World Journal of Biology Pharmacy and Health Sciences
eISSN: 2582-5542
Cross Ref DOI: 10.30574/wjbphs
Journal homepage: https://wjbphs.com/

(RESEARCH ARTICLE)

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Association between normal, abnormal thyroid hormones and diabetes mellites retinopathy in patients with type 1, 2 and 3 diabetes in the Anbar city

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World Journal of Biology Pharmacy and Health Sciences, 2023, 14(03), 078–082

Publication history: Received on 20 April 2023; revised on 07 June 2023; accepted on 09 June 2023

Article DOI: https://doi.org/10.30574/wjbphs.2023.14.3.0234

Abstract

Diabetes is a type of disease that affects the rest of the body's functions. The study was conducted at Al-Ramadi Teaching Hospital for Women and Children for the period from 2021 to 2022. Our study aimed to investigate the relationship between the three types of diabetes (T2DM, gestational diabetes and T1DM). The study found that age affects disease severity levels in addition to weight, where the effect was less in type 2 and gestational diabetes. For fats, there was no strong effect in increasing diabetes. With regard to low-density lipids, it has been shown that it directly affects the development of the disease, because triglyceride levels have a strong and direct influence on the development of diabetes, especially type 1 and type 2. Cumulative glucose testing: Sugar and insulin have been linked to disease. In this study, when performing Pearson's correlation analysis of the relationship between TSH and some biochemical tests, there was a strong correlation between TSH, age, weight, T3, RBS, HbA1c and insulin, while there was no correlation for TSH with lipids, T4 and other tests. These results indicate the importance of thyroid screening for diabetic patients.

Keywords: Thyroid Hormones; Retinopathy; Diabetes Mellitus; TSH

1. Introduction

Diabetes mellitus is a metabolic disorder that is characterized by increased amounts of blood sugar. Type one diabetes, each type has its own set of causes, symptoms, and treatments [1, 2].

The healthy operation of the endocrine system depends on the presence of the thyroid gland. This gland, found at the base of the front of the neck, is responsible for producing thyroid hormones. The thyroid gland is responsible for producing both T3 and thyroxine (T4). These hormones, among other things, govern your weight, energy levels, internal temperature, skin, hair, and nail growth. The Thyrotropin-releasing hormone (TRH) is released by the brain, which stimulates the pituitary gland to produce thyroid-stimulating hormone (TSH) [3, 4].

Thyroid dysfunction (TD) and diabetes mellitus (DM) are two conditions that are often diagnosed together. Thyroid disorders such as hypothyroidism and hyperthyroidism are more frequent in persons with type 2 diabetes mellitus (T2DM) than in those who do not have the disease [5, 6].

The frequency of thyroid function testing in T2DM patients is not specified by current guidelines. Blood thyroid hormones regulate a wide variety of organs and tissues, have a significant impact on the metabolism of glucose, lipids,

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and proteins, and are associated with an increased risk of poor glycemic control in T2DM patients. Hyperthyroidism and thyrotoxicosis may exacerbate subclinical DM and cause hyperglycemia in T2DM patients, placing them at risk for diabetic complications [5].

T2DM prevents the conversion of thyroxine (T4) to triiodothyronine, which reduces thyroid-stimulating hormone levels in peripheral tissues (T3). Poorly managed T2DM may cause thyroid tissue growth, nodule development, and goiter formation, as well as insulin resistance and hyperinsulinemia. Additionally, although metformin has been demonstrated to help both TD and T2DM patients, other antidiabetics such as thiazolidinediones, sulfonylureas, and pioglitazone have been observed to aggravate TD.. It is possible that thyrovigilance in patients with T2DM and diabetovigilance in individuals with TD are both required in order to enable individualized medication and treatment [6].

However, the main objective of this study is to identify the relationship between Normal and abnormal Thyroid Hormones and Diabetes Mellitus Retinopathy. This study will focus on patients with Type one, Type two, and type three Diabetes, living in Anbar city in Iraq as a case study.

2. Material and methods

This study included a 160 subjects (40 TDM1, 40 TDM2 and 40 TDM3) with varying degrees of disease activity and a control group of 40 healthy subjects (Without Diabetes Mellitus) matched for age, sex was evaluated. TSH, T3, T4, Ca, and insuline. A sandwich ELISA was used to estimate the TSH, and insuline. The study was conducted Al-Ramadi Teaching Hospital for Women and Children during the period from 2021 to 2022.

2.1. Statistical analysis

The statistical program SPSS 23 was used to estimate the means of the chemical tests. One way ANOVA was used for analysis of data and least significant test was used to assess the differences among means. Pearson correlation coefficient was employed to determine the relationships between the variables. $P<0.05$ is considered significant.

3. Results and discussion

Our results showed that the mean age of the control, T1DM, T2DM and T3DM were 33.1 ± 5.89; 53.9 ± 9.63; 57.7 ± 7.16; 31.5 ± 6.31 Year, respectively, as shown in Table 1.

Results showed a statistically significant differences between the control and the T1DM and T2DM groups, but no statistically significant difference between the control and T3DM.. Also, the mean weight of the all groups differed significantly. The highest weight was showm in T1DM (79.10 kg), followed by T2DM (70.60 kg),T3DM (66.30 kg) the control (61.5 kg) (Table 1). Obesity and overweight were identified in 35.5 percent and 13.2 percent of diabetics, respectively (p=0.016), and 26.1 percent and 7.3 percent of the control group. In the whole study population, advanced age (OR =1.10; p 0.001) and diabetes mellitus (OR =2.25; p 0.001) were both linked with an elevated risk of obesity.. There was a tendency toward excess body weight in diabetics[7]. which is agreed with our study.

Table 1 Age and weight in Patients and control with diabetes mellitus

Variable	Groups	Mean ± SD
Age (Years)	Control (n = 40)	33.1 ± 5.89c
	T1DM (n = 40)	53.9 ± 9.63b
	T2DM (n = 40)	57.7 ± 7.16a
	T3DM (n = 40)	31.5 ± 6.31c
Weight (kg)	Control (n = 40)	61.5 ± 9.31d
	T1DM (n = 40)	79.1 ± 12.4a
	T2DM (n = 40)	70.6 ± 10.1b
	T3DM (n = 40)	66.3 ± 7.44c

T3 (ng/dl), T4 (µg/dl), T3/T4(%) and TSH (µIU/ml)

As shown in Table 2, the means of T3 was significntly low in control and T3DM as compared with other groups. The highest mean (177.8 ng/dl) was detected in T1DM.

Concerning the T4, results illustrated the the mean of control was 7.87 (µg/dl) which was significantly lower than the of other groups. In our studies, we discovered that diabetes individuals had low T3 status, which was associated with considerably higher fasting blood glucose, HbA1c, and serum insulin levels. There was no statistically significant difference in TSH levels between diabetics and non-diabetics. A "low T3 level" is described as a serum total and free T3 level that is below normal, but above normal in terms of serum T4 and TSH concentrations. Low blood T3 levels are caused by a reduction in peripheral T4 to T3 conversion via the 5'-monodeiodination process [8]. Thyroid illness is more common in those with T1DM. Female diabetics are more likely to have this finding. Hypothyroidism is the most frequent thyroid disorder. Thyroid issues are more commonly associated with diabetes among diabetics who have poor metabolic control [9]. This study agreed with our study. For the T4 showed a non-significant difference between means groups of study. T3/T4 revealed statistically significant variations in the outcomes between the control groups. There is also a significant difference in group T2DM only (P< 0.05) when it came to TSH. In our studies, we discovered that diabetes individuals had low T3 status, which was associated with considerably higher fasting blood glucose, HbA1c, and serum insulin levels. There was no statistically significant difference in TSH levels between diabetics and non-diabetics. A "low T3 level" is described as a serum total and free T3 level that is below normal, but above normal in terms of serum T4 and TSH concentrations. Low blood T3 levels are caused by a reduction in peripheral T4 to T3 conversion via the 5'-monodeiodination process [8, 10].

Thyroid illness is more common in those with T1DM. Female diabetics are more likely to have this finding. Hypothyroidism is the most frequent thyroid disorder. Thyroid issues are more commonly associated with diabetes among diabetics who have poor metabolic control [9]. This study agreed with our study.

Table 2 T3, T4, T3/T4 and TSH in Patients and control with diabetes mellitus

Variable	Groups	Mean ± SD
T3 (ng/dl)	Control (n = 40)	146.8 ± 28.7b
	T1DM (n = 40)	177.8 ± 20.1a
	T2DM (n = 40)	137.8 ± 24.8c
	T3DM (n = 40)	146.9 ± 29.4b
T4 (µg/dl)	Control (n = 40)	7.87 ± 2.03b
	T1DM (n = 40)	8.60 ± 1.51a
	T2DM (n = 40)	8.37 ± 1.64a
	T3DM (n = 40)	8.34 ± 1.98a
T3/T4 (%)	Control (n = 40)	19.9 ± 7.11ab
	T1DM (n = 40)	21.4 ± 5.59a
	T2DM (n = 40)	17.3 ± 6.15c
	T3DM (n = 40)	18.2 ± 4.54bc
TSH	Control (n = 40)	2.56 ± 1.68b
	T1DM (n = 40)	4.58 ± 1.08a
	T2DM (n = 40)	4.40 ± 0.70a
	T3DM (n = 40)	2.52 ± 1.60b

Calcium (mg/dL), HbA1c (%) and Insulin (µIU/mL)

The results of this study refer that significantly higher in Calcium, HbA1c and Insulin level in patients (Ca, T1DM, 9.04 ± 3.63; T2DM, 8.75 ± 2.16; T3DM, 8.53 ± 1.31) significant difference when compared to the control group (8.16 ± 2.89). In patients the HbA1c (T1DM, 7.91 ± 1. 4; T2DM, 7.06 ± 3.1; T3DM, 66.3 ± 1. 44) highly significant difference when compared to the control group (4.15 ± 1.31). Also, in patients was Insulin (T1DM, 10.1 ± 1.56; T2DM, 9.53 ± 0.72; T3DM, 15.9 ± 5.40) significant difference when compared to the control group (18.2 ± 3.12), as shown in Table 3, .5 these results are consistant with results obtained by Piero et al., [11].

Table 3 Ca in Patients and control with diabetes mellitus

Variable	Groups	Mean ± SD
Ca (mg/dL)	Control (n = 40)	8.16 ± 2.89c
	T1DM (n = 40)	9.04 ± 3.63a
	T2DM (n = 40)	8.75 ± 2.16ab
	T3DM (n = 40)	8.53 ± 1.31bc

Table 4 HbA1c and Insulin in Patients and control with diabetes mellitus

Variable	Groups	Mean ± SD
HbA1c (%)	Control (n = 40)	4.15 ± 1.31c
	T1DM (n = 40)	7.91 ± 1.40a
	T2DM (n = 40)	7.06 ± 3.10b
	T3DM (n = 40)	6.63 ± 1. 44b
Insulin (µIU/ml)	Control (n = 40)	18.20 ± 3.12a
	T1DM (n = 40)	10.10 ± 1.56c
	T2DM (n = 40)	9.53 ± 0.72c
	T3DM (n = 40)	15.9 ± 5.40b

3.1. Pearson Correlation coefficient

In this study, the correlation between TSH and some biochemical tests was significant. The correlation between TSH and Age, Weight, T3, RBS, HbA1c and Insulin were 0.509**; r= 0.353**; r= 0.328*; r= 0.357*; r= 0.462**; r= 0.219 * respectively as shown in Table 5. Similar results obtained by Vargas-Uricoechea et al. [12].

Table 5 Correlation between TSH and Some Variables in DM

	TSH	
Variables	**r**	**P-Value**
TSH-Age (years)	0.509**	< 0.05
TSH-Weight (kg)	0.353**	< 0.05
TSH–T3 (ng/dl)	0.328*	< 0.05
TSH–T4 (ng/dl)	0.132	> 0.05
TSH–T3/T4 (% L)	0.252	> 0.05
TSH–Calcium (µIU/L)	0.168	> 0.05
TSH–HbA1c (%)	0.462**	< 0.05
TSH–Insulin (µIU/L)	0.219 *	< 0.05

No asterisk:(P > 0.05);** highly significant at (P < 0.01);* Statistically significant at (P < 0.05); N.S. : non-significant.

4. Conclusions

The purpose of this research was to look at the link between diabetes and its three forms (Diabetes types 1 and 2, as well as T3DM), where the study concluded that age affects the levels of disease severity as well as weight, but the disease was less or no effect. For type 3 diabetes. With regard to type 1 and type 2, testing of sugar, cumulative sugar, and insulin have been associated with disease, and this is information indicated by many studies.

Compliance with ethical standards

Acknowledgments

The authors like to thank the Al-Imameen Al-Kazimin Teaching Hospital for their cooperation.

Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of ethical approval

Ethical approval for this study was done.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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