Trends in Clinical and Medical Sciences

PSR Press

Article

Correlation between diabetes mellitus and thyroid dysfunction

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Academic Editor: Nazia Tauheed
Received: 20 September 2021; Accepted: 15 December 2021; Published: 30 December 2021.

Abstract: Aim: To assess relation between diabetes mellitus and thyroid dysfunction.
Methodology: 105 type II diabetes mellitus patients of both genders were included. Serum TSH (Thyroid Stimulating Hormone), free T_3 (Triiodothyronine) and free T_4 (Thyroxine) were determined in all enrolled patients.
Results: There were 50 males and 55 females in the present study. Age group 21-30 years had 15 patients, 31-40 years had 26, and 41-50 years had 64 patients. Duration of diabetes was 8.4 years, and the level of glycosylated hemoglobin (HbA1C) was 9.2 years. A significant difference was observed (P< 0.05). Serum T3 was increased by 15% and decreased by 4%. Free T3 was increased in 5% and decreased in 13%, and free T4 was increased in 7% and decreased in 5%. There were 20 hypothyroidism and 29 hyperthyroidism patients. Maximum hypothyroidism patients (12) and hyperthyroidism patients (14) were seen with >7 HbA1C levels.
Conclusion: Most of the type II DM patients had hypothyroidism than hyperthyroidism.

Keywords: Diabetes; Thyroid dysfunction; Thyroxine.

1. Introduction

Diabetes mellitus (DM) is well known metabolic disorder characterized by increased glucose levels in the blood. It is classified as juvenile-onset, also called insulin-dependent (type I) and adult-onset or type II diabetes mellitus [1]. It is well-known that thyroid abnormalities are more likely to occur in these diabetes patients, especially in type II DM. With time progression, these patients develop thyroid dysfunction [2]. The role of insulin resistance in causing hypothyroidism is decreased thyroid hormone levels in type II diabetes mellitus patients. An altered lipid profile, also known as dyslipidemia, is a common feature of patients with type II diabetes mellitus [3]. Cardiovascular diseases (CVDs) and increased blood pressure (hypertension) are also seen in these patients. Hence, it becomes essential to identify thyroid profiles in these patients to avoid complications of diabetes [4].

Type II diabetes mellitus (T2DM) patients have defective insulin secretion or insulin resistance secreted from beta-cell of the islet of Langerhans of pancreas [5]. The number of diabetic patients is on the rise worldwide, with approximately more than 320 million patients suffering from it [6]. The role of lifestyle changes, urbanization, consuming fast foods like burgers, patties, or sandwiches with a low-calorie diet is well documented. Type II DM patients tend to have defective homeostasis of triglycerides, fatty acids, and lipoproteins [7].

The diagnosis of hypothyroidism can be performed using measurement of T3, T4 in blood using. These tests are cheaper and readily available. Early diagnosis and prompt management of thyroid abnormalities in type II diabetic patients help standardize glycemic level and lipid profile. These patients with sub-clinical hypothyroidism are also prone to have cardiovascular diseases and nephropathy. Other complications such as retinopathy and neuropathy may also be evident in hypothyroidism patients [8]. The present study was undertaken to assess the relationship between diabetes mellitus and thyroid dysfunction.

2. Methodology

A total of one hundred five type II diabetes mellitus patients of both genders were taken into the study after they agreed to participate. The institutional ethical review board approved the study. The demographic

characteristics of each patient were recorded. Height (cms) and weight (Kgs) were recorded. With the help of height^2/ weight, we calculated body mass index (BMI), which was regarded as overweight if BMI falls in the range of 25-29.9 kg/m^2 and obese if > 30 kg/m^2.

Determination of serum TSH, free T_3(Tri-iodothyronine), and free T_4 (Thyroxine) was performed using the chemiluminescent immunoassay method. Results were clubbed together and entered in an MS excel sheet for statistical analysis keeping the significance level as P<0.05.

3. Results

There were 50 males and 55 females in the present study. Age group 21-30 years had 15 patients, 31-40 years had 26, and 41-50 years had 64 patients. Duration of diabetes was 8.4 years, and the level of glycosylated haemoglobin (HbA1C) was 9.2 years. A significant difference was observed (P< 0.05), see Table 1.

Table 1. Baseline characteristics

Parameters	Variables	Number	P value
Gender	Male Female	50 55	>0.05
Age group (Years)	21-30 31-40 41-50	15 26 64	<0.05
Duration of diabetes (years)		8.4	
HbA1C (%)		9.2	

Serum T3 was increased by 15% and decreased by 4%. Free T3 was increased in 5% and decreased in 13%, and free T4 was increased in 7% and decreased in 5%. The significant difference was significant (P< 0.05), Table 2.

Table 2. Thyroid function test in diabetes mellitus patients

TFT	Normal	Increased	Decreased	P value
Serum T3	81%	15%	4%	<0.05
Free T3	82%	5%	13%	<0.05
Free T4	88%	7%	5%	<0.05

Table 3 and Figure 1 show that there were 20 hypothyroidism and 29 hyperthyroidism patients. Maximum hypothyroidism patients (12) and hyperthyroidism patients (14) were seen with >7 HbA1C level.

Table 3. Thyroid dysfunction based on glycemic status

HbA1C (%)	Hypothyroidism	Hyperthyroidism
6.5-7	2	3
7.1-8	3	4
8.1-9	3	7
>9	12	14

4. Discussion

There is a well-known association between type 2 diabetes mellitus and thyroid disorders owing to insulin resistance [9]. Hyperthyroidism with increased thyroid level and hypothyroidism with low thyroid level are two forms of thyroid dysfunctions [10,11].

Sub-clinical hypothyroidism occurring in diabetics may be the reason for various diabetic complications [12]. Decreased glucose absorption from GIT along with continued peripheral glucose accretion, new glucose formation, reduced liver glucose output, and reduced glucose clearance are trademarks of hypothyroidism [13]. Studies revealed that insulin resistance in overt or subclinical hypothyroidism results in glucose-stimulated insulin secretion. Similarly, it has been evident that in subclinical hypothyroidism, reduced insulin-stimulated glucose transport rate triggered by the disconcerting appearance of glucose transporter type

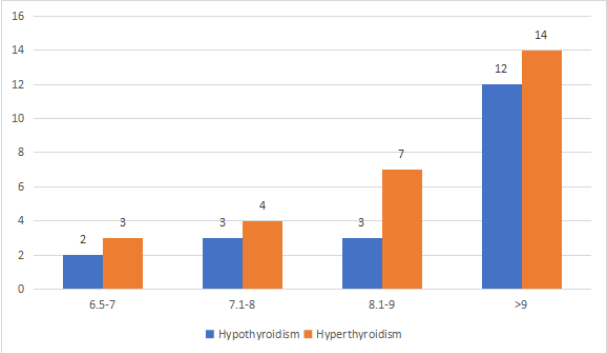

Figure 1. Thyroid dysfunction based on glycaemic status

2 gene (GLUT 2) translocation can result in insulin resistance [5]. The present study was undertaken with the aim of assessing the relationship between diabetes mellitus and thyroid dysfunction.

Our study found that there were 50 males and 55 females in the present study. Age group 21-30 years had 15 patients, 31-40 years had 26, and 41-50 years had 64 patients. Duration of diabetes was 8.4 years, and the level of glycosylated haemoglobin (HbA1C) was 9.2 years. Mahalingam *et al.*, [5] in their study conducted on 331 type II DM patients, determined thyroid profile and thyroid abnormalities along with diabetic complications. Various diabetic complications such as CVDs, retinopathy, neuropathy, and nephropathy were determined in these patients. Out of 331 patients, 13.9% showed the presence of hypothyroidism, and only 3.6% had hyperthyroidism. All these changes were highly prevalent in females as compared to males. On assessing the correlation between diabetic complications and thyroid dysfunction, there was no association.

We observed that serum T3 was increased by 15% and decreased by 4%. Free T3 was increased in 5% and decreased in 13%, and free T4 was increased in 7% and decreased in 5%. Palma *et al.*, [14] investigate the prevalence of TD in patients with type 1 and type 2 diabetes mellitus (T1DM and T2DM). They conducted a study including 386 T1DM or T2DM patients. All patients were classified as clinical hypothyroidism, subclinical hypothyroidism, subclinical hyperthyroidism, and clinical hyperthyroidism based on FT$ level and thyroid-stimulating hormone level. 14.7% exhibited thyroid dysfunction. Results revealed that 13% of patients had subclinical hypothyroidism with T1DM and 12% of patients with T2DM.

We observed that there were 20 hypothyroidism and 29 hyperthyroidism patients. Maximum hypothyroidism patients (12) and hyperthyroidism patients (14) were seen with >7 HbA1C levels. Ogbonna *et al.*, [15] included 354 type II diabetics of both genders and determined thyroid dysfunction in patients. For easy comparison, healthy control (118 non-diabetics) was included. There were 56.5% type II DM females and 62.7% healthy females. In comparison, it was evident that BMI tended to have higher in T2DM patients as compared to healthy subjects. There was a 7.8% mean HbA1c level as compared to 2.0% in healthy subjects. It was further found that female sex, central obesity, HbA1c =7%, DM nephropathy, and duration of DM more than 5years were significantly associated with thyroid dysfunction in T2DM patients.

5. Conclusion

There was thyroid dysfunction in type II diabetes mellitus patients. Hypothyroidism patients were more in type II diabetes mellitus patients.

Author Contributions: All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript.

Conflicts of Interest: "The authors declare no conflict of interest."

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