

A study of Leptin hormone concentration and several Physiological aspects in Women with Diabetes Mellitus Type 2 in the western Anbar regions

Omar Qahtan Yaseen*

Department of Heet Education, General Directorate of Education in Anbar, Ministry of Education, Hit, Anbar 31007, Iraq

دراسة لتركيز هرمون اللبتين وبعض الجوانب الفسيولوجية لدى النساء المصابات بداء السكري من النوع الثاني في مناطق غرب الأنبار

عمر قحطان ياسين*

دائرة تربية هيت، المديرية العامة لتربية الأنبار، وزارة التربية، هيت، الأنبار 31007، العراق.

*Corresponding author: omerkahtan@gmail.com

Received: July 30, 2026

Accepted: September 27, 2026

Published: October 26, 2026



Copyright: © 2026 by the authors. This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract

Diabetes is a multifaceted disease categorized through hyperglycemia subsequent from impaired insulin excretion, insulin act, or both. The observed diagnosis rates are considered a risk factor in the western Anbar region. Although the role of the hormone leptin is clear in obesity, its function remains a point of contention and ambiguity. Understanding the role of this hormone will contribute to the future management and treatment of diabetes. The study aims to determine or evaluate leptin status and some Physiological parameters in females with diabetes in the western Anbar region. The methodology is a case-control approach conducted on female patients with Diabetes type 2 diabetes in the western Anbar region. The data were obtained through direct interviews with the patients and chemical blood analyses of the study sample, which included thirty patients with Diabetes type 2 and thirty non diabetes women. When comparing the governor group and the patients across various measurements, significant differences were found in most measurements. Furthermore, Pearson's correlation analysis revealed that diabetes affects the function of various organs, particularly the kidneys. The results confirmed that leptin hormone levels and lipid profiles in diabetic patients were affected by the stress caused by high blood sugar levels.

Keywords: Diabetes, Leptin, lipid profiles, Pearson's, circulating hormone

الملخص

يُعد مرض السكري حالة مرضية متعددة الجوانب، تتسم بارتفاع مستوى السكر في الدم (فرط سكر الدم) الناتج عن خلل في إفراز الأنسولين، أو في عمله، أو في كليهما معاً. وتُعتبر معدلات التشخيص المسجلة في منطقة غرب الأنبار مؤشراً على وجود عامل خطر في تلك المنطقة. وعلى الرغم من وضوح دور هرمون "اللبتين" في حالات السمنة، إلا أن وظيفته لا تزال محل جدل وغموض؛ لذا فإن فهم دور هذا الهرمون سيساهم في تطوير استراتيجيات علاج وإدارة مرض السكري مستقبلاً. تهدف هذه الدراسة إلى تقييم مستويات هرمون اللبتين وبعض المؤشرات الفسيولوجية لدى الإناث المصابات بمرض السكري في منطقة غرب الأنبار. وقد اعتمدت الدراسة منهجية المقطع العرضي (cross-sectional study) على عينة من الإناث المصابات بمرض السكري من النوع الثاني في المنطقة المذكورة. جُمعت البيانات من خلال مقابلات مباشرة مع المريضات وإجراء تحاليل كيميائية للدم؛ حيث شملت عينة الدراسة ثلاثين مصابة بالسكري من النوع الثاني، وثلاثين امرأة غير مصابة

بالسكري. وعند مقارنة المجموعتين (المصابات وغير المصابات) عبر مختلف المقاييس، وُجدت فروق ذات دلالة إحصائية في معظمها. علاوة على ذلك، كشف تحليل الارتباط لـ "بيرسون" (Pearson's correlation analysis) أن مرض السكري يؤثر على وظائف أعضاء مختلفة في الجسم، لا سيما الكليتين. وأكدت النتائج أن مستويات هرمون اللبتين وملفات الدهون لدى المصابات بالسكري تتأثر بالضغط الفسيولوجي الناجم عن ارتفاع مستويات السكر في الدم.

الكلمات المفتاحية: داء السكري، اللبتين، مستويات الدهون، بيرسون، الهرمون الدائر.

Introduction

Diabetes is a Disease influenced by multiple factors, including environmental and genetic factors. It results from a malfunction in the pancreas's ability to produce insulin, or from impaired insulin activity itself, or both. There are two main types of diabetes: type 1 and type 2. Type 1 diabetes accounts for approximately 5-10% of global diabetes cases. This condition results from insufficient insulin secretion due to the destruction of beta cells in the pancreas, caused by a viral infection or an autoimmune disease. Type 2 diabetes is far more common, accounting for approximately 90% of diabetes cases [1]. Type 2 Diabetes mellitus may begin with insulin resistance. In this case, insulin is produced normally, but the defect lies in the receptors on the cell surface. As a result of the body's urgent need for insulin, pressure is placed on the pancreas, impairing its ability to function [2]. In type II diabetes, which results from insufficient insulin secretion or impaired insulin production, this leads to increased glucose production in the liver by halting glycogen synthesis and stimulating its breakdown and gluconeogenesis. This increase in hepatic glucose production results in a significant rise in blood glucose levels, especially during fasting [3].

In such conditions, an increase in lipolysis (the breakdown of fats from adipose tissue) may be observed, leading to elevated levels of free fats in the blood. This results in the production of ketones at high levels, a liver changes fat into fatty acids and ketone body, which the body uses as an energy source [4]. Furthermore, excess fatty acids in the serum of diabetic's patients are changed into phospholipids and cholesterol in the liver. A-long with the triglycerides produced in the liver, these phospholipids and cholesterol are released into the bloodstream as lipoproteins [5]. Leptin levels fluctuate over time, hence its medical name, circulating hormone. With a molecular weight of 16 kDa, leptin is primarily secreted in adipose tissue. This hormone regulates food intake through neuronal inhibition of Y (NPY), selectively increasing metabolic rates and fat metabolism [6]. Leptin levels in the blood are regulated by renal clearance [7], and insulin can also play a role in this regulation [8]. The association between Leptin, Obesity, and Diabetes is uncertain and controversial. But, there is a converse association between leptin secretion and Diabetes mellitus. Many researchers have demonstrated a decrease in leptin levels in individuals with type 2 diabetes [9-12].

Conversely, other researchers have found elevated leptin levels in individuals with type 2 Diabetes mellitus who also have diabetic neuropathy [13, 14]. It has recently become apparent that Diabetes mellitus is widespread in western Anbar, but there is a lack of diagnosis and reporting, with data being limited to biochemical information obtained through monitoring blood glucose levels at private clinics. The study was conducted to examine and evaluate Leptin levels and blood biochemical markers in women from western Anbar with type 2 diabetes. Since leptin levels differ between males and females, it is preferable to study each sex separately. Assessing leptin levels in conjunction with other indicators is useful in managing Diabetes mellitus.

Material and methods

study design

Thirty Blood sample was collected from female patients with Diabetes Type 2. Who had before been identified rendering to the current World Health Organization (WHO) diagnostic standards for Diabetic (WHO, 2006). Thirty Blood samples were also collected from healthy female, who helped as a control group.

Sampling

Blood samples were collected from 30 female patients with type 2 Diabetes mellitus and 30 healthy females in the control group. A venous blood sample (approximately 5 ml) was drawn from each individual in both groups (patients and control) after an overnight fast. The samples were placed in vacuum tubes and allowed to clot for a period of time without the use of anticoagulants. Serum samples were then collected by centrifugation at room temperature at 4000 rpm for 10 minutes. The blood samples were analyzed, and serum glucose, creatinine, urea, cholesterol, and triglyceride levels were measured.

Lipid profile

Lipid profile analyses included cholesterol, triglycerides, low-density lipoprotein (LDL) cholesterol, and high-density lipoprotein (HDL) cholesterol.

Serum Leptin

The concentration of leptin in human's serum was measured using competitive enzyme immunoassay (ELISA). The human leptin ELISA is a sandwich-type enzyme-amplified immunoassay. A set of human's leptin parameters was used to establish a reference standard.

Statistical analysis:

A SPSS program was used to compare two means for each of the study criteria at a probability level of 0.05.

Leptin correlation to lipid profile

shows the association between leptin level and blood lipid profile in the study participants by used Pearson's correlation test.

Results and discussion

Table1 indicates that the mean fasting blood glucose levels in patients were significantly higher than those in controls (189.6 ± 81.6 vs. 81.9 ± 14.2 , $p = 0.001$).

Table 1 Fasting Blood Glucose levels in diabetic patients and healthy individuals

Parameter	Controls mean	Diabetics mean	P-value
Glucose	81.9	189.6	0.05

As shown in the table 2, the means serum urea concentration was slight lower in diabetic patients compared to the control group, with a difference of 22.9 ± 7.8 vs. 22.1 ± 7.9 . This difference was not statistically significant ($p=0.001$). In contrast, serum creatinine concentration was slightly higher in diabetic patients compared to the control group (1.443 vs. 0.899). This difference was also not statistically significant ($p=0.001$).

Table 2: Serum Urea and Creatinine

Parameter (mg/dl)	Controls mean	Diabetics mean	P-value
Urea	22.9	22.1	0.05
Creatinine	0.899	1.443	0.05

Lipid profile analyses included cholesterol, triglycerides, low-density lipoprotein (LDL) cholesterol, and high-density lipoprotein (HDL) cholesterol. As shown in Table 3, mean blood levels of cholesterol, triglycerides, and LDL cholesterol were significantly higher in diabetic patients (214.3 mg/dL, 201.733 mg/dL, and 108.733 mg/dL, respectively) compared to the control group (160.5 mg/dL, 85.6 mg/dL, and 103.533 mg/dL, respectively), with a $p > 0.05, 0.001$ in all cases. In contrast, HDL cholesterol level was significantly lower in Diabetic patients compared to the control group (48.7 mg/dL vs. 49.833 mg/dL, $p > 0.05$).

Table 3: Serum of lipid profile

Parameter	Controls mean $\pm$ SD	Diabetics mean $\pm$ SD	P>value
Cholesterol	160.5 ± 26.1	214.3 ± 42.6	0.05
Triglycerides	85.6 ± 1.87	201.733 ± 22.74	0.05
LDL	103.533 ± 5.20	108.733 ± 5.97	0.05
HDL	49.833 ± 1.84	48.7 ± 2.84	0.05

Table 4 displays the Mean Serum Leptin levels in healthy individuals and Diabetic patients. A major decrease in Mean Leptin levels was observed in diabetic patients compared to healthy individuals (7.847 ng/ml vs. 24.233 ng/ml, $p > 0.001$).

Table 4: Serum Leptin in the study

Parameter	Controls mean	Diabetics mean
Leptin	24.233	7.847

The relationship between leptin and blood glucose levels is shown in Table 5. As glucose levels rise, leptin levels decrease, as demonstrated by Pearson's correlation test. The inverse relationship was statistically significant, confirming the unassociation between diabetes and leptin ($r = -0.161$, $p > 0.05$).

Table 5. The relation between Leptin and Glucose level

Leptin		
	Pearson correlation (r)	P>value
Glucose	-0.161	0.05

Table 6 shows the association between leptin level and blood lipid profile in the study participants. Pearson's correlation test showed that lower leptin levels were associated with higher levels of cholesterol, triglycerides, and low-density lipoprotein (LDL) cholesterol. This inverse relationship was statistically important for triglycerides ($r = -0.099$, $p > 0.001$), but not for cholesterol and LDL cholesterol ($r = -0.110$, $p = 0.001$ and -0.253 , $p = 0.001$, respectively). In contrast, a positive relationship was found between leptin levels and high-density lipoprotein cholesterol (HDL-C), and this relationship was statistically important ($r = 0.130$, $p > 0.001$).

Table 6: The relationship between leptin and lipid profile.

Lipid Profile (mg/dl)	Leptin	
	Pearson correlation (r)	P>value
Cholesterol	-0.110	0.001
Triglycerides	-0.099	0.001

Discussion

Females were tested and compared to a control group in order to measure leptin levels, contributory risk factors, and some Physiological aspects of diabetes Type 2. The management and control of diabetes will surely be aided by understanding the role of leptin in the condition as well as by recognizing danger aspects and metabolic abnormalities. Despite taking medication, the blood glucose levels of the diabetic patients were considerably higher than those in the control group. This can be partially explained by the fact that almost one-third of the individuals with diabetes did not follow their diet. Moreover, they might not have followed their prescription schedule. It has been discovered that a diet heavy in fat raises the risk of type 2 diabetes [15]. Zakout (2006) found that half of the participants in a prior study evaluating non-adherence among 216 type 2 diabetes patients at GS did not follow their prescribed medication schedule, and three-quarters of the subjects had poor glycemic control. Patients frequently gave the following explanations: forgetfulness, frustration, feeling better without therapy, taking several medications, fear of negative effects, and prescription unavailability.

Serum urea and creatinine concentrations in diabetes patients did not substantially differ from those in the control group, as indicated by the results. While creatinine is a byproduct that is often filtered from the blood and eliminated in the urine, urea is formed in the liver as a last product of protein breakdown. Changes in the levels of creatinine and urea, two markers of renal function, indicate kidney disease [16]. Conflicting results may arise because it has been challenging to identify when these increases in urea and creatinine concentrations began [17]. Because creatinine levels vary very little, it is important to closely monitor them in order to evaluate renal function.

According to the current findings, diabetes patients had significantly Higher level of triglycerides, low-density lipoprotein cholesterol (LDL-C), and total cholesterol than the control group. On the other hand, diabetic patients showed a significant drop in high-density lipoprotein cholesterol (HDL-C) levels. Patients with diabetes are known to have higher levels of LDL-C, triglycerides, and cholesterol [17,18]. Since insulin inhibit the hormone-sensitive (lipase enzyme), the enhanced release of free fatty acids from fat reserves is the main cause of the abnormal increase in blood lipid concentration in diabetes individuals. The liver transforms excess fatty acids in diabetic patients' serum into triglycerides, phospholipids, and cholesterol. These three compounds can be delivered into the bloodstream as lipoproteins, along with protein [19]. Diabetic nephropathy can result from the deterioration of renal function caused by the advancement of diabetes. The kidneys are unable to eliminate leptin from the plasma due to this disease. This could account for the higher leptin levels seen in people with diabetic nephropathy, which could account for the discrepancy between these results and our research [20].

Leptin and triglyceride or HDL cholesterol levels were discovered to be significantly correlated negatively in this investigation. This result is in line with earlier research showing that patients with type 2 diabetes had lower HDL

cholesterol, greater triglyceride, and lower leptin levels than the control group. Other investigations produced similar findings [21,22]. This indicates that the kidneys were still capable of eliminating leptin from the patients' blood, as was previously mentioned, and that the popular of patients did non-exhibit altered kidney function that correlated with stable serum creatinine concentrations.

Conclusion

These results suggest that "type 2 diabetes patients do not necessarily exhibit elevated leptin levels." This is relevant to the early phases of the illness. It's possible that when diabetes worsens, higher leptin levels are frequently seen because kidney function—which is in charge of removing leptin—is usually compromised.

References

- [1] AHMED, Esra Ahmed Mohamed. Association of Vitamin D and Glycemic Control in Type2 Diabetes Mellitus in Khartoum state. 202). PhD Thesis. Al-Neelain University.
- [2] KIM, Doo Kyung; LEE, Jaemin. Physiological function of insulin-like peptides in insects. Korean journal of applied entomology, (2022), 61.1: 85-90.
- [3] FAHED, Gracia, et al. Metabolic syndrome: updates on pathophysiology and management in 2021. International journal of molecular sciences, (2022), 23.2: 786.
- [4] CASADO, María E., et al. Changes in lipid metabolism enzymes in rat epididymal fat after chronic central leptin infusion are related to alterations in inflammation and insulin signaling. International Journal of Molecular Sciences, (2023), 24.8: 7065.
- [5] GUO, Lifei, et al. Metabolites-mediated posttranslational modifications in cardiac metabolic remodeling: implications for disease pathology and therapeutic potential. Metabolism, (2025), 165: 156144.
- [6] IYER, Dhanya R., et al. Chromogranin A and its derived peptides: potential regulators of cholesterol homeostasis. Cellular and Molecular Life Sciences, (2023), 80.9: 271.
- [7] HABIB, Dawoud Fakhry, et al. The role of liver in leptin metabolism in experimental nephrotic syndrome. EXCLI journal, (2011), 10: 322.
- [8] LAFERRÈRE, Blandine, et al. Inhibiting endogenous cortisol blunts the meal-entrained rise in serum leptin. The Journal of Clinical Endocrinology & Metabolism, (2006), 91.6: 2232-2238.
- [9] EBENIBO, Sotonte, et al. Basal and dynamic leptin secretion: association with cardiometabolic risk and body weight trajectories in African-Americans and European-Americans. Frontiers in endocrinology, (2018), 9: 12.
- [10] HERNÁNDEZ-DÍAZ, Yazmín, et al. Increased leptin levels in plasma and serum in patients with metabolic disorders: a systematic review and meta-analysis. International Journal of Molecular Sciences, (2024), 25.23: 12668.
- [11] Al-Dallal, Reem, et al. "The Association of Resistin with Metabolic Health and Obesity in a Mexican-American Population." International journal of molecular sciences 26.9 (2025): 4443.
- [12] Wadivkar, Pradnyashree, et al. "Undernutrition-associated diabetes mellitus: pathophysiology of a global problem." Physiology 40.5 (2025): 441-453.
- [13] Kakey, Esmail S., and Shahan S. Hussien. "Some Cardiac Marker Levels and Cytokines in Diabetic Patients." 2018 International Conference on Pure and Applied Science. 2018.
- [14] Abderahman, Nahla Ahmed Mohammed, and Mohammed Ahmed Ibrahim Ahmed. "Leptin Level in Patients with Type 2 Diabetes as a Risk Factor for Cardiovascular Disease." Mathews Journal of Diabetes & Obesity 6.1 (2023): 1-14.
- [15] Sergi, Domenico, et al. "HOMA-IR and TyG index differ for their relationship with dietary, anthropometric, inflammatory factors and capacity to predict cardiovascular risk." Diabetes Research and Clinical Practice 222 (2025): 112103.
- [16] Elwy, Abd El-Hamid Mohamed, Ibrahim El-Agousa, and Ahmed E. Azzazy. "Taurine as a Drug for Protection of Liver and Kidney against Toxicity of Dinitrotoluene on Male Rats (Applicable Study)." International Journal of Pharmaceutical Research & Allied Sciences 8.1 (2019).
- [17] Jin, Qi, et al. "Oxidative stress and inflammation in diabetic nephropathy: role of polyphenols." Frontiers in immunology 14 (2023): 1185317.
- [18] Christoffersen, Berit Østergaard, et al. "Functional and morphological renal changes in a Göttingen minipig model of obesity-related and diabetic nephropathy." Scientific Reports 13.1 (2023): 6017.
- [19] Polo-Barranco, Alberto, et al. "Diabetes Mellitus and Lipoprotein (a): A Determinant Interaction in Micro- and Macrovascular Damage." International Journal of Molecular Sciences 26.23 (2025): 11427.

- [20] Romejko, Katarzyna, et al. "Relationships between sclerostin, leptin and metabolic parameters in non-dialysis chronic kidney disease males." *Journal of Personalized Medicine* 13.1 (2022): 31.
- [21] Al-Harithy, Rowyda N., and Amani S. Alomari. "Expression of leptin mRNA as non-invasive biomarker in type 2 diabetes mellitus." *International Journal of Clinical Practice* 75.12 (2021): e14844.
- [22] Moonishaa, Thiyagarajan Manjuladevi, et al. "Evaluation of leptin as a marker of insulin resistance in type 2 diabetes mellitus." *International journal of applied and basic medical research* 7.3 (2017): 176-180.
- [23] Saar-Kovrov, V., et al. "Reduction of protein-bound uraemic toxins in plasma of chronic renal failure patients: a systematic review." *Journal of Internal Medicine* 290.3 (2021): 499-526.

Disclaimer/Publisher's Note: The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of **JSMD** and/or the editor(s). **JSMD** and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.