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Biochemical and Hormones Study on Diabetic Nephrotic Patients

Ahmed Sulaiman Jumaa, Firas Taher Maher* and Hanaa Ka'an Salah

Department of Chemistry, College of Science, Tikrit University, Baghdad, Iraq

Abstract

Background: Diabetes mellitus is a growing epidemic and is the most common cause of chronic kidney disease (CKD) and kidney failure. Diabetic nephropathy affects approximately 20–40% of individuals who have diabetes. Diabetic nephropathy can be detected by the measurement of urine albumin or serum creatinine. Visceral adipose tissue-derived serine proteinase inhibitor (vaspin) was identified in the visceral adipose tissue of OLETF (Otsuka Long-Evans Tokushim a Fatty) rats, an animal model of obesity and type 2 diabetes mellitus (T2DM).

Material and methods: In this study conducted on 70 individuals in the age group of 35-70 years, from Kirkuk General Hospital. study group consists 40 individuals with diabetic nephropathy and 30 ages and sex matched healthy individuals (control).

Results: Serum vaspin of diabetic nephropathy patients showed a high significant relationship ($p<0.0001$). as compared with the controls. There is high significant decrease ($p<0.001$) in the serum levels of T4 and T3. There is high significant increase ($p<0.001$) in the serum levels of TSH as compared with the controls. There is high significant increase ($p<0.001$) in the serum concentration of K^+ and uric acid and glucose as compared with the controls. There is high significant decrease ($p<0.001$) in the serum levels of Ca^{++} and Na^+ as compared with the controls. There is high significant increase ($p<0.001$) in the serum levels of Cholesterol, TG, LDL and VLDL as compared with the controls. There is significant decrease ($p<0.05$) in the serum levels of HDL as compared with the controls.

Conclusion: The hormones (vaspin, TSH, T4, T3) have higher diagnostic validity values in the current study, which may be useful as a diagnostic tool to identify recurrence of the diabetic nephropathy syndromes.

Keywords: Vaspin; Diabetes nephrotic; Lipid profile serum T3; Serum T4; Serum TSH; Serum K^+; Na^+; Serum uric acid; Serum glucose

Introduction

Diabetes mellitus is a growing epidemic and is the most common cause of chronic kidney disease (CKD) and kidney failure. Diabetic nephropathy affects approximately 20–40% of individuals who have diabetes [1]. Diabetic nephropathy can be detected by the measurement of urine albumin or serum creatinine, and both tests should be performed at minimum annually [1]. those with abnormal levels should have repeat tests done sooner. The first stage of nephropathy is usually the onset of elevated urine albumin which predicts the development of CKD and a gradual decline in glomerular filtration rate (GFR) [2].

Visceral adipose tissue-derived serine proteinase inhibitor (vaspin) was identified in the visceral adipose tissue of OLETF (Otsuka Long-Evans Tokushim a Fatty) rats, an animal model of obesity and type 2 diabetes mellitus (T2DM) [3]. Vaspin is also expressed in the skin, hypothalamus, pancreatic islets, and stomach [4]. Circulating levels of adiponectin, a hormone produced predominantly by adipocytes, are highly heritable and are inversely associated with T2DM and other metabolic traits [5]. Both of the two adipocytokines are associated with the diabetes and other metabolic disorders. Some studies have shown that plasma vaspin concentrations are significantly higher in men with the metabolic syndrome compared with those without the metabolic syndrome [6]. that the serum vaspin levels are negatively correlated with the creatinine levels and were significantly reduced in the Japanese chronic hemodialysis (HD) patients [7].

The thyroid gland responds by producing and releasing the 2 thyroid hormones: Tri-iodothyronine (T3) and Thyroxine (T4) [8]. Two primary pathological conditions involving the thyroid gland are hyperthyroidism and hypothyroidism [9]. Hypothyroidism occurs when thyroid gland is not producing enough of thyroid hormones and is by far the most common thyroid disorder in the adult population. Hyperthyroidism is a condition in which thyroid gland is overactive and produces excessive amounts of thyroid hormones [10]. T4 and T3. Acting through nuclear receptors, these hormones play a critical role in cell differentiation during development and help maintain thermogenic and metabolic homeostasis in the adult. Thyriod stimulating hormone (TSH), secreted by the anterior pituitary plays a pivotal role in control of the thyroid axis [11]. TSH production is suppressed when the T4 levels are high, and vice versa [12,13]. By a negative feedback mechanism, increased levels of free TH (T4 and T3) inhibit TSH secretion from the pituitary, whereas decreased levels of them cause an increase in TSH release from the pituitary. TSH secretion is also influenced by thyroxine releasing hormone(TRH)synthesized in the hypothalamus. TRH causes release of TSH [14,15].

Aim of the Study

Estimation of the levels of hormones (vaspin, TSH, T4, T3). and estimation of the concentrations of urea, creatinine and uric acid. Estimation of the levels of lipid profile. Estimation of the concentration of electrolytes. This author is not done in Iraq previously. To improve the effects of Iraqi environments on the parameters of the patient with diabetic nephropathy, because of the environment in our home is different from other country, socially, economically and also the presence of recurrent wars.

Materials and Methods

This study was conducted on 70 individuals in the age group of 35-70 years, from Kirkuk General Hospital (Iraq). Study group consists

***Corresponding author:** Firas Taher Maher, Assistant Professor, Department of Chemistry, College of Science, Tikrit University, Baghdad, Iraq, Tel: 009647702658972; E-mail: firastaher3@gmail.com

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40 individuals with diabetic nephropathy all the indisiduals in the authors with diabetic nephropathy were diagnosed clinically and by laboratory findings by medical staff and 30 ages and sex matched healthy individuals (control). Five milliliter (5 ml) disposable plastic syringes were used to draw five ml of venous blood from each patient and control (healthy individuals). containing vacutainer tube and left for 20-30 minutes at 37°C. Blood samples were centrifuged at 1000 g for 10 minutes. Plasma specimens were then frozen and stored at -40°C until analysis. serum vaspin [16], serum T3 [17], Serum T4 [18], Serum TSH [19], were measured by ELISA. Serum potassium (K^+) [20], Serum calcium (Ca^{++}) [21], Serum sodium (Na^+) [22], Serum glucose [23], Serum urea [24], Serum creatinine [25], Serum uric acid [26], Serum lipid profile [27,28] were measured by spectrophotometer.

Statistical analysis was done using Microsoft office (SPSS version 14) which include the following: mean and standard deviation of variables. The significance of difference between mean values were estimated by student T-test. The probability P<0.0001=highly significant, P<0.05=significant, P>0.05=non-significant. Correlation regression, P value of less than 0.05 was considered significant, less than 0.01 and 0.001 were highly significant.

Results and Discussion

This study included 2 groups of patient, diabetic nephropathy syndrome group and control group. The mean serum vaspin level was 7.11 ± 2.11 ng/dL in controls, 5.21 ± 2.31 ng/dL in diabetic nephropathy. This difference is high significant in diabetic nephropathy subjects (P<0.0001). This study agreement with Yan et al. [29] (Table 1).

The mean serum TSH level was 1.025 ± 0.27 µIU/ml in controls, 3.169 ± 1.78 µIU/ml in diabetic nephropathy. This difference was high significant in diabetic nephropathy subjects (P<0.0001). The mean serum T4 level was 8.95 ± 1.33 µg/dl in controls, 6.96 ± 1.48 µg/dl in diabetic nephropathy. This difference was high significant in diabetic nephropathy subjects (P<0.0001). The mean serum T3 level was 1.36 ± 0.096 ng/ml in controls, 0.630 ± 0.144 ng/ml in diabetic nephropathy. This difference was high significant in diabetic nephropathy subjects (P<0.0001). this study agreement with Rai et al. [30] (Table 1).

The mean serum urea concentration was 35.65 ± 0.933 mg/dL in controls,168.39 ± 44.4 mg/dL in diabetic nephropathy. This difference was highly significant in diabetic nephropathy subjects (P<0.0001). The mean serum creatinine concentration was 0.64 ± 0.082 mg/dL in controls, 6.9 ± 1.27 mg/dL in diabetic nephropathy. This difference was highly significant in diabetic nephropathy subjects (P<0.0001). this study agreement with Rai et al. [30] (Table 1).

The mean serum potassium concentration was 4.12 ± 0.309 mg/dL in controls, 6.01 ± 0.46 mg/dL in diabetic nephropathy. This difference was highly significant in diabetic nephropathy subjects (P<0.0001). this study agreement with El–Zawhry et al. [31] (Table 1).

The mean serum calcium concentration was 8.83 ± 0.349 mg/dL in controls, 6.19 ± 0.69 mg/dL in diabetic nephropathy. This difference was highly significant in diabetic nephropathy subjects (P<0.0001). this study agreement with Abdelgader et al. [32].

The mean serum sodium concentration was 141.6 ± 2.03 mg/dL in controls, 136.9 ± 4.2 mg/dL in diabetic nephropathy. This difference was highly significant in diabetic nephropathy subjects (P<0.0001). this study agreement with csaba P [33] (Table 1).

The mean serum uric acid level was 5.8 ± 0.849 mg/dL in controls, 8.33 ± 0.781 mg/dL in diabetic nephropathy. This difference was highly significant in diabetic nephropathy subjects (P<0.0001). this study agreement with Kuriyama et al. [34] (Table 1).

The mean serum glucose level was 95.9 ± 12.31 mg/dL in controls, 179.5 ± 28.7 mg/dL in diabetic nephropathy. This difference was highly significant in diabetic nephropathy subjects (P<0.0001). this study agreement with Rai et al. [30] (Table 1).

The mean serum (cholesterol, TG, LDL, VLDL) level was higher significant in diabetic nephropathy as compared with the control (P<0.0001). but HDL was low (p<0.05) in diabetic nephropathy as compared the with control. this study agreement with Tsimihodimos et al. [35] (Table 1).

Correlations of Study

The obtained results revealed significant relation between vaspin hormone and uric acid. There are stronger positive correlation between vaspin and uric acid. As shown in the Table 2.

Conclusion

The hormones (Vaspin, TSH, T4, T3) have higher diagnostic validity values in the current study, which may be useful as a diagnostic tool to identify recurrence of the diabetic nephropathy syndromes. Hormones levels measurement showed: Valuable information for diagnosis, Good monitoring disease status, Progression of the disease. Serum level of urea, creatinine, uric acid, lipids profile electrolytes and

Parameters	Control	Diabetic nephropathy	P value
Vaspin (ng/dl)	7.11 ± 2.11	5.21 ± 2.31	0.04
TSH (µIU/ml)	1.025 ± 0.27	3.169 ± 1.78	0.001
T4 (µg/dl)	8.95 ± 1.33	6.96 ± 1.48	0.001
T3 (ng/ml)	1.36 ± 0.096	0.630 ± 0.144	0.000
Urea (mg/dl)	35.65 ± 0.933	168.39 ± 44.4	0.000
Creatinine (mg/dl)	0.64 ± 0.082	6.9 ± 1.27	0.000
Potassium (mg/dl)	4.12 ± 0.309	6.01 ± 0.46	0.000
Calcium (mg/dl)	8.83 ± 0.349	6.19 ± 0.69	0.000
Sodium (mg/dl)	141.6 ± 2.03	136.9 ± 4.2	0.000
Glucose (mg/dl)	95.9 ± 12.31	179.5 ± 28.7	0.000
Uric acid (mg/dl)	5.8 ± 0.849	8.33 ± 0.781	0.000
Cholesterol (mg/dl)	213.7 ± 22.6	226.8 ± 20.8	0.04
TG (mg/dl)	164.9 ± 17.4	178.466 ± 29.28	0.04
HDL (mg/dl)	42.9 ± 3.36	41.78 ± 7.1	0.5
VLDL (mg/dl)	33.05 ± 1.73	35.16 ± 4.45	0.04
LDL (mg/dl)	135.6 ± 21.3	148.5 ± 19.8	0.03

Table 1: Mean Serum parameters of the groups studied.

Parameters	*r*	*P value*
TSH	0.236	0.236
T4	-0.042	0.835
T3	0.116	0.563
Calcium	0.180	0.370
Potassium	-0.141	0.484
Sodium	0.118	0.559
Cholesterol	0.053	0.793
Triglyceride	0.240	0.227
HDL	0.094	0.642
LDL	-0.077	0.703
VLDL	0.367	0.060
Urea	0.341	0.081
Creatinine	0.186	0.354
Uric acid	0.454*	0.017
Sugar	-0.267	0.179

Table 2: Correlations between vaspin and other parameters.

glucose have affected by disease which may be changed dramatically and have no useful role in the diagnosis of patients with renal failure. They may be used as additive factor to detect activity and extent of disease. The results of this study suggested a high correlations between vaspin level and others parameters levels.

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