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Original article

## Changes of serum omentin-1 levels in normal subjects, type 2 diabetes and type 2 diabetes with overweight and obesity in Chinese adults

*Variations du taux sérique d'omentine-1 chez les sujets normaux et les diabétiques de type 1 avec ou sans surpoids dans une population chinoise adulte*

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### Abstract

**Purpose.** – Omentin-1 has been identified as interesting novel adipokines that may modulate insulin action. Its exact biological function is unclear. The aim of this study is to assay the levels of serum omentin-1 in normal subjects and type 2 diabetes mellitus (T2DM) with normal weight, overweight and obesity and to analyze the relationship between serum omentin-1 levels with body mass index (BMI), waist to hip ratio (WHR), glycosylated hemoglobin (HbA1c), plasma glucose, insulin resistance index (HOMA-IR) and serum lipid levels. **Methods.** – There are eighty newly diagnosed type 2 diabetes patients, thirty-five type 2 diabetes patients with normal weight, twenty-nine type 2 diabetes patients with overweight, sixteen type 2 diabetes patients with obesity, and forty healthy control subjects were enrolled in this study. The levels of plasma glucose at fasting and 2-hour postprandial blood glucose and fasting serum levels of insulin, omentin-1 and HbA1c were measured. HOMA-IR was calculated. **Results.** – Serum omentin-1 levels were found to be significantly decreased in type 2 diabetes patients with normal weight ( $821.16 \pm 312.50$  ng/L), in type 2 diabetes patients with overweight ( $748.00 \pm 322.51$  ng/L), and in type 2 diabetes patients with obesity ( $530.44 \pm 357.35$  ng/L) compared with healthy control subjects ( $994.71 \pm 435.90$  ng/L) at  $P < 0.05$ . The level of serum omentin-1 was negatively correlated to BMI, HOMA-IR, WHR, fasting insulin (FINS), fasting plasma glucose (FPG), 2-hour postprandial blood glucose (2HPG), triglycerides (TG), and positively correlated to high-density lipoprotein (HDL). BMI was independent related factor that influenced the levels of serum omentin-1. **Conclusion.** – Decreased omentin-1 levels may contribute to the development of insulin resistance, T2DM and particularly to obesity in Chinese adults, however, its role in these diseases needs to be fully elucidated.

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**Keywords:** Omentin; Adipokines; Insulin and diabetes

### Résumé

**Objectif.** – L'omentine-1 a été identifiée comme une nouvelle adipokine qui pourrait moduler l'activité de l'insuline par un mécanisme moléculaire inconnu. L'objectif de cette étude est de mesurer la concentration d'omentine-1 dans le sérum de sujets contrôles et de patients diabétiques de type 1 avec ou sans surpoids et de rechercher une association entre les taux d'omentine-1 sérique avec l'index de masse grasse (IMC), le rapport taille sur hanche (T/H), l'hémoglobine glyquée (HbA1C), la glycémie et l'insulinémie à jeun, l'index HOMA pour évaluer la résistance à l'insuline, et le taux de lipides. **Méthodes.** – Pour cette étude nous avons recruté 80 nouveaux cas de diabète de type 2 avec surpoids, et 60 nouveaux cas sans surpoids ainsi que 40 sujets en bonne santé. L'omentine-1, l'HbA1C, la glycémie et l'insulinémie à jeun et en postprandial pour calculer l'HOMA index ont été mesurés. **Résultats.** – La concentration d'omentine-1 était significativement ( $p < 0,05$ ) abaissée chez les patients diabétiques avec poids normal ( $821,16 \pm 312,50$  ng/L) ou avec surpoids ( $748,00 \pm 322,51$  ng/L) en comparaison des contrôles sains ( $994,71 \pm 435,90$  ng/L).

**Abbreviations:** BMI, Body mass index; FINS, Fasting insulin; FPG, Fasting plasma glucose; HbA1c, Glycosylated hemoglobin; HDL-c, High-density lipoprotein cholesterol; HOMA-IR, Homeostasis model assessment of insulin resistance; 2HPG, 2-hour postprandial blood glucose; LDL-c, Low-density lipoprotein cholesterol; TC, Total cholesterol; TG, Triglyceride; WHR, Waist to hip ratio.

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La concentration sérique d'omentine-1 corrélait de façon négative avec l'IMC, l'HOMA index, le rapport T/H, la glycémie et l'insulinémie à jeun, la glycémie postprandiale, les triglycérides, et corrélait de façon positive avec l'HDL-cholestérol. L'IMC était le facteur indépendant prédictif du taux d'omentine-1. *Conclusion.* – La baisse de l'omentine-1 pourrait être un des éléments de la résistance à l'insuline au cours du diabète de type 2 et de l'obésité dans la population chinoise. Le mécanisme par lequel l'omentine-1 module la sensibilité à l'insuline doit être élucidé. © 2014 Elsevier Masson SAS. Tous droits réservés.

*Mots clés :* Omentine ; Adipokines ; Insuline et diabète

## 1. Introduction

Obesity is an emerging health hazard and contributes to the increased morbidity and mortality worldwide [1]. Increased abdominal/visceral fat is associated with insulin resistance, type 2 diabetes mellitus and cardiovascular complications [2]. A variety of adipokines, including leptin, adiponectin, visfatin, TNF alpha, and IL-6 [3,4] have widespread effects on carbohydrate and lipid metabolism and appear to play an important role in the pathogenesis of insulin resistance, diabetes, obesity, atherosclerosis, vascular endothelial dysfunction, and inflammation [5–9].

Omentin (intelectin, intestinal lactoferrin receptor, endothelial lectin HL-1, galactofuranose-binding lectin) is a novel fat depot-specific secretory factor that was identified from a cDNA library from human omental adipose tissue. In addition, it is known that it is exclusively secreted from stromal vascular cells of visceral adipose tissue [10,11]. The omentin gene is located in the 1q22–q23 chromosomal region, which has been linked to Type 2 diabetes in different populations [12–14]. There are two highly homologous isoforms of omentin, omentin-1 and omentin-2. The former is the major circulating form in human blood [15]. Recently, it was found that subjects with impaired glucose regulation, as well as patients with newly diagnosed and untreated Type 2 diabetes, showed a decrease in serum omentin-1 level [16]. The biological activity of omentin is not well understood. Recent studies showed that omentin-1 plasma levels are lower in type 1 and type 2 diabetes patients [17]. Lean subjects had significantly higher plasma omentin 1 levels than obese and overweight subjects. Plasma omentin 1 levels were inversely correlated with BMI, waist circumference, leptin levels, and insulin resistance as measured by homeostasis model assessment and positively correlated with adiponectin and HDL levels. In addition, higher plasma omentin 1 levels were detected in women compared with men [15,18]. Omentin gene expression are correlated negatively with obesity and insulin resistance and correlated positively with adiponectin and HDL levels [19]. There are a lot of study about omentin-1 with diabetes and obesity, but it is not known the change of serum omentin-1 levels in type 2 diabetes patients with abnormal weight. The aim of our study was to determine the serum omentin-1 levels in normal subjects and type 2 diabetes patients with normal weight, overweight and obesity and to analyze the relationship between serum omentin-1 levels with BMI, WHR, HbA1c, plasma glucose, HOMA-IR and serum lipid levels.

## 2. Subjects and methods

### 2.1. Study population

One hundred and twenty participants (62 men and 58 women, age range 39–89 and 40–86; mean 67.45 and 65.12, respectively) were recruited from the inpatient and outpatient Endocrinology Department in the Yueyang Integrated Traditional Chinese and Western Medicine Hospital of Shanghai University of Traditional Chinese Medicine from March 2011 to May 2012. The control subjects did not have any health problems and were not receiving any medications or dietary supplements. All type 2 diabetic mellitus were newly diagnosed patients. Subjects were classified into four groups: 40 healthy control subjects, 35 type 2 diabetes mellitus with normal weight ( $BMI < 25 \text{ kg/m}^2$ ), 29 type 2 diabetes mellitus with overweight ( $25 \leq BMI < 30 \text{ kg/m}^2$ ), 16 type 2 diabetes mellitus with obesity ( $BMI \geq 30 \text{ kg/m}^2$ ). Diagnoses were based on the diagnostic criteria of World Health Organization (WHO) 1999 [20]. The following exclusion criteria were used for all subjects: having type 1 diabetes, renal or hepatic diseases, acute or chronic inflammatory diseases, cancer, thyroid dysfunction, acute or chronic infection, any haematologic disorders, the presence of hepatitis C, alcohol or drug abuse; female subjects taking hormonal replacement therapy were also excluded. This study was approved by the Clinical Research Ethics Committee of Shanghai University of Traditional Chinese Medicine, and complied with the Declaration of Helsinki. Informed consent was obtained from each participant.

### 2.2. Blood sampling

All blood samples were drawn after overnight fasting. Samples were divided into two aliquots: the first part was collected in Vacutainer tubes (BD Diagnostics, Franklin Lakes, NJ, USA) containing disodium salt ( $\text{Na}_2$ )-EDTA for the assay of HbA1c (mmol/mol and %); the second aliquot of blood was collected in plain Vacutainer tubes for serum preparation used for lipid profile, fasting blood glucose level, insulin, liver enzymes, detection of omentin-1. Thus, serum samples were divided into several aliquots and kept at  $-80^\circ\text{C}$  for subsequent assay.

### 2.3. Clinical and biochemical measurements

All subjects were screened with regard to medical history (i.e., date of birth, smoking, alcohol consumption, and medical treatments). Height and weight (with light-weight clothing and without shoes), waist and hip circumferences and seated

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