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Original Article

Estimation of Asprosin Levels in Female Iraqi Patients with Type 2 Diabetes and Hypothyroidism

Nedaa A. Lefta[1,*], Ahmed Y. Abed[1], Baydaa A. Abed[2]

[1]*Department of Chemistry, College of Science for Woman, University of Baghdad, Baghdad, Iraq*
[2]*National Diabetes Center, Mustansiriyah University, Baghdad, Iraq*

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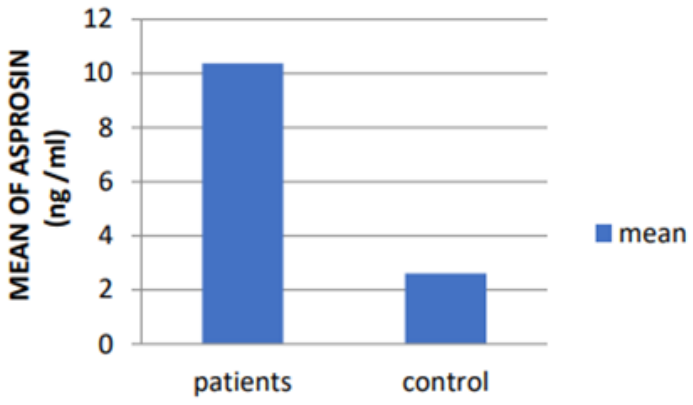
ABSTRACT

Adipose tissue secretes the hormone asprosin. The asprosin molecule has several roles in the central nervous system and other body systems: hunger, glucose metabolism, insulin resistance (IR), and cellular death. IR is pathologically associated with high asprosin levels. Patients with type 2 diabetes mellitus (DMII) are more likely to have thyroid problems. Over time, many diabetics develop thyroid dysfunctional symptoms. The study included 80 women. Forty had hypothyroidism with diabetes (DMII), and 40 were healthy controls. Gathered samples from the National Diabetes Center, Al-Mustansiriyah University (Iraq), and College of Science for Women/University of Baghdad/Iraq, 35 to 65-year-olds. Dec. 2021-March 2022. The findings of this study indicate that asprosin, FBG, BMI, TSH, cholesterol, triglyceride, VLDL, and LDL concentrations increased significantly when compared to the healthy group. Additionally, there was a real decrease in T3 and HDL levels when compared to the healthy group. Whiles The T4 level, however, did not show any statistically significant variations. Hypothyroidism and DMII patients showed high serum asprosin, which is linked with poor glycemic and lipid management. It's a biomarker for diabetes and thyroid issues.

GRAPHICAL ABSTRACT



* Corresponding author: Nedaa A. Lefta
✉ E-mail: Email: nedaa.atiea1205a@csw.uobaghdad.edu.iq

Introduction

Glucose and fatty acids are the main sources of energy of the body; glucose may be converted into fatty acids and cholesterol. Lipoproteins or lipid droplets store excess lipids. Diabetes, cardiovascular disease, and fatty liver come from glucose and lipid metabolism problems [1]. blood glucose levels in humans are tightly controlled mostly by pancreatic hormones such as insulin and glucagon, but also by growth hormones, epinephrine, cortisol, and other glucocorticoids are important [2, 3]. Diabetes mellitus (DM) is a metabolic condition defined by the elevated blood sugar brought on by aberrant insulin production or insulin malfunction [4]. The number of DM patients quadrupled from (108 million) in 1980 to (422 million) in 2014 in just 34 years, while the worldwide prevalence of diabetes among individuals over 18 rose to 8.5% in 2014 from 4.7% in 1980 [5]. DMII is a metabolic condition caused by inadequate insulin production by pancreatic β-cells and insulin-resistant tissues [6]. Patients with DMII are more likely to have thyroid problems. Through the pass of time, many diabetics develop thyroid dysfunctional symptoms [7]. The decreased resting energy expenditure, weight gain, elevated cholesterol levels, impaired lipolysis, and reduced gluconeogenesis are all symptoms of hypothyroidism associated with hypometabolism [8]. Weight gain is frequently one of the symptoms of hypothyroidism [9, 10]. Increased adipose tissue energy storage is the cause of weight gain and obesity [11]. The ecess white adipose tissue and metabolic problems are not well-understood [10]. Asprosin is a new hormone secreted by white adipocytes during fasting, and as a glucogenic peptide, it increases glucose release from hepatocytes by activating the G-proteins AMP-PKA pathway [12]. The asprosin molecule is involved in various processes across the central nervous system (CNS), in addition to the other tissues and organs. It has a role in hunger, metabolism of glucose, IR, death of cells, and other processes [13]. Insulin resistance is pathologically associated with the high asprosin levels [12]. Women are more likely than males to have thyroid problems as they age. The 13.4% of diabetics were found to have a thyroid disorder and female DMII patients were more likely to have a thyroid disorder than male DMII patients (31.4% vs. 6.9%) [14].

Materials and methods

The verbally informed assent was acquired from all participants in the study conducted at the National Diabetes Center/Al-Mustansiriyah University (Iraq) and the College of Science for Women/University of Baghdad/Iraq during the period of December 2021 to March 2022. Eighty females were selected in the age range of 35- 65 years old. Forty female patients have been given a hypothyroidism diagnosis with DMII after consulting with a seasoned medical practitioner and selected forty healthy volunteers to serve as healthy controls during the same time. In-person interviews were conducted with respondents to gather data on their way of life and demographic information obtained by using a questionnaire that had been developed in advance. The women who have hypothyroidism with DMI1 were taking medication to treat their disease (levothyroxine and metformin). Females who were diagnosed with any of the diseases or disorders described in the following paragraphs, and also those had their thyroid glands surgically removed (thyroidectomy), with hyperthyroidism or thyroid cancer, the smoking women, and pregnant were excluded from this study. The blood sample was acquired from the subject after they had fasted for ten to twelve hours, during which time they had not eaten anything. A disposable syringe capable 10 millilitres were used to extract 10 millilitres of blood from each patient as well as the control group. The blood was taken and put inside a gel tube. After that, the serum was separated by spinning it for 15 minutes at a speed of 3000 rpm. One millilitre of the patient's serum was examined for fasting blood glucose levels and lipid profiles, and 1.5 millilitres of the patient's serum was evaluated for thyroid function (T3, T4, and TSH). The rest of the patient's serum was transferred to an eppendorf tube and kept in (deep freezing) at -20 °C until it was time to determine the quantity of asprosin. By using an enzyme-linked

immunoassay sandwich approach with a final fluorescent detection, the function of thyroid hormones was assessed (VIDAS, biomeriux). In addition, the kit provided by the manufacturer was applied to determine asprosin by using enzyme-linked immunoassay (MyBioSource). Furthermore, the kit provided by (Cecil CE1011, Linear) was used to determine (FBG, TCHO, TG, and HDL) by using an enzymatic colorimetric technique.

Statistics examination

The SPSS-25, a statistical analysis program, was utilized to achieve the aimed-for data analysis. To compare parameter means between groups, the independent sample t-test was used, and for a high-level overview of our findings, we relied on the more generic descriptive statistic. A p-value of less than 0.05 was considered as statistically significant.

Results and Discussion

Table 1 presents the (Mean ±SD) and p-value for asprosin hormone, thyroid hormones, FBG, BMI, and lipid profiles in (hypothyroidism with diabetes) and compared them with the control group.

Females with (hypothyroidism and type 2 diabetes mellitus (DMII)) had significantly higher mean body mass index (BMI), fasting blood glucose (FBG), serum asprosin, total cholesterol (TCHO), triglyceride (TG), and thyroid stimulating hormone (TSH) levels than healthy females (P <0.05). Except for the high-density lipoprotein (HDL) and triiodothyronine (T3), which were lower in females with (hypothyroidism and DMII) (P <0.05) than in healthy women. On the other hand, there was no significant difference between thyroxin (T4) levels between groups (P > 0.05).

Table 1: A comparison of laboratory and demographic factors in the research population

Test	Hypothyroidism with DMII (N= 40) (Mean ±SD)	Control (N=40) (Mean±SD)	P-value
ASPROSIN (ng /mL)	10.37± 6.35	2.61±1.06	0.001
T3 (nmol/L)	1.23±0.36	1.4748±0.39	0.014
T4 (nmol/L)	92.33 ±23.18	84.84±14.54	0.248
TSH (uUI / L)	7.66±14.07	2.08±0.76	0.012
BMI(Kg/m^2)	31.21±4.32	23.65 ±1.79	0.001
FBG (mg/dl)	185.98±94.68	89.93±8.86	0.001
TC (mg/dl)	203.02±54.28	154.40±16.02	0.001
TG (mg/dl)	181.55±79.06	90.10±29.86	0.001
HDL (mg/dl)	42.70±6.82	48.15±5.71	0.003
LDL (mg/dl)	128.50±46.11	87.58±12.07	0.001
VLDL (mg/dl)	36.25±16.08	18.15±6.90	0.001

Result given in (mean ±SD)
P-value ≤ 0.05 levels are considered as significant
P-value ≥0.05 levels are considered as nonsignificant

This study examines the potential relationship between asprosin hormone and hypothyroidism in DMII positive patients.

As a part of this study, an experienced physician professional made the hypothyroidism diagnosis with DMII patients and control group were compared clinically and biochemically. Most females with hypothyroidism and DMII had the poor lipid and glycemic control.

The data in the table demonstrate the TSH levels are high, whereas the thyroid hormone T3 is significantly lower in people with (hypothyroidism with DMII). The T4 level did not disclose anything noteworthy. In people with DM, the poor glycemic control is more prevalent. T3

levels are low when DM is not under control. It has been connected to the inhibition of T4 to T3 conversion in the periphery, which frequently returns to normal as glycemic management improves [15]. Insulin, which is an anabolic hormone, is known to raise T4 levels while lowering T3 levels by stopping the liver from turning T4 into T3 [16]. In DM, both the nocturnal TSH peak and the TSH response to Thyrotropin-releasing hormone TRH are attenuated or nonexistent [17]. Table 1 and Figure 1 demonstrate that the asprosin hormone levels were significantly higher in the hypothyroidism with DMII population than in the control group. Hypothyroidism causes weight gain and lipid profile changes. These alterations affect glucose, insulin, and adipose tissue [18]. Thyroid profile changes can influence asprosin secretion, which can lead to further difficulties where the excess visceral adipose tissue is linked to insulin resistance and poor glucose tolerance, both of which can progress to DMII, proinflammatory pathways, and the oxidative stress if left untreated [10]. One of the most striking changes that occur with increased adiposity is insulin resistance and cause of DMII [19]. Plasma asprosin is pathologically increased in humans with insulin resistance and obesity [12]. In DMII patients, asprosin levels are higher than usual [20]. This clearly suggests that higher levels of hormone aprosin are linked to the metabolic impairment owing to hypothyroidism and DMII.

The findings of this study reveal that the high FBG readings in patients with hypothyroidism with DMII are indicative of poor glycemic management in these individuals. Hypothyroidism often accompanies metabolic syndrome. As a result, hypothyroidism and diabetes are interconnected. Diabetic individuals may be poorly managed if they have abnormal thyroid hormone levels [21].

The current study found that people with hypothyroidism with DMII have a significantly higher BMI than in the control group. An increase in fat mass in obesity promotes the TSH release, which increases T3 via the hypothalamic-pituitary-thyroid (HPT) axis, while the expression of TSH receptors is lowered, leading to reduced negative feedback and more TSH and T3 in the circulation. These events cause thyroid dysfunction and reduce energy expenditure, leading to fat mass gain [22]. The results of this study were agreed with the study that found people who had both hypothyroidism and DMII had a higher BMI [23].

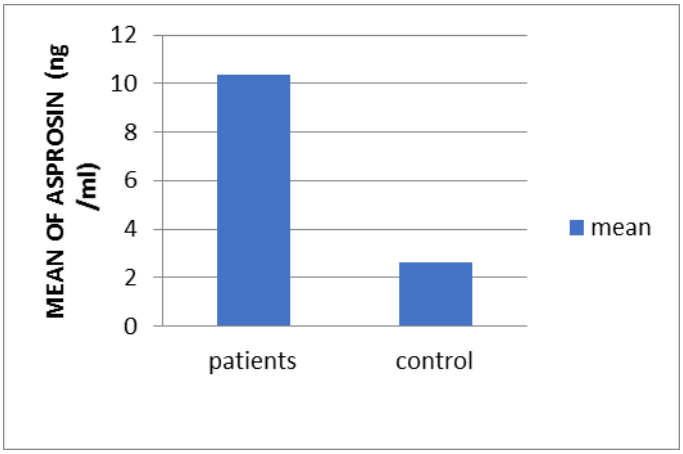


Figure 1: Average of asprosin hormone for both groups

Dyslipidemia, a disorder of lipoprotein metabolism, is common in people with diabetes. Triglycerides, total cholesterol, and low-density lipoprotein (LDL) are all raised, whereas the high-density lipoprotein (HDL) values are extremely low [24]. Hypothyroidism is also linked to dyslipidemia, which means that the total cholesterol, LDL, and triglyceride levels in the blood are too high. Thyroid hormone affects how cholesterol is made, moved out of the body, and changed. However, new research shows that TSH participates in lipid metabolism independently of thyroid hormone [25]. Thyroid dysfunction and DMII are two illnesses that are strongly related

[26]. In this investigation, the serum lipoprotein, such as total cholesterol, TG, LDL, and VLDL was significantly increased in the hypothyroidism with DMII group compared with the control group, except for the serum HDL level, which was lower in patients compared with the healthy group. The results here agree with a study that showed that patients with DMII and hypothyroidism had significantly higher levels of all lipid markers except HDL [27]. On other hand, the asprosin is linked to glucose release, dyslipidemia, and IR [28]. β-cells can also secrete asprosin in hyperlipidemic circumstances [13]. Asprosin has been found to have strong associations with TG, HDL, FBG, and BMI [28]. All of these findings indicate that hypothyroidism patients with diabetes have metabolic abnormalities that cause large amounts of fat to be deposited in the liver and adipose tissue, particularly white adipose tissue, which is the main source of the asprosin hormone, raising asprosin levels.

Conclusion

The serum asprosin was closely linked to the poor glycemic and lipid control in patients with hypothyroidism and DMII. As a result, it could serve as a potential biomarker for predicting diabetes and thyroid dysfunction risk factors.

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Authors' contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

Conflict of Interest

There are no conflicts of interest in this study.

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