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Relation Between Visfatin, Body Mass Index with Insulin Resistance in Type 2 Diabetic Iraqi Patients

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Abstract

Background: Insulin resistance, obesity, sedentary lifestyle and type of food are considered to be a causative agent for predisposing of T2DM.

Aim: To investigate the correlation between insulin resistance with BMI and the effect of Visfatin in this interaction (T2DM).

Method: This project has two groups, a control healthy group consist of 200 volunteers and a second group of 200 T2DM patients who were documented according to WHO criteria. HOMA-IR, FBG and BMI were measured.

Results: A significant relationship between T2DM and IR was observed, additionally to a significant relationship between visfatin level and blood glucose level.

Conclusion: T2DM is associated with insulin resistance which has many predisposing factors like obesity, sedentary lifestyle and type of food style, visfatin is an adipokine with an insulin-mimetic action that tends to increase insulin sensitivity and reduces blood glucose level and this clarifies the elevated level of Visfatin in such T2DM.

keywords: Insulin resistance, T2DM, Visfatin

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Introduction:

IR means that ordinary quantities of insulin are not giving the normal response, (i.e. does not the use of insulin by cells is not enough to decrease triglyceride and glucose concentration (1). IR is a mixture of factor effects for lifestyle (reduced physical activity, diet) and genetic (2). T2DM is a disease with characteristic features of hyperglycemia, resulted from the abolished response for insulin receptors to circulating insulin which is normally known as insulin resistance (IR) (3).

Obese patients have a higher BMI, due to fat accumulation. Visfatin is adipokine discovered by Fukuhara *et al*. in 2005 with an insulin mimetic action secreted from fatty adipose tissue in response to increased glucose level (4).

Action of Visfatin in glucose metabolism: human studies outcomes state that visfatin levels elevated after giving glucose (5). Despite its lower concentration in blood compared to insulin (6). Additionally, patients with T2DM have a higher concentration of Visfatin than normal

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persons (7,8,9). There are reports of increased Visfatin plasma concentrations in gestational, type 1 or type 2 diabetes (5,7). Glucose administration to adipocytes (*In vitro*) produces an increase in Visfatin adipocyte secretion (10), also mice with no Visfatin have an impaired test for tolerance of glucose (11).

So, this project was done to investigate the relation between circulating visfatin level and insulin resistance in T2DM in Iraqi population.

Materials and methods:

After taking the approval from the committee (ethical) in the faculty of medicine/ Kufa University, the project was done in the biochemistry laboratory in the mentioned college. The samples were collected from the Diabetic center in Al-Sader Teaching hospital from October 2016 to January 2017.

Visfatin blood level was estimated by ELISA, blood glucose level was estimated by enzymatic methods. IR was determined by Homeostasis model assessment (HOMA) via equation as follow:

HOMA={glucose (in mole/L) × insulin (in microU/mL)}/22.5 .

Table 2.1: Chemicals used in this study with their suppliers.

No.	Chemicals	Source
1	Visfatin human EIA kit of 96 wells	Raybiotech,Inc. (USA)
2	Glucose kit	Plasmatic , France

2.3. Apparatus and equipments

Table 2.2 : Apparatus used in this study with their suppliers .

No.	Apparatus	Company and country
1	ELISA system	Bio-tech instruments.Inc. USA
2	Centrifuge	Hettich EBA 20 Germany
3	UV-VIS Spectrophotometer	APLE PD-303 UV Japan
4	Water bath	Memmert -Japan

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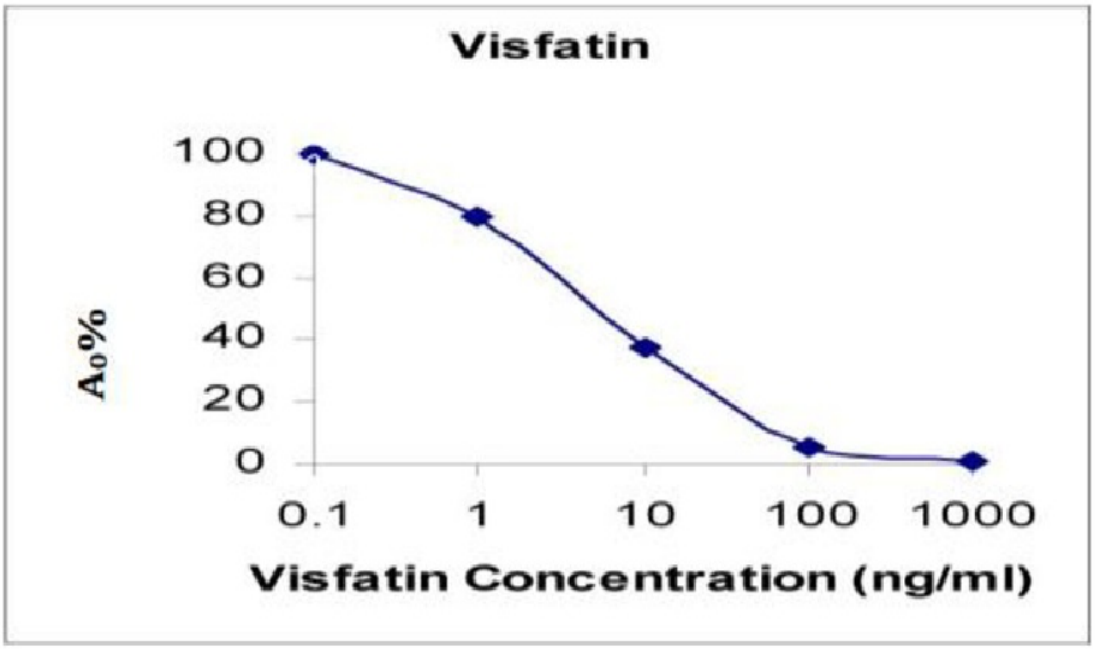

Figure 2.1: The standard curve for determination of visfatin concentration.

Table 2.3: Fasting blood glucose, insulin and visfatin levels in T2DM and control groups

parameter	T2DM	Control	P value
	Mean ±SD	Mean ±SD	
FBG (mmol/L)	8.65 ± 0.47	4.01 ±1.47	<0.001
Visfatin (ng/ml)	17.62±2.93	9.24±4.52	<0.001
BMI (kg/m2)	24.68 ± 3.81	23.83±1.81	<0.001

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Discussion

Insulin is a hormone secreted from the pancreas its main job is to aid in the metabolism of carbohydrates. (IR) defined as the reduced cells to react with insulin and entering (sugar) from the blood tissue to tissues like muscle. Hyperglycemia and IR are characteristic features of T2DM.

Obesity with its consequent increase in visceral adiposity that leads to elevation for circulating level of non-esterified fatty acid (NEFA) which in turn it will block the clearance of insulin by the liver (hyperinsulinemia), and inhibits insulin action on insulin receptors located in different tissues (insulin resistance) such as liver and muscles.

Visfatin is produced by visceral adipose tissue and exerts insulin mimicking effect. Visfatin has a glucose lowering effect through the stimulation and binding of insulin receptors (12,13).

From the outcome data, the present study clarified the positive significant correlation between the blood circulating level of Visfatin with BMI and between Visfatin with circulating glucose level and these data are in accordance with the other studies (7,8,9), and the consequence correlation between the elevated level of Visfatin and HOMA-IR. These data showed Visfatin as an insulin-mimetic cytokine that although fatty adipose tissue in obese patients is one of the main reasons for insulin resistance but the body tries to overwhelm this problem via producing Visfatin and other agents like adiponectin which affect to enhance insulin sensitivity and reduce blood glucose level.

The effect of Visfatin is done through the activation of receptors of insulin, enhances lipogenesis and transport of glucose and block liver release of glucose (*In vitro*).

In addition to its action in lowering the glucose level in plasma, it enhances insulin sensitivity and reduces the level of insulin and glucose when injected into mice with diabetes (12).

It appears that Visfatin is a cytokine with a physiological effect in reducing the level of plasma glucose.

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العلاقة بين الفسفاتين ومؤشر كتلة الجسم مع مقاومة الانسولين لمرضى داء السكري من النوع الثاني في العراق

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الخلاصة

الخلفية: تعتبر السمنة واسلوب الحياة المستقرة ونوع الطعام عاملا مسببا للإصابة بداء السكري من النوع الثاني.
الهدف: لدراسة العلاقة بين مقاومة الانسولين مع مؤشر كتلة الجسم وتأثير الفسفاتين في الاصابة بداء السكري من النوع الثاني.
طريقة العمل: يحتوي هذا المشروع على مجموعتين، مجموعة مراقبة صحية تتكون من 200 متطوع ومجموعة ثانية من 200 مريض بداء السكري من النوع الثاني، تم توثيقهم بناء على مواصفات منظمة الصحة العالمية.
تم قياس كل من مستوى مقاومة النسولين وايضا مستوى السكر في المصابين اضافة الى مؤشر كتلة الجسم ومستوى الفسفاتين في الدم لجميع المشتركين في البحث.
النتائج: هناك علاقة وثيقة وكبيرة بين داء السكري من النوع الثاني ومقاومة الانسولين وكذلك علاقة كبيرة بين مؤشر كتلة الجسم ومقاومة الانسولين اضافة الى وجود علاقة وثيقة بين مستوى الفسفاتين ومستوى السكر في الدم.
الاستنتاج: ان مرض داء السكري من النوع الثاني يرتبط بمقاومة الانسولين التي لديها العديد من العوامل المؤهبة مثل السمنة، ونمط الحياة المستقر ونمط الطعام وان الفسفاتين هو مادة شحمية تعمل مع حركة الانسولين المحركة التي تميل الى زيادة حساسية الانسولين وتقلل مستوى السكر في الدم وهذا يوضح المستوى المرتفع من الفسفاتين عند المرضى المصابين بداء السكري من النوع الثاني