World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-13, August 2022
ISSN: 2749-3644

DETERMINATION OF LEPTIN LEVEL WITH OTHER BIOCHEMICAL PARAMETERS IN TYPE 2 DIABETIC PATIENTS

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Article history:

Received: June 11th 2022
Accepted: July 14th 2022
Published: August 21st 2022

Abstract:

Background: Background: An adipokine called leptin has been linked to pathways that affect the risk of diabetes mellitus and cardiovascular disease.
Aims: To calculate and contrast leptin levels between people with type 2 diabetes mellitus (T2DM) and healthy people.
Materials and methods: A total of 90 individuals were included for the study (43 men and 47 women), 65 Type 2 diabetes patients, and 25 people who appeared to be normal). A cross-sectional research from December 2021 to May 2022 was done for our study. Leptin was measured using a sandwich-based ELISA kit (Mybiosource, U.S.A). Serum cholesterol, triglyceride, and fasting glucose levels were measured full-automatically.
Results: The mean duration of T2DM in cases was 54±7.6 years. The mean value of leptin (ng/ml) was 10.63±2.73 in cases and 4.05 ± 1.67 in controls, TC (r=0.12, p=0.61) and Tg (r=0.30, p=0.186) and it was associated with negatively HDL (r= -0.564, p=0.0009).
Conclusion: An major risk factor for developing diabetes is elevated leptin levels.

Keywords: Leptin, T2DM, sandwich-based ELISA kit

INTRODUCTION:

A category of metabolic diseases known as diabetes mellitus (DM) are characterized by chronic hyperglycemia. [1] As of 2014, there were an estimated 387 million cases of diabetes globally, with type 2 diabetes (T2DM) accounting for roughly 90% of cases and 8.3% of all adult cases[2]. The most prevalent kind of diabetes is T2DM. It may be brought about by either an insulin secretory malfunction combined with insulin resistance or by relative insulin deficit and insulin resistance. It is mostly caused by elements like a sedentary lifestyle and bad eating habits that result in obesity and overweight[3]. Diabetes may result from an increase in fat tissue. The release of adipokines by adipose tissue, such as leptin, chemerin, resistin, and adiponectin, is affected by obesity or an increase in fat mass. It is hypothesized that this altered release of adipokines plays a role in the pathophysiology of diabetes linked with obesity. Increases in leptin levels have been linked to obesity, body mass index (BMI), and blood glucose levels in a number of populations[4-7]. In 1994, 167 amino acids in leptin were identified. It is a hormone that adipocytes release and has been shown to control food intake [8, 9]. Through central neuroendocrine pathways, leptin helps to regulate eating behavior [9]. It shares structural similarities with cytokines and possesses a functional intrachain disulphide bond [10]. White adipose tissues are the main producers of leptin, which is secreted as a 16 kilo Dalton [kDa] protein [10]. The levels of leptin mRNA and protein in adipose tissue positively correlate with this circulating leptin [10]. Leptin functions differently from ghrelin, a peptide that mostly comes from the stomach and increases hunger [11]. The ratio of ghrelin to leptin increases in direct proportion to an increase in appetite [12]. Leptin levels rise during sleep, according to clinical research. The current study's objective was to compare the blood leptin concentrations of type 2 diabetics with obesity to those of health individuals.

MATERIAL AND METHOD

Patient sample:

A total number of 90 (65 Type 2diabetic patients and 25 apparently normal subjects), (43male and 47 female) obtained from Al-kadhimain Teaching Hospital/ Baghdad – Iraq. In our study is a cross sectional investigation conducted from December 2021 to May 2022.

Study Design

In the current study, there were 65 patients with T2DM and their ages ranged from 40 to 63. All individuals had their demographic information, lipid profiles, and blood leptin levels analyzed. During the months of December 2021 and May 2022, samples were taken. Diabetes and Body Mass Index (BMI

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Volume-13, August 2022
ISSN: 2749-3644

Kg/m^2) were used to categorize obesity. According to BMI, there are three categories: underweight 19 (normal range: 19 to 24.9), overweight 25 to 29.9, and obese >30.

Using biochemical analysis:

By using a sandwich-based ELISA kit, leptin was quantified (Mybiosource, U.S.A). Fasting glucose level, cholesterol, and triglyceride levels in the serum were determined full-automatically. Clinical chemistry tester Micro lab 300.444

Analytical Statistics:

The current study's demographic and biochemical data were processed using Graph Pad Prism version 8.0.2. (San Diego, California, USA). To determine the mean, standard deviation (STD), and any differences that were statistically significant (P-value), between the two groups under study, the T-test unpaired was used. In the current study, Pearson's correlation coefficient was used to evaluate correlations between parameters. Statistics were judged significant at P≤0.05.

Result:

Results Table (1) displays the demographic information for the two groups under study (T2DM, and control). The mean age of control was 54±7.6 years and that of T2DM was 54.76±6.9 years (P=0.6983) whereas The BMI for control and T2DM was 30.48 ± 2.84 kg/m^2 and 32.65 ± 3.25 kg/m^2, correspondingly (p=0.4865).

Table 1. Statistical analysis of age, gender and BMI for the T2DM, and control groups

Variables	Control	T2DM	P-Value
Age(year)	54±7.6	54.76±6.9	0.6983
Gender(male\female)	10\20	20\40	__
BMI	30.48 ± 2.84	32.65 ± 3.25	0.4865

Totally values are displayed as mean±SD (Standard Deviation). S: p-value <0.05 (Significant),NS: p-value <0.05 (Non-Significant),HS: p-value <0.0001 (Highly Significant).

The results of the blood analysis are shown in Table (2) for the two groups. Data in table established that mean value of fasting blood sugar (169.8 ± 20.9 mg/dL) and triglyceride (151 ± 21.64 mg/dL) in type 2 obese diabetic was highly significant increased (P<0.0001) compared with mean value of fasting blood sugar (82.33 ± 9.04 mg/dL) and triglyceride (125.6 ± 25.51mg/dL) for controls .however, the level of total cholesterol (188.7 ± 25.97 mg/dL) and high-density lipoprotein cholesterol was adequate significant for T2DM compared to controls. Similarly, The plasma leptin levels was significantly higher in type 2 diabetic mellitus than in the control group.

Table 2. Clinical and laboratory parameters between the T2DM and control groups (Mean±SD).

Parameters	Control	T2DM	P-Value
Leptin(ng/ml)	4.05 ± 1.67	10.63±2.73	0.0001***
FBS (mg/dL)	82.33 ± 9.04	169.8 ± 20.9	0.0001***
TC (mg/dL)	171.5 ± 20.9	188.7 ± 25.97	0.0032**
TG (mg/dL)	125.6 ± 25.51	151 ± 21.64	0.0001***
HDL (mg/dL)	54.13 ± 10.67	45.52 ± 8.36	0.0039**

FBS- Fasting blood sugar, HDLc – high-density lipoprotein cholesterol, TC – total cholesterol, TG – triglyceride

We calculated the Pearson's correlation coefficient between the various research variables[13]. In the T2DM group, there were two significant relationships. leptin had moderate positive correlations with BMI(r=0.62, P=0.0035) while, it had weak negative correlation with HDLc (r=-0.564, P=0.009) as shown in table (3).

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Table 3.Pearson correlation analysis of leptin with other parameters in T2DM.

Parameter	Leptin	
	r	P-value
BMI	0.62	0.0035
FBS (mg/dL)	0.04	0.086
TC (mg/dL)	0.12	0.60
TG (mg/dL)	0.30	0.186
HDL (mg/dL)	-0.564	0.0009

DISCUSSION:

A protein hormone called leptin controls how much food is consumed. The adipocytes secrete this substance. The hormone tells the hypothalamus to release less food cravings, which in turn regulates appetite. In type 2 diabetes mellitus, which is closely related to obesity and insulin resistance, leptin levels are elevated. Leptin may be increased in both diabetes and obesity, although neither condition is brought on by leptin. Leptin may be a potential therapy for insulin resistance because it has been hypothesized that it mediates the condition[14].

Leptin resistance as well as a lack of leptin have an impact on obesity [15]. In both humans and animals, it has been demonstrated that leptin rises with obesity [15]. Elevated leptin levels in obese people are characterized as leptin resistance since leptin affects food intake and body weight [16]. In these situations, individuals are not sensitive to leptin's effects on appetite suppression [17].

By lowering the expression of pre-proinsulin mRNA in cells, leptin reduces the production of insulin. The main cause of type 2 diabetes is weight gain that causes insulin resistance[18]. People with T2DM who are overweight or obese experience a decline in leptin sensitivity that makes it difficult to feel full while having significant energy reserves. This eventually culminates in leptin resistance and an elevated amount of leptin in the body. Increased leptin is ineffective in preventing the onset of obesity[18].

Numerous populations have conducted substantial research on the relationship between leptin and BMI, with the main finding being a positive association between these two parameters [19].

According to a survey from Pakistan, leptin levels and body mass index are strongly correlated. In obese patients without type 2 diabetes mellitus, blood leptin levels were observed to be higher. With an increase in BMI, a gradual rise in serum leptin levels was seen. These findings concur with our findings. As a result, leptin levels is strongly correlated with overall adiposity, making this conclusion predicted [20].

In the study where blood leptin concentrations were examined in a group of individuals with moderate and severe obesity, leptin linked favorably with HDL cholesterol and adversely with triglycerides in the diabetes group. [21]

Our findings are in line with earlier research on the function of leptin in diabetes, while other studies have found lower or stable levels of leptin in T2DM [21] or diabetes [20, 21].

LIMITATIONS:

Because of the study's tiny sample size, conclusions cannot be generalized.

CONCLUSION:

Obesity, especially central obesity, is one of the most significant risk factors for T2DM and insulin resistance. According to our research, type 2 diabetes mellitus and plasma leptin have a beneficial relationship.

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Volume-13, August 2022
ISSN: 2749-3644

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