

Assessment of Serum Chemerin, Omentin-1 and Apelin Concentration in Normal Weight, Overweight and Obese Men in Al-Hilla City

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Abstract

The objective of the study is to evaluate the association between different adipokines (chemerin, omentin-1 and apelin) and obesity. The study consisted of 88 men who were classified in to three groups according to body mass index. The first group included 30 normal weight men, the second group included 26 overweight men and the third group included 32 obese men. Blood was taken from all subjects for determination of serum chemerin, omentin-1 and apelin concentration. The outcomes of current study shows a significant rise in serum chemerin concentration and a significant decrease in serum omentin-1 concentration in obese group as paralleled with normal weight and overweight group. The results also show insignificant changes in serum apelin concentration among all of studied groups. The results of linear regression analysis show a significant positive association between serum chemerin concentration and BMI, while there is a significant negative association between serum omentin-1 concentration and BMI and a significant positive association between serum chemerin and triglycerides concentration in obese group. This study concludes that there is an association between adipokines (chemerin and omentin) and obesity, also measurement of serum chemerin and omentin may be useful for preventing the complications of obesity.

Keyword: Obesity, BMI, Chemerin, Omentin-1 and Apelin

الخلاصة

الهدف من هذه الدراسة لتعيين العلاقة بين مختلف الأديبوكاينات (الكيميرين و الأومنتين و الأبيلين) و السمنة. تضمنت الدراسة 88 رجلا قسموا على ثلاثة مجاميع اعتمادا على مؤشر كتلة الجسم. المجموعة الاولى تضمنت 30 رجلا ضمن الوزن الطبيعي، المجموعة الثانية تضمنت 26 رجلا فوق الوزن الطبيعي، المجموعة الثالثة تضمنت 32 رجلا سميئا. عينات الدم تم الحصول عليها من كل الاشخاص لتعين تركيز الكيميرين و الأومنتين و الأبيلين. نتائج هذه الدراسة بينت ان هناك زيادة ملحوظة في التركيز المصلي للكيميرين ونقصان ملحوظ في التركيز المصلي للأومنتين-1 في مجموعة السمان عند مقارنتها مع مجموعتي الوزن الطبيعي والوزن الزائد. كذلك اشارت النتائج ان هنالك تغيرات غير ملحوظة في التركيز المصلي للأبيلين بين كل مجاميع هذه الدراسة. نتائج تحليل الانحدار الخطي بينت ان هنالك ارتباطا معنوياً موجبا بين التركيز المصلي للكيميرين و مؤشر كتلة الجسم بينما وجدت ان هنالك ارتباطا معنوياً سالبا بين التركيز المصلي للأومنتين-1 و مؤشر كتلة الجسم و ارتباطا معنوياً موجبا بين التركيز المصلي للكيميرين و التركيز المصلي للكليسيريدات الثلاثية في مجموعة السمان. استنتجت هذه الدراسة ان هنالك علاقة بين الأديبوكاينات (الكيميرين و الأومنتين) و السمنة، كذلك قياس تركيز الكيميرين و الأومنتين يمكن ربما يساعد على منع مضاعفات السمنة.

الكلمات المفتاحية: السمنة، مؤشر كتلة الجسم، الكيميرين، الأومنتين و الأبيلين

Introduction

Obesity is a state characterized by an increased body fat. It is usually coupled with a cluster of disorders counting, hyperglycemia, impaired glucose tolerance, dyslipidemia, insulin resistance, hypertension, diabetes mellitus and cardiovascular diseases (Dietz , 2005; Bulló, 2007). The white adipose tissue is important component of obesity. In addition to the main role of adipose tissue represented by the storage of energy as triglyceride, it also acts as an endocrine tissue, which secretes a polypeptides, termed adipokines or adipocytokines, counting leptin, adiponectin, visfatin, chemerin, vaspin, omentin-1, resistin and apelin, which act vital functions in metabolism and energy balance. It also has an important roles in adipocyte biology

regulation, food intake, growth, inflammation and reproduction (Wise, 2004; Berg, 2002, Steppan , 2001).

Chemerin is released by adipose tissue. Chemerin is synthesized as inactive (prochemerin) form. The prochemerin is composed of 163 amino acids. It is activated by serine proteases to form mature chemerin that is composed from 146 amino acids. The function of chemerin involves adipogenesis regulation, metabolism of glucose and potentiation of insulin signaling through enhancement of insulin-encouraged uptake of glucose (Zabel , 2005; Rourke , 2013; Takahashi , 2008).

Another adipokine is omentin, which is found in two isoforms, omentin-1 and omentin-2. Omentin-1 is noticed in blood and it is released from stromal vascular cells in visceral adipose tissue while omentin-2, which is not detected in blood and it is secreted primarily from intestinal lumen. Omentin-1 is a glycoprotein composed of 295 amino acids. (DE-Souza, 2007; Schaffler, 2005). The omentin functions are not completely recognized, nevertheless there are several researches that show the role of omentin in homeostasis of energy. It proposed that omentin rises sensitivity of insulin, upsurges the transporting of glucose in separated human adipocytes that is stimulated by insulin and regulation the distribution of fat (DE-Souza , 2007; Yang , 2006).

Apelin is an adipokine that is liberated by adipocytes. It is composed of 36-amino acid (Boucher, 2005). Several studies established that there are an apelin expression in several tissues, particularly in the kidneys, brain, heart, lungs and adipocytes. The functions of apelin are concentrated in the myocardium and blood vessels (Medhurst, 2003; Falcao-Pires, 2005). Several studies demonstrate that an administration of apelin intravenously to the mice shows a hypotensive effect and it decreases the blood pressure, it also decreases glucose level by increasing the glucose uptake in skeletal muscle and adipose tissues (Lee, 2000; Dray, 2008). The objective of the study is to evaluate the association between different adipokines (chemerin, omentin-1 and apelin) and obesity.

Materials and Methods

1. Subjects

The study consists of 88 men who are classified in three groups depending on body mass index (BMI). The first group includes 30 normal weight men (BMI between 19.5 and 24.9) whose ages range between 36 and 48 years, the second group includes 26 overweight men (BMI between 25.0 and 29.9) whose ages range between 34 and 49 years and the third group includes 32 obese men (BMI above 30.0) whose ages range between 38 and 51 years. BMI is determined by the subsequent equation [BMI = weight (kg) / height² (meters)] (Pamela, 2006). All subjects are chosen by specialist physicians. Leaving out measures for subjects were having inflammatory diseases, renal failure, hepatic failure, diabetes mellitus, endocrine diseases, drug, alcohol and smoking.

2. Blood sampling and parameter determination

Five milliliters of blood are drawn by vein puncture from all subjects after an overnight fast. The blood is placed in plain tube, then it is centrifuged for obtaining the sera and stowed at -20°C till the analysis. Serum chemerin, omentin-1 and apelin concentration are measured by ELISA kits. Serum total cholesterol, HDL-cholesterol, and triglycerides concentrations are determined by spectrophotometric kit. Serum LDL-cholesterol concentration is measured by Friedewald equation (Carl, 2006). Statistical analyses are done by SPSS.

Results

The general and biochemical features of study groups (normal weight, overweight and obese) as revealed in table (1-1). The outcomes of the current study demonstration a significant rise ($P < 0.05$) in serum chemerin concentration in obese group as paralleled with normal weight and overweight group, but there is insignificant increase ($P > 0.05$) in serum chemerin concentration in overweight group as paralleled with normal weight group as revealed in figure (1-1). The results in figure (1-2) show a significant decrease ($P < 0.05$) in serum omentin-1 concentration in obese group as paralleled with normal weight and overweight group, but there is insignificant decrease ($P > 0.05$) in serum omentin-1 concentration in overweight group as paralleled with normal weight group. The results in figure (1-3) show insignificant changes ($P > 0.05$) in serum apelin concentration among all of study groups.

The results of linear regression analysis (table 1-2) show a significant positive association between serum chemerin concentration and BMI in obese group, while there is a significant negative association between serum omentin-1 concentration and BMI in obese group, and a significant positive association between serum chemerin and triglycerides concentration in obese group. Moreover, there is insignificant correlation between each of chemerin, omentin-1 and apelin with the remaining variables.

Table (1-1) General and Biochemical Features of the Study Groups

Character	Normal weight	Overweight	Obese
Number	30	26	32
Age (year)	42.45 ± 3.13	40.79 ± 4.45	43.23 ± 2.99
Weight	69.69 ± 19.43	83.3 ± 23.2 ^(*)	101.06 ± 21.54 ^{(*) (**)}
Height	176.99 ± 6.31	175.87 ± 5.46	174.55 ± 6.1
BMI	22.5 ± 1.26	27.2 ± 1.84 ^(*)	33.34 ± 0.92 ^{(*) (**)}
Total Cholesterol (mg/dL)	158.61 ± 27	157.24 ± 31.2	210.25 ± 49.81 ^(*)
HDL-Cholesterol (mg/dL)	39.2 ± 8.55	38.63 ± 7.46	36.53 ± 7.01
Triglycerides (mg/dL)	112.34 ± 39.26	119.18 ± 43.64	183.78 ± 52.52 ^(*)
LDL-Cholesterol (mg/dL)	97.42 ± 28.32	98.20 ± 31.65	137.59 ± 46.76 ^(*)

^(*) This means significant value ($P < 0.05$) as paralleled with normal weight group

^(**) This means significant value ($P < 0.05$) as paralleled with overweight group

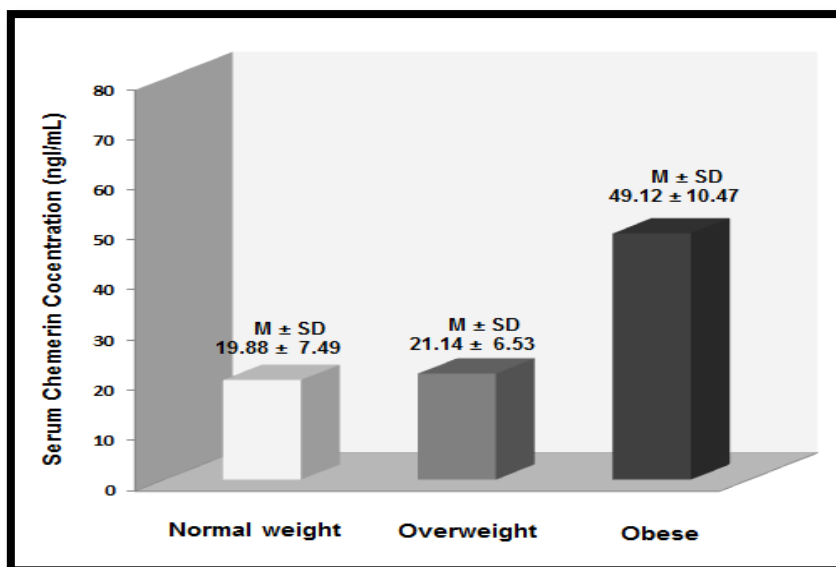


Figure (1-1): Serum Chemerin Concentration in Study Groups

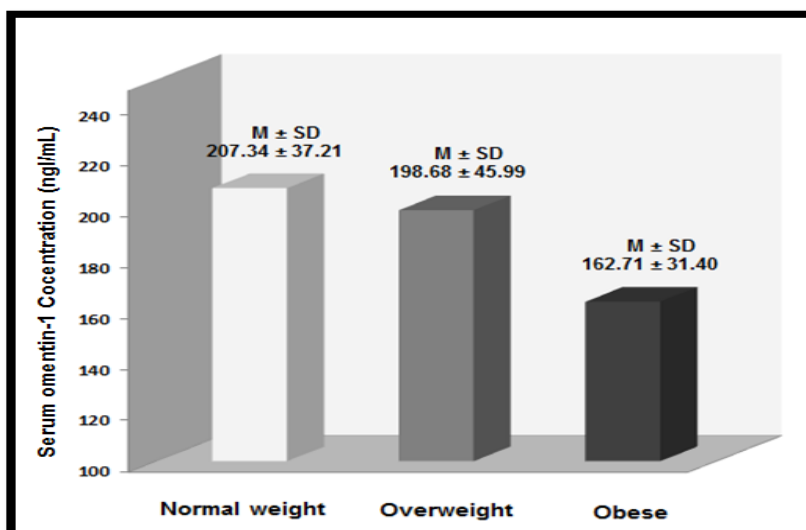


Figure (1-2): Serum Omentin-1 Concentration in Study Groups

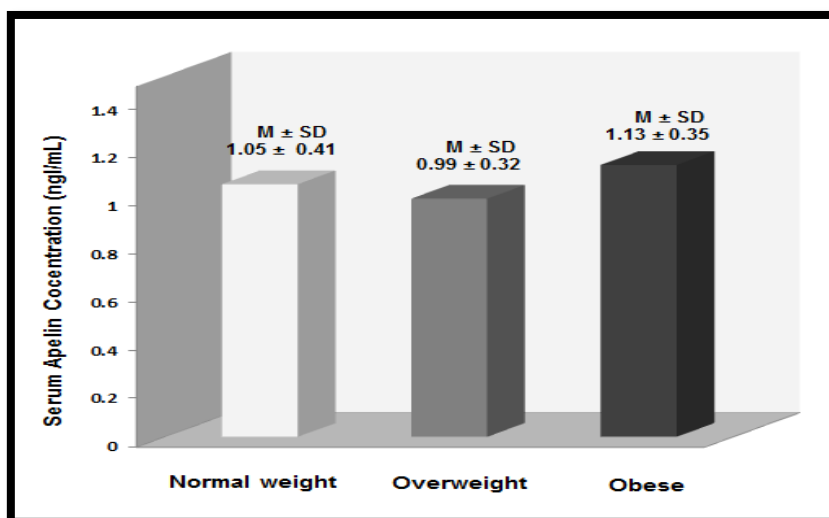


Figure (1-3): Serum Apelin Concentration in Study Groups

Table (1-2) Correlation Between Adipokines (Chemerin, Omentin and Apelin) and Other Characteristics of the Obese Group

Character	Chemerin (r)	Omentin-1 (r)	Apelin (r)
BMI	0.43*	- 0.52*	0.08**
Total Cholesterol	0.15**	- 0.07**	0.03**
HDL-Cholesterol	0.18**	- 0.13**	0.09**
Triglycerides	0.38*	- 0.20**	0.12**
LDL-Cholesterol	0.24**	- 0.22**	0.19**
Chemerin	-	- 0.12**	0.07**
Omentin-1	- 0.12**	-	0.08**
Apelin	0.07**	0.08**	-

(*) This means significant association ($P < 0.05$)

(**) This means a none significant association ($P > 0.05$)

Discussion

In addition to the principal function of adipose tissue as a reservoir of energy, adipose tissue makes as endocrine organ that secret adipokines like chemerin and omentin, these adipokines play an important role in metabolism and energy homeostasis by collaborating with other organ like skeletal muscle, liver, and the brain (Rosen, 2006; Ronti , 2006).

This study shows a significant rise in serum chemerin level in obese group in contrast with normal weight and overweight group. Nevertheless there are insignificant changes in serum chemerin level in overweight group in contrast with normal weight group. The current outcomes are covenant with the outcomes of Adriana (2014) and Syeda (2013) studies wherein the serum chemerin level was significantly increased in the obese group as compared to the normal weight group and overweight group. The present study shows a significant positive association between serum chemerin concentration and BMI in obese group. The existing results are in consistence with the outcomes of Wang (2013) and Dae (2017) studies wherein serum chemerin level were positively associated with BMI. Also, there are a significant positive association between serum chemerin and triglycerides concentration in obese group, the current outcomes are covenant with the outcomes of Syeda (2013) and Dae (2017) studies wherein serum chemerin level were positively correlated with triglycerides.

Adipocytes is secrete chemerin and the plasma levels of chemerin raised with obesity, this may propose that the expression of chemerin may revealed the state of adipocytes differentiation and the entire body fat mass (Bozaoglu ,2007; Bozaoglu, 2010). The chemerin function in adipocytes is to control adipogenesis and regulate the metabolic homeostasis (Goralski, 2007). For these reasons, the increasing serum chemerin level is linked with the increasing adipocytes differentiation and body fat in

obese group, also same reason interpretate the positive association between serum chemerin concentration and BMI. Also, the increasing the BMI i.e obesity is associated with the increased of adipocytes, the increasing of adipocytes mean the increase of triglycerides, for this reason the serum chemerin concentration is associated with triglycerides.

The results show a significant reduction in serum omentin-1 level in obese group in contrast with normal weight and overweight group. Nevertheless there are insignificant variations in serum omentin-1 concentration in overweight group in contrast with normal weight group. The current results are covenant with the outcomes of Adriana (2014) and Samir (2015) studies wherein the serum omentin-1 level was significantly reduced in the obese group as paralleled to the control group. Also, there is a significant negative association between serum omentin-1 concentration and BMI in obese group, the existing results are in consistence with the outcomes of Oswiecimska (2015) and Samir (2015) studies wherein serum omentin-1 level was negatively associated with BMI.

Omentin is secreted from visceral adipose tissue (Schaffler, 2005). Omentin-1 participates in mediation of glucose uptake by insulin and it has been established that the omentin level is reduces in several cases like obesity, diabetes mellitus and insulin resistance (DE-Souza, 2007; Sledzinski, 2013). Tan (2008) stated that glucose and insulin decrease the omentin mRNA expression and consequently decrease the production of omentin in visceral adipose tissue. It was proposed that serum levels of glucose and insulin may adjust the synthesis of omentin-1 directly or indirectly. In this study, the decrease in serum omentin-1 level in obese group may be resulted from the reduction of omentin-1 biosynthesis or resulted from the response to the increase in glucose and insulin in obese subjects. Olumide (2014) study showed a positive association between blood glucose level and BMI in obese group. For this reason an increase in BMI may be associated with the increased blood glucose level which can consequently lead to the decrease in omentin-1 level. This may interpret the negative association between serum omentin-1 level and BMI in obese group.

The apelin concentration show insignificant change among all studied groups. The existing outcomes are in agreement with the outcomes of Qutaiba (2016) and Hong-Jun (2014) studies wherein the serum apelin level was insignificantly changed in the obese group as paralleled to the control group.

Conclusions

This study concludes that there is an association between adipokines (chemerin and omentin) and obesity, also measurement of serum chemerin and omentin may be useful for preventing the complications of obesity.

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