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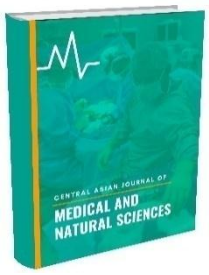

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Evaluation of Adiponectin and IL6 in Patients with Diabetes Mellitus Type Two

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Abstract: e most prevalent kind of chronic metabolic illness, Type 2 diabetes is defined as by hyperglycemia (excessive blood glucose) brought on by a problem with protein, lipid, and carbohydrate metabolism. Adiponectin is adipokine produced by adipocytes××, is a well -known homeostatics factor for maintaining glucose amounts in the blood, Lipoprotein metabolism, and insulin resistance due to its anti-inflammatory×, anti -fibrotic, and anti oxidant properties. The adiponectin receptors dipoR1 and AdipoR2 mediate each of these metabolic processes. Additionally, One of the proteins with the greatest plasma concentrations is adiponectin. Adiponectin levels rise as a result of calorie restriction or weight loss, and this rise is linked to improved insulin sensitivity. Cytokines have a significant role in the selective death of beta cells that produce insulin and the impairment of insulin signaling.. Thus, An immune-mediated condition can be used to describe the second kind of diabetes. This study sought to determine the adiponectin and (IL-6) levels in type 2 diabetic patients in the region of Babil in Iraq.

Key words: interleukin-6; Adiponectin; diabetes mellitus.

Introduction.

Hyperglycemia is a symptom of × (T2DM) , a metabolic disease. It is due regarding insulin resistance (IR) resulting due to defect of insulin function in muscle and hepatic system , impaired insulin secretion or both (Crook et al., 2012). here are numerous causes of type 2 diabetes counts for about 95% of total diabetic cases. The rate of distribution of diabetes and the IR is elevated in vary fact manner . The main complication of this disease is cardiovascular disease, kidney disease and increase susceptibility to infection (Preeti N. Malani, MD, MSJ, 2012). The Langerhans islets of the pancreas generate and emit the peptide hormone insulin . By delivering glucose to cells in the liver, skeletal muscle, and fat through the bloodstream, it controls the metabolism of carbohydrates, fats, and proteins.*(AL et al., 2020)*. Pancreatic beta cells are the only cells in our bodies capable of producing and secreting insulin, which tells our bodies' insulin-sensitive cells and tissues when it's time for lunch again *(Huising, et al 2020)*. Adiponectin is a protein contains 244 AAs, synthesized in adipose tissue.

It locates on chromosome 3q.27. It circulates in blood and effects metabolism of fatty acid and carbohydrate in the muscle and liver, It shows higher serum level in women than men, more in healthy body weight that obese and more in those with normal glucose level than hyperglycemic individuals. Circulating adiponectin levels greatly rise after weight loss (Chen, et al., 2006). Level of adiponectin rise the absorption of fatty acids by muscle and stimulate β oxidation and triglyceride clearance and block fatty acid synthesis by the liver, so it decreases fatty acid and TG concentration. It increases glucose uptake and catabolism by the muscle and liver cells and decrease gluconeogenesis by the liver so decreases plasma glucose level. Adiponectin is an insulin sensitizing agent, it increases insulin sensitivity and action (Coppola et al., 2010). The function of (IL-6) in the It is controversial whether peripheral The sensitivity to insulin causes type 2 diabetes. *(Glund S, et al 2008*). Serum levels of pro-inflammatory cytokines such as Resistin, Tumor Necrosis Factor, and IL-6 have been measured. Obese and diabetes progression are linked. Obesity is connected to increased fat mass and subsequent IL-6 release, which has been linked to how insulin resistance develops. Adipose tissue IL-6 concentration corresponds with lower whole-body insulin-mediated glucose absorption and glucose tolerance in obese adults with or without type 2 diabetes. Endothelial cells, pancreatic cells, hepatocytes, and skeletal and smooth muscle are among the other cell types that express and release IL-6. (*Ellingsgaard H, et al 2011*)

Objective: Adiponectin and IL-6 serum levels were measured in type two diabetic patients.

Material and Methods

The ELISA sandwich method was measures with Adiponectin and (IL-6) level. he 115 participants in the study were separated into two groups: The first group is made up of 75 people suffering from type 2 diabetes, 30 of whom were excluded based on exclusion criteria, and the remaining 45 were identified by a specialized diabetes doctor using samples obtained at the Diabetes and Endocrine Center in Marjan Medical City in Hilla, Babylon province /Ministry of Health/Iraq from November 1, 2022 to January 31, 2023. The control group is the second group, which consists of 45 healthy× individuals. The patients' ages ranged from 35 to 80. All type 2 diabetes patients were eligible to participate. The second group is the control group, which is made up of 45 healthy people who have normal glucose and HbA1C values. The age group was thirty five to eighty years old.

Exclusion criteria

1. Acute and chronic inflammatory diseases..
2. Proteinuria due to other causes than DM..
3. Type 1 diabetic patients.
4. Fever.
5. Persons on glucocorticoid medications.
6. Malignancies.
7. Chronic Hypertension.
8. Persons on glucocorticoid medications.

Inclusion criteria

1. Type 2 DM
2. Diabetes for more than× 1 year

Blood Collection:

Blood samples were collected from both sick and healthy individuals.. using medical sterile syringes from the brachial vein and placed in a gel tube for this study. The gel tube was then for 2 hours at ambient temperature or overnight at 2-8°C before being centrifuged for 20 minutes at 1000g at 2-8°C to separate the serum from other blood components. The serum was collected with a micropipette and placed in two repeaters in Eppendorf tubes before being frozen at -20 C for ELISA measurements of Adiponectin and Interleukin 6.

Immunological Assays..

Adiponectin and interleukin 6 estimated by ELISA kit, the biochemical kit used in the study for performed by Elabscience company (USA).

Statistical Analysis : Data from study participants, type 2 diabetes patients and controls, were entered, managed, and analyzed using IBM's SPSS version 25 software for Windows, distributed in the United States in 2017.. Prior to the study, Every variable was checked for mistakes or inconsistencies.. Using histogram and normal distribution curves, the continuous variables adiponectin and interleukin 6 were studied for statistical normality distribution, and They all seemed to adhere to the statistical normal distribution . To compare the mean values of Adiponectin, Interleukin 6, and the anthor study parameter to the control, the T-independent test was utilized. A level of significance of 0.05 or less is deemed significant . Finally, conclusions and discoveries are provided in Microsoft Word 2010 tables and/or figures for Windows application.

Result and Discussion :

1-Adiponectin

As indicated in table (1) and figure (1), The ill group's mean Adiponectin level was significantly lower (p0.001) than the control group's .

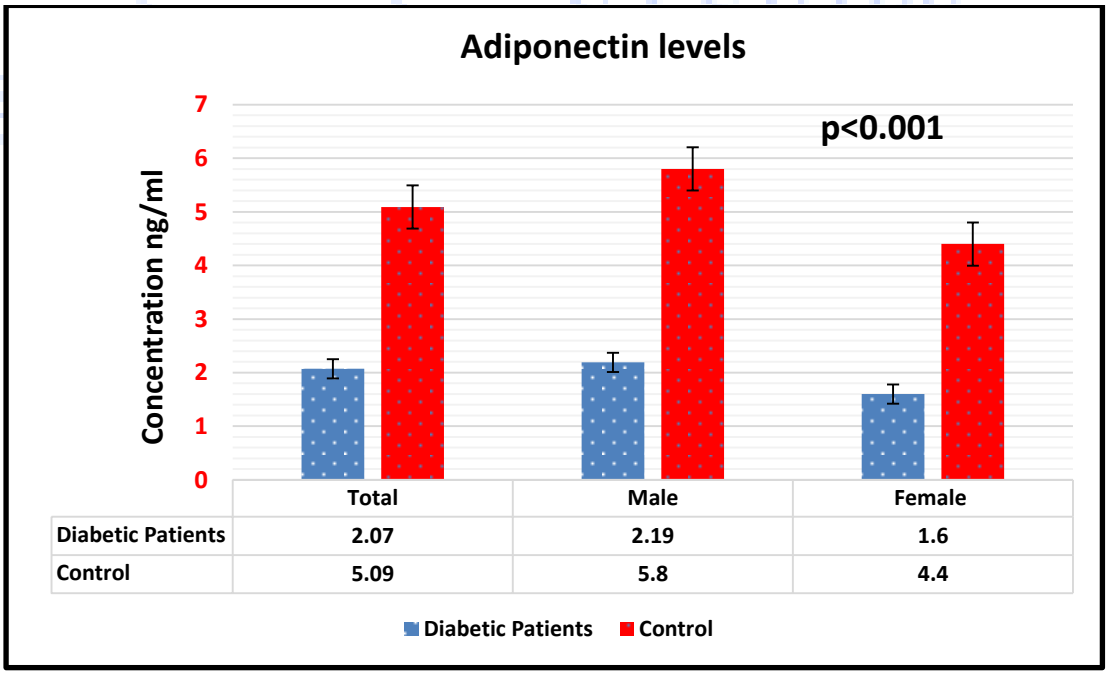

Figure (1): serum adiponectin among diabetes patients and control.

Table 1 compares the mean, standard error, and p-value of adiponectin levels in diabetics and controls.

Parameter		Diabetic patients No. (45) Mean ± SD	Healthy control No. (45) Mean ± SD*	p. value
Adiponectin (ng/ml)	Total mean	2.07 ± 0.8	5.09 ± 2.7	**<0.001**
	Male	2.19 ± 0.8	± 3.14 5.8	**<0.001**
	Female	1.6 ± 0.6	± 2.1 4.4	**<0.001**
Significant at **p<0.001.** Standard deviation**;** two independent **t-test;*:**				

The protein adiponectin is secreted by adipose tissue. (Chait & Den Hartigh, 2020Other tissues, For instance, placental tissue, epithelial cells, liver parenchyma cells, osteoblasts, and myocytes all produce just little amounts. (Achari & Jain, 2017). Adiponectin has antidiabetic, anti-inflammatory, and anti -atherogenic properties ×, with The ability of increasing insulin sensitivity. (Nguyen, et al 2020.

Adiponectin is the most potent biomarker for type 2 DM because it modulates insulin resistance, stimulates lipid metabolism, controls sensitivity to sugar and changes Using homeostasis to stave off diabetes. (Siitonen *et al.*, 2011). Adiponectin levels were significantly lower in patients with type 2 diabetes mellitus compared to healthy controls in the current investigation, which was consistent with previous findings. (Prates, *et al*, 2016 : Gupta, *et al.*, 2018). A meta -analysis was performed of multiethnic populations for a genome-wide connection study discovered low levels of circulating adiponectin among those at risk. A higher danger of getting Type two Diabetes. (Dastani *et al.*, 2012).

A Japanese research of newly diagnosed diabetics revealed that blood adiponectin levels are inversely associated to diabetes incidence. (Yamamoto *et al.*, 2014). The average baseline adiponectin level in diabetic participants was less than in nondiabetic participants in an Indian study done in Chennai. Low level adiponectin were discovered to be a robust predictor of future diabetes development, and HbA1c levels were also discovered to have a favorable predictive relationship. (Diwan *et al.*, 2018).

2- Interleukin 6

The mean of serum levels interleukin 6 in diabetes patients and controls are presented in Table (2) and figure (2), and It is substantially more than in the control group (P0.001).

Table (2): Serum interleukin-6 concentration in diabetes patients and Healthy control groups

Parameter		Diabetic patients No. (45)	Healthy control No. (45)	p. value
IL6 (pg/ml)	Total mean	38.1 ± 19.7	18.1 ± 9.7	**<0.001**
	Male	35.3 ± 18.5	17.9 ± 7.6	**<0.001**
	Female	40.4 ± 20.8	18.7 ± 8.12	**<0.001**
Significant at **p<0.001.** Standard deviation**;** two independent **t-test;*:**				

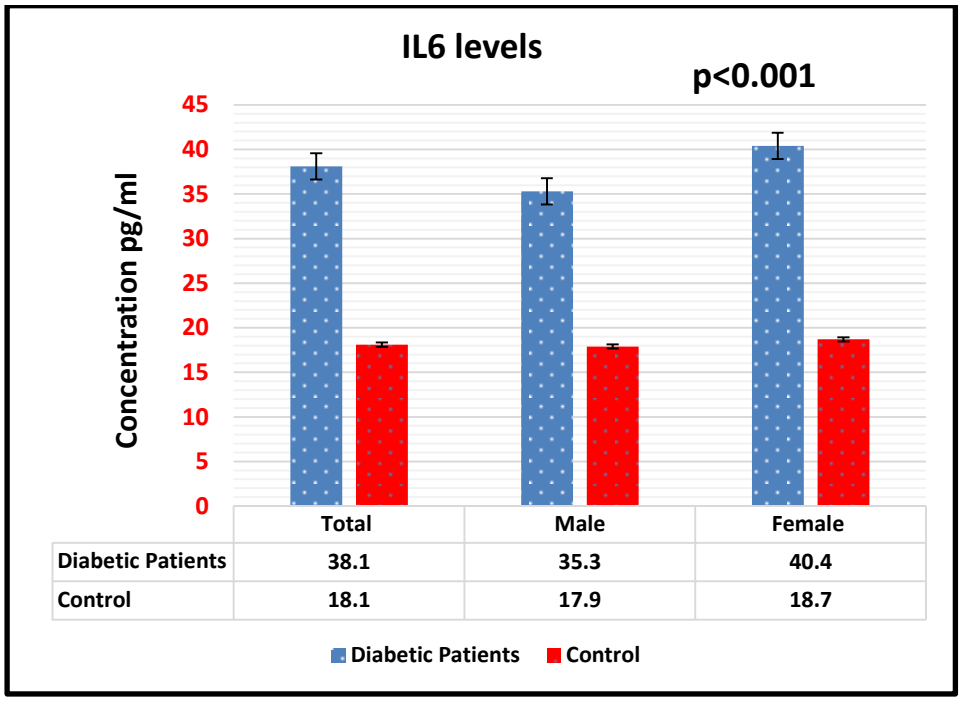

Figure (2): serum IL6 among diabetes patients and control.

Scholars have uncovered a link between type 2 diabetes and persistent inflammation, which may be due system innate immunity dysregulation, and this may be a Diabetes and metabolic syndrome are linked *(Ferrucci & Fabbri, 2018).* IL 6 is a cytokine that has been linked to inflammation and type two diabetes *(Ayelign, et al., 2021).* NFKB (nuclear factor Kappa light× chain enhancer of activator B× cell), a major transcription factor in the inflammatory cascade, coordinates the activation of pro× inflammatory adipocytokinase in the fat tissue (AT). *(Toth, et al., 2013),* The function of cytokines in adiponection levels of TNF, IL8, and IL6, and also their expression in adipose tissue *(Giardullo et al., 2021).*

Although IL-6 levels in tissues are normal,, its irregular synthesis and long-term exposition cause inflammation, which causes insulin resistance and overt diabetes. Insulin resistance and IL-6 activation are related mechanistically. Insulin resistance is because of IL-6 via raising the synthesis of SOCS-3, a putative insulin signaling inhibitor, and decreasing the phosphorylation of the insulin receptor and insulin receptor substrate-1 (*Rehman et al., 2017). …*

Conclusion:

1. In comparison to healthy controls, patients with type×two diabetes had significantly greater levels of interleukin-6.
2. Individuals with type two diabetes× had significantly lower adiponectin levels than healthy controls. Adiponectin deficiency was also associated with an increase in lipid profile levels, showing that adiponectin, as a hormone, plays an important role in hyperlipidemia prevention.

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