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Evaluation of ghrelin concentration and some biological variables in patients with type II diabetes

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Abstract:

Diabetes is one of the widespread chronic diseases in the world, and one of the main health problems in most countries of the world includes this disease includes a group of different metabolic disorders (carbohydrates, proteins, fats), the most important of which is a chronic rise in the level of glucose in the blood. A biochemical study was conducted to investigate the effectiveness of the germin hormone in 90 blood serum samples, 60 of which were for patients with type II diabetes collected from Tarmiya General Hospital, Health Center and a group of public laboratories in Baghdad Governorate, and 30 samples were collected for healthy people as a control group.

A number of biochemical variables were measured in serum for the groups under study, including ghrelin, cumulative blood sugar, random sugar, fasting sugar and insulin.

The results of this study showed a significant increase at the level of probability ($P \leq 0.05$) in the level of ghrelin hormone (female), cumulative blood sugar, random sugar, fasting sugar and insulin. The results did not show significant differences at the level of probability ($P \leq 0.05$) in the level of ghrelin hormone (male) in the blood serums of people with type II diabetes compared to healthy people.

Keywords : ghrelin, cumulative blood sugar, blood sugar (fasting, random), insulin hormone .

تقييم تركيز الكرلين وبعض المتغيرات البيولوجية في مرضى السكري من النوع الثاني

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المستخلص :

مرض السكري هو أحد الأمراض المزمنة المنتشرة في العالم ، ومن المشاكل الصحية الرئيسية في معظم دول العالم يشمل هذا المرض مجموعة من الاضطرابات الأيضية المختلفة (الكربوهيدرات ، البروتينات ، الدهون) ، وأهمها الارتفاع المزمن في مستوى الجلوكوز في الدم . أجريت دراسة كيميائية حيوية للتحقق من فعالية هرمون الجرمين في 90 عينة مصل الدم ، 60 منها لمرضى السكري من النوع الثاني تم جمعها من مستشفى الطارمية العام والمركز الصحي ومجموعة من المختبرات العامة في محافظة بغداد ، وتم جمع 30 عينة للأشخاص الأصحاء كمجموعة ضابطة. تم قياس عدد من المتغيرات البيوكيميائية في مصل الدم للمجموعات قيد الدراسة ، بما في ذلك الكرلين وسكر الدم التراكمي والسكر العشوائي والسكر الصائم والأنسولين.

أظهرت نتائج هذه الدراسة ارتفاعاً معنوياً عند مستوى الاحتمال ($P \leq 0.05$) في مستوى هرمون الجريلين (الأنثوي) وسكر الدم التراكمي والسكر العشوائي والسكر الصائم والأنسولين. لم تظهر النتائج فروق ذات دلالة إحصائية عند مستوى الاحتمال ($P \leq 0.05$) في مستوى هرمون الجريلين (الذكور) في مصل الدم لدى المصابين بداء السكري من النوع الثاني مقارنة بالأشخاص الأصحاء.

الكلمات المفتاحية : الكرلين ، سكر الدم التراكمي ، سكر الدم (صيام ، عشوائي) ، هرمون الأنسولين .

Introduction

Diabetes Mellitus is defined as a group of metabolic disorders that lead to a long-term rise in blood glucose concentration Hyperglycemia, with an estimated number of more than 120 million people in the world(1). The patient shows slow consumption of glucose and then leads to an increase in its concentration in the blood. The kidneys excrete part of the excess sugar in the urine. Diabetes occurs for several reasons, either because of the lack of secretion of the hormone Insulin by the pancreas or the lack of response of the body's cells to the insulin produced correctly (2). There are also factors that contribute to diabetes, including age, gender, obesity, genetics, lack of physical activity, exposure to chemicals, type of food, psychological state and many other reasons (3). Diabetes mellitus exists in several types, the most important of which are the first type and the second type: as the first type of insulin-dependent diabetes mellitus (IDDM), which is the most important and dangerous and is called juvenile diabetes It occurs mostly for children and young people and the main reason for this type is the lack of insulin secretion or lack of it in the body and usually occurs due to the destruction of the immune system of beta cells producing insulin by mistake, and this type of disease is treated by taking the hormone insulin in the form of injections (4). As for the second type of diabetes, which is non-insulin dependent Diabetes Mellitus (NIDDM), which usually affects the elderly over the age of 40 years, where this type represents a global health problem that has been spreading and the incidence of this type of diabetes is closely related to obesity, inactivity, lack of movement and unhealthy diet, and high levels of fat weaken the function of pancreatic beta cells secreting the hormone insulin and associated with insulin resistance, which leads to hyperglycemia Blood (5). There are other types of diabetes, but they are less prevalent, such as gestational diabetes(6).

Ghrelin hormone is a multifaceted bowel hormone that activates its receptor (growth hormone secretion receptor) (GHS-R), the receptor of growth hormone secretion, which is a peptide consisting of 28 amino acids produced by the stomach in the blood plasma, the hormone curlin is a metabolic hormone that stimulates appetite and regulates

energy expenditure to a large extent through its effect on growth hormone secretion receptors in addition to its stimulating effects on growth hormone secretion, food intake and fat deposition (7). The hormone ghrelin also regulates glucose balance by inhibiting insulin secretion and regulating glucogenesis. Gerlin improves the survival prognosis of myocardial infarction by reducing sympathetic nerve activity, gerlin prevents muscle atrophy by stimulating muscle differentiation and fusion. The Kremlin regulates bone formation and metabolism by modulating the proliferation and differentiation of osteoblasts (8). Gerlin signaling also plays important roles in glucose and energy balance, heart protection, muscle atrophy and bone metabolism. These multifaceted roles make ghrelin and GHS-R highly attractive targets for drug development, gerlin simulators can be used to treat heart disease, muscle failure and osteoporosis, and GHS-R antagonists can be used to treat obesity and insulin resistance(9) .

Samples of study

The study included (90) samples (60) of people with diabetes - type II and those with obesity and (30) healthy people (control group) from Tarmiya General Hospital, health centers and a group of public laboratories in Baghdad Governorate for the period from October 2022 to January of the year 2023, and the ages of infected people range from 35-70 years and healthy people from 35-70 years, Patients were diagnosed by specialists in Tarmiya General Hospital, health centers and public laboratories, and a special questionnaire was organized in which information was collected on patients with type II diabetes associated with obesity and healthy people. Samples were collected from all subjects by drawing blood from a vein in the arm or elbow with a wine plastic syringe .

Estimating the level of ghrelin hormone

The ghrelin hormone was estimated using ELISA technique and is done by an enzyme-linked immunoassay test (ELISA) and then measuring absorption at 450 nm, using a ready-made kit for the German company Human origin(10).

Measuring the hormone insulin

The concentration of insulin in the blood serum was estimated using the

diagnostic kit prepared by the processing company and this analysis is based on direct (non-competitive) enzymatic immunotechnology. Using the ELISA device, the optical density (O.D) is determined at the wavelength 450 nm(11).

Estimation of cumulative blood sugar (HbA1c)

In this method, the hydrolyzed blood is mixed with a weakly binding positive ionic resin and the glycated hemoglobin concentration is measured at a wavelength of 415nm(12.13).

Determination of blood glucose (fasting and random)

Serum glucose concentration was estimated by Enzymatic calorimetric method (14) using Kit ready-made kit The absorbance of the models and the standard solution is read at a wavelength of 500 nm in the spectrophotometer (Mindray Ba88a).

Statistical analysis

The results were analyzed statistically by applying the statistical program Minitab (VER/17) and using the F (ANOVA) test, and the arithmetic averages were compared to determine the differences using the Dunkin' polynomial test with a probability level of 0.05 p≥ and 0.01p≥(15)(15).

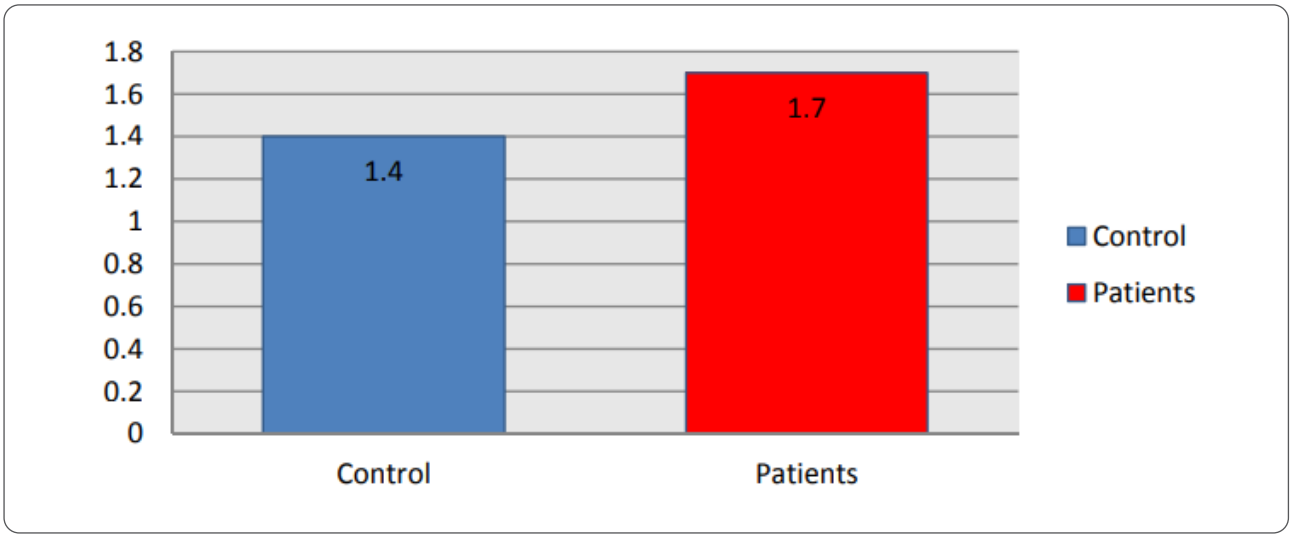
Results and discussion

The results of this study showed a significant increase in the level of probability (P≤0.05) in the level of the hormone insulin, cumulative blood sugar, blood sugar (fasting, random). The results did not show statistically significant differences at the probability level (P≤0.05) in the level of ghrelin hormone in the blood serum of people with type II diabetes compared to healthy people, as shown in Table (1).

Parameters	Control	Patients	P-Value
Ghrelin ng/ml	0.477 ± 1.42	0.66 ± 1.7	0.05 <
Insulin µIU/ml	1.09 ± 5.16	2.06 ± 8.92	05 .0 >
HBA1C mg/dl	0.32 ± 5.003	1.67 ± 8.29	05 .0 >
(RBS (mg/dl	10.41 ± 93.7	60.41 ± 218.28	05 .0 >
(FBS(mg/dl	6.79 ± 79.63	±46.48 163.9	05 .0 >

The level of ghrelin hormone in the serums of healthy people and patients with type II diabetes

Table (1) shows the mean ± standard deviation of ghrelin hormone in the control group was (1.42 ± 0.477) ng/ml while the mean standard deviation ± in the group of patients with type II diabetes was (1.7 ± 0.66) ng/ml .The above results showed that there was no significant difference in the level of ghrelin hormone at the probability level ($P \leq 0.05$) in the serums of patients with type II diabetes compared to healthy people as shown in Figure (1).



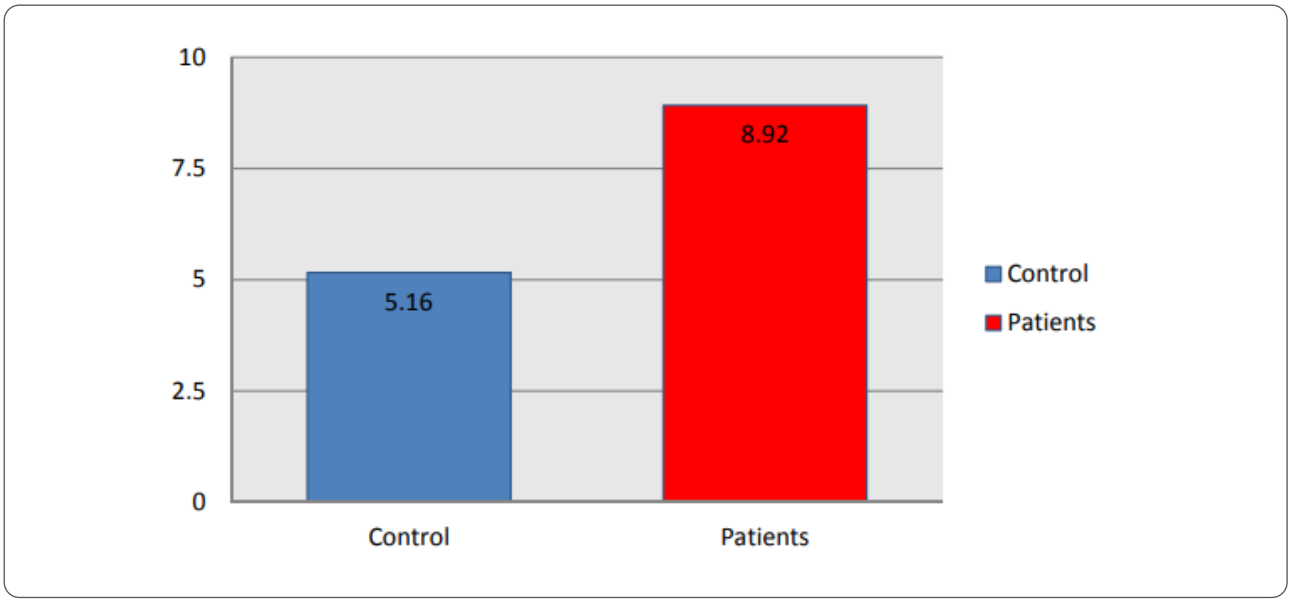
These findings are consistent with those conducted by researchers (Nadida A. Gohar & Dina F. Elgayar & Ayat I. Hassan & Samar H. Aboulsoud & Mona A. Hegazy) where the aim of the study is to solve the dialectical relationship between the level of gerlin and the polymorphism of the gerlin gene (Met72Leu) with obesity and type II diabetes. They have a normal BMI and 40 non-diabetic participants who are identical in age divided into two groups (20 people with a normal body mass index (BMI) and 20 obese). All participants underwent a complete medical history, examinations and anthropometrics, In vitro investigations involving complete lipid profile, plasma fasting glucose, cumulative glycated hemoglobin, fasting serum insulin and IR-HOMA were calculated and ghrelin level in fasting plasma was determined using ELISA method and Met72Leul polymorphism was examined for gerlin gene using RFLP-PCR. The median level of fasting gerlin plasma was higher in the

diabetic group compared to the non-diabetic group. P = (0.157), however, a decrease in the average level of ghrlin in fasting plasma was reported in the obesity group compared to those with a normal BMI, but no statistical significance P = (0.289) . In this study, the number of forms Met72Leu was present in 13% of diabetics, 20% of non-diabetics with normal BMI, and in 30% of obese participants without diabetes. No statistically significant association was found between ghrelin level and Met72Leu polymorphism in the preprogrelin gene with obesity or type II diabetes. The exact role of ghrelin in metabolic disorders is still debated. Met72Leu polymorphism of the gerlin gene has been associated with higher body mass index (BMI) in middle-aged Japanese (2006al et Kuzuya), studies in other populations have not been able to confirm this finding (Larsen et al. 2005 and Mager et al. 2006). Data on the association between the Met72Leu variant of the gerlin gene with type II diabetes were conflicting. Some studies have found that Met72Leu increases the risk of type II diabetes in people with impaired glucose tolerance. Mager et al. 2006 However others reported that Met72Leu polymorphism was associated with protection against insulin resistance. Zavarella et al. 2008 Furthermore, other studies have not supported an association between Met72Leu polymorphism and type II diabetes (Choi et al. 2006 and Berthold et al. 2009) (16). The researcher (Ayat Najib Kamal) also indicated in her research, which aims to study the evaluation of serum levels of the hormones gerlin and opstatin in obese children compared to non-obese children. : The mean age of obese children in our study was 9.28 years ± SD 1.66 which showed no statistically significant difference from the control group (8.81 ± 1.74 years) (P = 0.210). The obesity group had significantly higher mean weight values (52.69 ± 11.46 kg versus 26.36 ± 5.34 kg) compared to children of normal weight (P = 0.000). The result of ghrelin hormone, obese children had low serum levels of fasting ghrelin (1167.37 ± 148.25 ng/L) and opstatin (390.72 ± 98.49 ng/L) of the control group (1628.10± 154.40 and 462.72 ± 109.40 respectively) where the levels of the hormones ghrelin and Opstatin is lower than healthy children and this may indicate an adaptive process between these peptides that may reduce food intake in obese people, and sig-

nificantly lower levels of ghrelin and opstatin in obese children compared to healthy children may reveal a possible physiological adaptation aimed at energy balance in these children (17).

The level of the hormone insulin in the serums of healthy people and patients with type II diabetes

Table (1) shows the mean ± standard deviation of the hormone insulin in the control group was (5.16 ± 1.09) µIU/ml while the mean ± standard deviation in the group of patients with type II diabetes was (8.92 ± 2.06) µIU/ml. The above results indicate that the level of the hormone insulin shows a significant increase at the level of probability ($P \leq 0.05$) in the serums of patients with type II diabetes compared to the control group as shown in Figure (2).

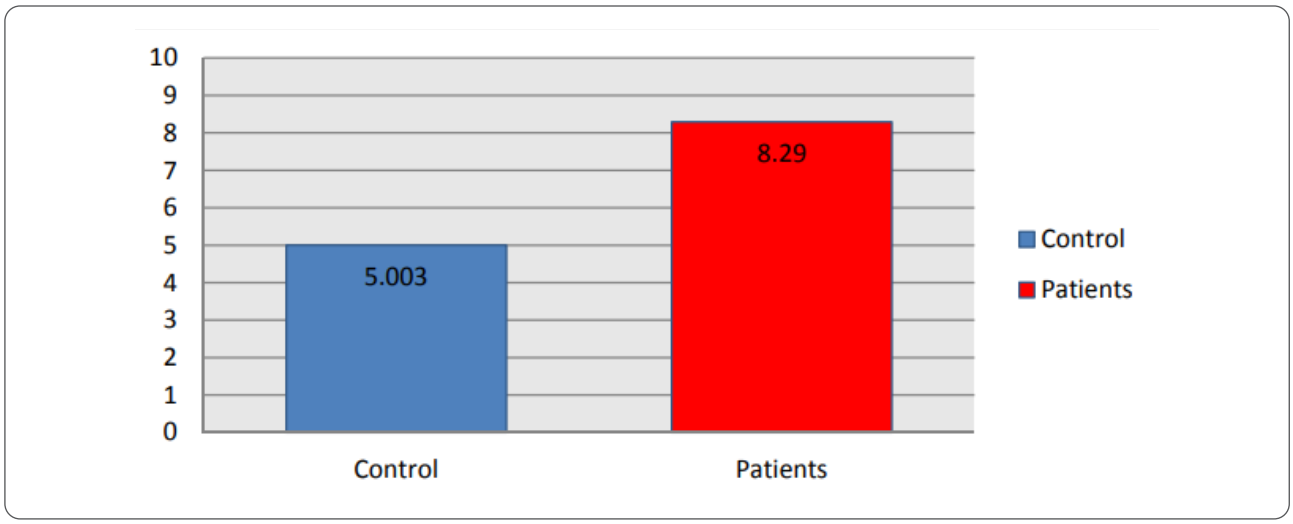


The results of this study are consistent with the findings of the researcher (Ozougwu), who showed that the cause of the high level of the hormone insulin is the increase in the accumulation of fat in the muscles, so the resistance of cells to insulin increases, which leads to an increase in its concentrations (18). Insulin resistance is one of the main reasons for the high level of insulin, as the body needs to increase its secretion to reduce the level of glucose, and some people produce quantities of insulin 2-3 times more than normal people produce as an attempt to reduce glucose in the blood, and this condition is called "hyperinsulinemia", After years of the body's success in producing sufficient amounts of insulin to overcome its resistance, beta cells

reach a state of fatigue, so the amount of insulin begins to decrease, and in return blood glucose levels begin to rise, and this condition is considered the beginning of type II diabetes (19). This condition is characterized by a weak ability of insulin to inhibit the production of glucose from the liver and enhance its absorption in the muscles and thus reduce the effectiveness of insulin and be more harmful in its metabolic processes (20), and unlike the study (Kohei), who found through his study conducted that the hormone insulin decreases in patients with type II diabetes as a result of high glucose and fat, which negatively affects the pancreatic beta cells as they begin to gradually deteriorate and thus reduce the secretion of insulin (21).

Cumulative blood sugar level in healthy serums and patients with type II diabetes

Table (1) shows the mean ± of the standard deviation of cumulative blood sugar in the control group was (0.32 ± 5.003) mg/dl, while the mean standard deviation ± in the group of patients with type II diabetes was (1.67 ± 8.29) mg/dl. The above results indicate that the cumulative blood sugar level shows a significant increase at the level of probability (P≤ 0.05) in the serum of patients with type II diabetes compared to the control group as shown in Figure (3).

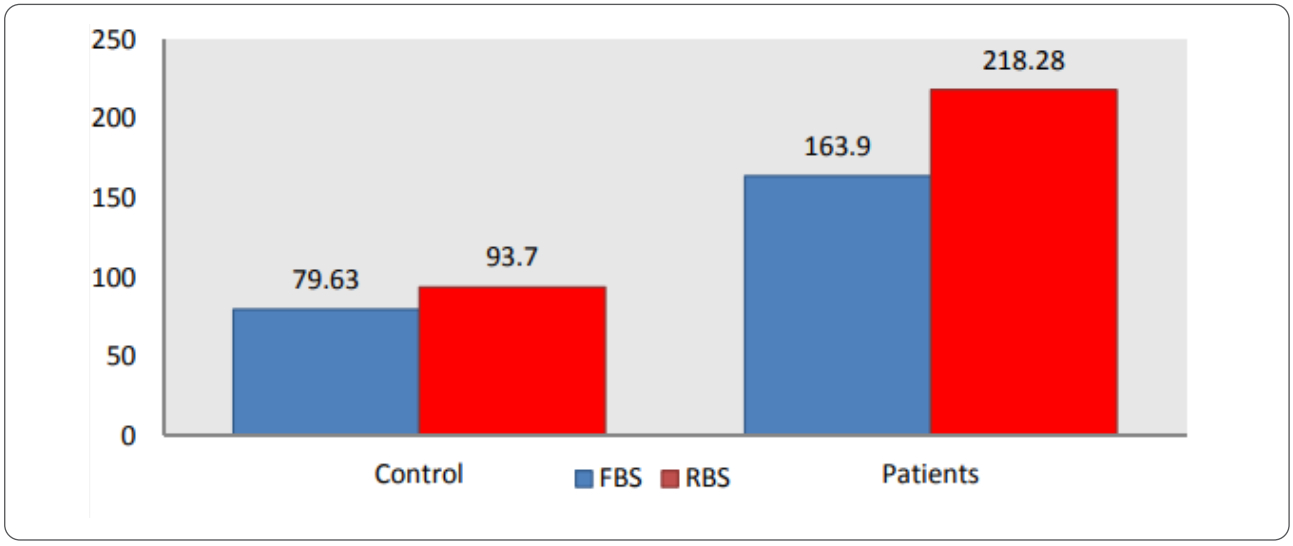


The (HbA1c) examination is an accurate picture of the extent of the condition of the person with diabetes, because (HbA1c) is present in red blood cells, which are about four months old, so this examination gives a picture of the person's condition during three months, while checking the level of

glucose is variable according to the person's daily food and medicine intake. The relationship between the levels of (HbA1c) formed and diabetes is a close relationship depends on the concentration of glucose that red blood cells are exposed to during the duration of their presence in the bloodstream that leads to its association with the hemoglobin molecule, and therefore measuring the level of (HbA1c) is the most proven evidence of the level of glucose concentration in the blood during the past three months (22). This result, which was extracted in this research, indicates a high moral difference between healthy and sick people and is consistent with what the researcher (Esraa Raouf 2005) (23) stated in her study of diabetes, as well as agrees with the researcher (24) (khursheed, 2018).

Glucose level in healthy serums and patients with type II diabetes

Table (1) shows the average ± standard deviation of fasting glucose in the control group where it was (79.63 ± 6.79) mg/dl, while the mean standard deviation ± in the group of patients with type II diabetes was (163.9 ±46.48) mg/dl, while random glucose was at the control group where it was (93.7 ± 10.41) mg/dl, while the mean standard deviation ± in the group of patients with type II diabetes was (218.28 ± 60.41) mg/dl. The above results indicate that the glucose level shows a significant increase at the probability level ($P \leq 0.05$) in serum of patients with type II diabetes compared to the control group as shown in Figure (4) .



These results coincided with the findings of both researchers (Solis-Herrera) and (Janaka) they pointed to the high concentration of glucose in

the blood in patients with type II diabetes and the reason for this is due to the increased resistance of cell receptors to the hormone insulin, which leads to a decrease in the ability of insulin to carry glucose into the cells, so the latter remains accumulated in the blood (25). Another study indicated that the rise occurs as a result of the link between the lack of insulin secretion by beta cells in the pancreas and the resistance of the target cells to insulin and this resistance occurs due to the low sensitivity of these tissues to him, including the liver, adipose tissue and muscle cells (26), the most important characteristic of type II diabetes is its association with various metabolic disorders such as dyslipidemia and obesity, which increases the risk of cardiovascular disease as these symptoms are associated with resistance Insulin collectively leads to the formation of the so-called metabolic syndrome (27). The function of insulin is to reduce the level of glucose in the blood, as it works to facilitate the process of penetrating glucose molecules into the cells to be burned and generate energy from them, and for unspecified reasons, the pancreas stops completely or partially from producing insulin, which leads to the accumulation of glucose in the blood without combustion, forcing the liver to burn its store of glucose to provide the body with energy and this combustion process extends to tissues and muscle cells and fats deposited under the skin, This may lead to weight loss as a result of loss of muscle and fat mass (28). The high level of glucose in the blood beyond the limit that exceeds the ability of the kidneys to reabsorb leads to the excretion of amounts of glucose with urine and this condition is called glucosuria, which causes osmotic disorder any loss of large amounts of water in the urine and this leads to dehydration and eating large amounts of water (Polydipsia), and the loss of water is accompanied by the loss of a number of ions (29).

Conclusions

1- High effectiveness of ghrelin hormone in patients with type II diabetes compared to the control group.
2- High levels of glucose, insulin hormone and glycated hemoglobin in patients with type II diabetes compared to the control group.

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