS	NS
CRP	0,29	0,26	0,29	0,27	0,22	0,19	0,19

Table 6. The correlations between adipose tissue and its abdominal and gynoidal deposit and cytokine concentrations in the group of men.

	Total fat (g)	Total fat (%)	Abdominal deposit (g)	Abdominal deposit (%)	Gynoidal deposit (g)	Gynoidal deposit (%)	Abdominal /gynoidal deposit
IL-6	NS	NS	NS	NS	NS	NS	NS
IL-18	NS	NS	NS	NS	NS	NS	NS
CRP	0,36	0,35	0,44	0,34	NS	NS	0,35