Associations of Circulating Adipokine Levels with Fat Deposits, Metabolic Risk Factors, and Renal Function in a General Population



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Background Adipose tissue is known to secrete a multitude of bioactive adipokines [1] and it seems that the majority of these adipokines is implicated in the pathogenesis of obesity and associated metabolic diseases [2,3,4,5,6]. Existing research studies that dealt with circulating concentrations of adipokines in relation to metabolic phenotypes in humans, mostly concentrated on one or two specific adipokines [2,3,4,5,6] and therefore, comparisons of the involvement of different adipokines in these disorders are difficult. Furthermore, associations of circulating adipokine concentrations with different fat deposits or lifestyle factors are mostly missing. This study aimed to provide a comprehensive overview of the associations of a panel of circulating adipokines (adiponectin, chemerin, galectin-3, leptin, resistin) with magnetic resonance imaging (MRI)-quantified fat deposits, lifestyle factors, metabolic parameters, blood pressure, and renal function in a well characterized population-based study.

Study Design

Study of Health in Pomerania (SHIP-TREND, Germany, N = 4,114)

- Circulating adipokine concentrations were determined using enzyme-linked immunosorbent assay (ELISA) and quantitative sandwich enzyme immunoassay (EIA) techniques.
- To facilitate comparisons between associations, the adipokine levels, fat deposits, as well as metabolic and renal parameters were scaled according to their standard deviation (z-score).
- To investigate the distinct contribution of each fat deposit on circulating adipokine concentrations, adjusted fat compartiments were calculated sexspecific by using residual method (n = 1,732).
- Multivariable regression models were applied to examine the associations of adipokine concentrations with lifestyle factors (smoking, alcohol consumption, physical inactivity), metabolic phenotypes, blood pressure, renal function as well as metabolic syndrome and its components.

Results and Discussion



	Adiponectin	Chemerin	Galectin-3	Leptin	Resistin
Glucose		- ⊕ -	- -		- @ -
HbA1c			•		
Total cholesterol			0_		•
HDL-C	•	•	¢		
LDL-C	÷	•	e		•
Total triglycerides	•	•	•		- - -
Diastolic BP	- @	- ()	- D -		
Systolic BP	ч Ф	L L	- -		
eGER	ė			-	•

Fig.1. Associations between liver fat content (LFC), subcutaneous adipose tissue (SAT), or visceral adipose tissue (VAT) and different adipokines based on original (left part) and adjusted (right part) fat values. Significant associations are outlined (p < 0.05). Models were adjusted for age, sex, smoking, height, physical inactivity, alcohol consumption.

- Physicallay inactive subjects had higher chemerin and leptin concentrations.
- Smokers had higher chemerin and galectin-3 as well as lower adiponectin and leptin concentrations.
- Alcohol consumption was associated with adiponectin (positive) and resistin (inverse).

Conclusion

 In general, high adiponectin concentrations are related to a favorable, whereas high chemerin, galectin-3, leptin, or resistin concentrations are related to an unfavorable metabolic profile.



Fig.2. Results from linear (upper part) and logistic (lower part) regression analyses investigating the association of circulating adipokine levels with metabolic parameters, blood pressure (BP), estimated glomerular filtration rate (eGFR) as well as metabolic syndrome (MetS) and its components. Significant associations are highlighted in bold (p < 0.05). Analyses were adjusted for age, sex, smoking, physical inactivity, alcohol consumption(, waist circumference).

- Leptin concentrations are strongly associated with abdominal obesity, whereas adiponectin and chemerin concentrations showed strong associations with widespread metabolic disorders.
- Four of the five adipokines were strongly related to renal function which should be considered in future investigations on adipokine concentrations.

- Obese subjects showed increased chemerin, galectin-3, and leptin concentrations, but decreased adiponectin concentrations.
- All adipokines were associated with at least one lipid marker.
- Associations with parameters of glucose metabolism were seen for adiponectin, chemerin, galectin-3, and leptin.
- With the exception of adiponectin, adipokines were inversely associated with eGFR to a similar strength.

References [1] Kershaw EE et al, J Clin Endocrinol Metab, 2004; [2] Zyllas S et al, Obesity (Silver Spring), 2004; [3] Altinova AE et al, Endocr J, 2007; [4] Malo E et al, Metab Syndr Relat Disord, 2011; [5] Weigert J et al, J Clin Endocrinol Metab, 2010; [6] Considine RV et al, N Engl J Med, 1996.

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