ISSN: 2219-8229
E-ISSN: 2224-0136
Founder: Academic Publishing House *Researcher*
DOI: 10.13187/issn.2219-8229
Has been issued since 2010.

European Researcher. International Multidisciplinary Journal

Engineering Sciences

Технические науки

The Association of Serum Adiponectin Level with Type Two Diabetes Mellitus in Some Iraqi Patients

[1] Norrya A. Ali
[2] Ali Akram Qaddoori

[1,2] Genetic Engineering and Biotechnology Institute for Postgraduate studies
University Baghdad, Iraq

Abstract. Adiponectin is a 244 – amino acid-long polypeptide, that acts as a hormone with anti-inflammatory and insulin sensitizing properties. serum adiponectin level correlates inversely with insulin resistance, and hypoadiponectinemia being is found in subjects with obesity or type 2 diabetes mellitus. The aim of the present study is to study the association of serum adiponectin level with the risk of type two diabetes mellitus. Sixty six diabetic patients and Twenty five controls were enrolled in this study. Adiponectin levels were significantly reduced in T2DM patients than in control group with mean and standard error of 8.98 ± 0.86µg/ml vs. 12.51 ± 1.53µg/ml, respectively. Adiponectin levels were significantly reduced in T2DM patients male with a mean and standard error of 5.58 ± 0.64 µg/ml more than that of female (10.95 ± 1.22 µg/ml).

Keywords: serum adiponectin; diabetes mellitus; Iraqi patients.

Introduction.

Type 2 diabetes mellitus (T2DM) is a disease in which insulin is abnormally secreted or does not act correctly; leading to elevated blood glucose (GSPP, 2008). Over time, elevated glucose levels can lead to multiple organ damage. Diabetes is the leading cause of chronic renal failure, adult blindness, and limb amputation, and is a major risk factor for heart disease, stroke, and birth defects (Doria *et al.*, 2008). Diabetes mellitus is a potentially morbid condition with high prevalence worldwide, this has affected millions of people all over the world, thus the disease constitutes a major health concern (Macedo *et al.*, 2002).

Adiponectin is a 30-kDa protein that consists of an N terminal collagenous domain and a C-terminal globular domain (Pajvani *et al.*, 2003); adiponectin was found to be as the most abundant adipokine and count for 0.01 % or 3–30 µg/ml of total plasma protein (Gu, 2009).

Low adiponectin levels are consistently associated with a higher risk of type 2 diabetes (Li *et al.*, 2009). In mice, chronic administration of recombinant adiponectin leads to enhanced fatty acid oxidation, and weight loss (Fruebis *et al.*, 2001) with beneficial effects on lipid metabolism and insulin sensitivity (Yamauchi *et al.*, 2001). Furthermore, adiponectin knock-out mice are highly sensitive to diet induced insulin resistance (Maeda *et al.*, 2002).

Adiponectin acts through its receptors, ADIPOR1 and ADIPOR2. It was initially thought that ADIPOR1 was primarily expressed in skeletal muscle, whereas ADIPOR2 was predominantly expressed in liver (Yamauchi *et al.*, 2003). ADIPOR2 is highly expressed in human muscle and may be the predominant isoform through which adiponectin exerts its insulin-sensitizing effects in

skeletal muscle (Civitarese *et al.*, 2004). Plasma adiponectin levels are influenced by various factors and their relative influence is still a matter of debate (Kacso *et al.*, 2012).

Materials and Methods.

This study includes sixty six diabetic patients (24 males and 42 females), with age range of 40-74 years and twenty five person as controls. The patients were selected from Baquba general hospital. T2DM was defined as excess of glycosylated hemoglobin (HbA1C) ≥6.5 %. Patients with any medical condition or patients suffering from chronic kidney disease were excluded from the study. Control subjects were apparently healthy, non-T2DM individuals free of any medical complications. Control subjects with history of T2DM, HbA1C>5.8 % excluded from this study.

Anthropometric measurements. Anthropometric measurements were done by same person. Height and body weight were measured without shoes. Body mass index (BMI) was calculated as weight/height^2 kg/m^2.

Adiponectin Measurement. The Quantikine Human Total adiponectin Immunoassay is a 4.5 hour solid-phase ELISA which was designed to measure the total (low, middle, and high molecular weight) of human adiponectin in cell culture supernates, serum, and plasma. This kit was supplied by R&D Company.

Results and Discussion

Adiponectin levels were significantly reduced in T2DM patients than in control group with mean and standard error of 8.98 ± 0.86µg/ml vs. 12.51 ± 1.53µg/ml, respectively. Significant differences were found out in adiponectin levels between males and females (5.58 ± 0.64µg/ml vs. 10.95 ± 1.22µg/ml respectively). Not surprisingly; the results shown in **Table (1)** indicate that the T2DM group displayed a significantly reduction in plasma adiponectin concentration as compared with control group. The same result was obtained by a study conducted in Kerbala province: Iraq, by Al-Kayatt *et al.* (2011) and in Japan by Hotta *et al.* (2000).

Table 1. Comparison between patients and healthy group in study parameters

Parameters	Mean ± SE		T-test value
	Patients (No. 66)	Control (healthy) (No. 25)	
BMI (kg/m^2)	28.29 ± 0.58	27.01 ± 0.61	2.024
HbAIC (%)	9.59 ± 0.23	4.58 ± 0.10	0.744
Adiponectin level (µg/ml)	8.98 ± 0.86	12.51 ± 1.53	3.375
(P>0.05), NS: Non-significant.			

BMI : Body Mass Index, HbAIC : glycosylated hemoglobin.

Adiponectin is reduced in the serum of type 2 diabetic and obese patients, and is further decreased in patients with cardiovascular disease. The correlation between adiponectin levels and the risk for type 2 diabetes mellitus was shown in another study (Tataranni and Ortega, 2005). Results of this study revealed that the differences between the adiponectin level and the BMI were not significant. This can be explained by saying that the BMI is not a good indicator for obesity. Adiponectin levels were significantly reduced in T2DM patients male with a mean and standard error of (5.58 ± 0.64 µg/ml) more than that of female (10.95 ± 1.22 µg/ml) (Table 2).

Table 2. Effect of gender of patients group on studied parameters

Parameters	Mean ± SE		T-test value
	Male	Female	
Adiponectin level (µg/ml)	5.58 ± 0.64	10.95 ± 1.22	3.402 *
* (P<0.05)			

Significant differences were found in adiponectin levels between male and female. This result may be due to the fact that men are susceptible to abdominal fat deposition, particularly in the abdominal cavity, a condition described as visceral obesity (Despres *et al*., 2000). The biological regulation of adiponectin is complex and is influenced by a number of factors including age, gender, fat mass and sexual hormones; interestingly, total adiponectin is lower in men than women and does not differ between premenopausal and postmenopausal women, suggesting that androgens may influence adiponectin. Adiponectin is secreted from adipose tissue and typically circulates in an inverse manner to visceral fat mass. A number of endocrine factors, including androgens and estrogens are known to influence adiponectin concentrations. Previous report indicate that testosterone lowers total adiponectin within the circulation (Yarrow *et al*., 2012).

References:

1. Al-Kayatt, T.H. Ibraheem A.A. and Al-Tu'ma F.J. (2011). Adiponectin and Lipid Profile Levels in Type-2 Diabetic Obese Patients in Kerbala Province. *Kerbala Journal of Pharmaceutical Sciences*, 2 pp. 157-166.

2. Civitarese A.E.; Jenkinson C.P.; Richardson D., Bajaj M., Cusi, K., Kashyap S.; Berria R.; Belfort R.A., DeFronzo L.J. and Ravussin M.E. (2004). Adiponectin receptors gene expression and insulin sensitivity in nondiabetic Mexican Americans with or without a family history of Type 2 diabetes. *Diabetologia*, 47(5), pp. 816-820.

3. Doria, A.; Patti, M-E. and Khan, C.R. (2008). The Emerging Genetic Architecture of Type 2 Diabetes. *Cell Metabolism,* 8(3), pp. 186-200.

4. Fruebis, J.; Tsao, T.S.; Javorschi, S.; Ebbets-Reed, D.; Erickson, M.R.; Yen, F.T.; Bihain, B.E. and Lodish, H.F. (2001). Proteolytic cleavage product of 30-kDa adipocyte complement-related protein increases fatty acid oxidation in muscle and causes weight loss in mice. *Proc Natl Acad Sci USA*, 98(4), pp. 2005-2010.

5. Genetic Services Policy Project (GSPP). (2008). Type 2 Diabetes and Genetic Technology: A Policy Brief.

6. Gu, H.F. (2009). Biomarkers of Adiponectin: plasma protein Variation and Genomic DNA polymorphisms. *Biomarker Insights*, 4, pp. 123-133.

7. Hotta, K.; Funahashi, T.; Arita, Y.; Takahashi, M.; Matsuda, M.; Okamoto, Y.; Iwahashi, H.; Kuriyama, H.; Ouchi, N.; Maeda, K.; Nishida, M.; Kihara, S.; Sakai, N.; Nakajima, T.; Hasegawa, K.; Muraguchi, M.; Ohmoto, Y.; Nakamura, T.; Yamashita, S.; Hanafusa, T. and Matsuzawa, Y. (2000). Plasma concentrations of a novel, adipose-specific protein, adiponectin, in type 2 diabetic patients. *Arteriosclerosis Thrombosis, and Vascular Biology*, 20, pp. 1595-1599.

8. Kacso, I.M.; Trifa, A.P.; Popp, R.A.; Bondor, C.I.; Farcas, M.F.; Lenghel, A.R.; Moldovan, D.; Rusu, C.; Nita, C.; Pop, I.V.; Gherman, C.M. and Hancu, N.D. (2012). Adiponectin gene 45T>G polymorphism is not associated to plasma adiponectin in a cohort of patients with type 2 diabetes from Romania. *Revista Română de Medicină de Laborator*, 20, pp. 73-79.

9. Li, S.; Shin, H.J.; Ding, E.L. and van Dam, R.M. (2009). Adiponectin levels and risk of type 2 diabetes: a systematic review and meta-analysis.*JAMA*, 302. pp. 179-188.

10. Macedo, C.S.; Capelletti, S.M.; Mercadnte, MC.S.; Padovani, C.R. and Spdella, C.T. (2002). Role of metabolic control on diabetic nephropathy. *Acta Cir Bras*, 17, pp. 37-50.

11. Maeda, N.; Shimomura, I.; Kishida, K.; Nishizawa, H.; Matsuda, M.; Nagaretani, H.; Furuyama, N.; Kondo, H.; Takahashi, M.; Arita, Y.; Komuro, R.; Ouchi, N.; Kihara, S.; Tochino, Y.; Okutomi , K.; Horie, M.; Takeda, S.; Aoyama, T.; Funahashi, T. and Matsuzawa, Y. (2002). Diet-induced insulin resistance in mice lacking adiponectin/ACRP30. *Nat Med*, 8(7), pp. 731-737.

12. Pajvani, U.B.; Du, X.; Combs, T.P.; Berg, A.H.; Rajala, M.W.; Schulthess, T.; Engel, J.; Brownlee, M. and Scherer, P.E. (2003). Structure-function studies of the adipocyte-secreted hormone Acrp30/adiponectin Implications for metabolic regulation and bioactivity. *J Biol Chem,* 278(11), pp. 9073-9085.

13. Rabe, K.; Lehrke, M.; Parhofer, K.G. and Broedl, U.C. (2008). Adipokines and insulin resistance. *Mol. Med*, 14, pp. 741–751.

14. Tataranni, P.A. and Ortega, E. (2005). A Burning Question Does an Adipokine-Induced Activation of the Immune System Mediate the Effect of Overnutrition on Type 2 Diabetes?. *Diabetes*, 54(4), pp. 917-927.

15.Yamauchi, T.; Kamon , J.; Waki, H.; Terauchi, Y.; Kubota, N.; Hara, K.; Mori, Y.; Ide, T.; Murakami, K.; Tsuboyama-Kasaoka, N.; Ezaki, O.; Akanuma, Y.; Gavrilova, O.; Vinson, C.; Reitman, M.L.; Kagechika, H.; Shudo, K.; Yoda, M.; Nakano, Y.; Tobe, K.; Nagai, R.; Kimura, S.; Tomita, M.; Froguel, P. and Kadowaki, T. (2001).The fat-derived hormone adiponectin reverses insulin resistance associated with both lipoatrophy and obesity. *Nat Med*, 7(8), pp. 941-946.

16.Yamauchi, T.; Kamon, J.; Ito, Y.; Tsuchida, A.; Yokomizo, T.; Kita, S.; Sugiyama, T.; Miyagishi, M.; Hara, K.; Tsunoda, M.; Murakami, K.; Ohteki, T.; Uchida, S.; Takekawa, S.; Waki, H.; Tsuno, N.H.; Shibata, Y.; Terauchi, Y.; Froguel, P.; Tobe, K.; Koyasu, S.; Taira, K.; Kitamura, T.; Shimizu, T.; Nagai, R. and Kadowaki, T. (2003). Cloning of adiponectin receptors that mediate antidiabetic metabolic effects. *Nature*, 423 (6941), pp. 762-769.

17. Despres, J.P.; Couillard, C.; Gagnon, J.; Bergeron, J.; Leon, A.S.; Rao, D.C.; Skinner, J.S.; Wilmore, J.H. and Bouchard, C. (2000). Race, visceral adipose tissue, plasma lipids, and lipoprotein lipase activity in men and women: the health, risk factors, exercise training, and genetics (HERITAGE) family study. *Arterioscler Thromb Vasc Biol*, 20(8), pp. 1932–1938.

18. Yarrow, J.F.; Beggs, L.A.; Conover, C.F.; McCoy, S.C.; Beck, D.T. and Borst S.E. (2012). Influence of Androgens on Circulating Adiponectin in Male and Female Rodents. *PLoS ONE*, 7(10): e47315.