



## The prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus

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### Short Communication

#### Abstract

**BACKGROUND:** Diabetes mellitus (DM) is a major health problem globally. There are many studies, which show high prevalence of thyroid disorders in patients with type 2 DM. The aim of this study was to investigate the prevalence of thyroid dysfunction in patients with type 2 DM.

**METHODS:** 90 patients with type 2 DM aged between 40-70 years were studied. Following a detailed history, all patients were evaluated for thyroid dysfunction by testing thyroid-stimulating hormone (TSH), free triiodothyronine (FT3), free thyroxine (FT4). The prevalence of thyroid dysfunction and its correlation with age, gender, hemoglobin A1c (HbA1c), and duration of DM were studied.

**RESULTS:** Out of 90 patients studied, 16 were found to have thyroid dysfunction. The most common thyroid abnormality was subclinical hypothyroidism followed by hypothyroidism; furthermore, thyroid abnormality was seen mostly in patients aged more than 60 and in those with uncontrolled DM.

**CONCLUSION:** Patients with type 2 DM should be screened for thyroid dysfunction, especially those with poor diabetic control.

**KEYWORDS:** Type 2 Diabetes; Thyroid; Dysfunction

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### Introduction

Type 2 diabetes mellitus (DM) is the most common metabolic disorder caused by hyperglycemia due to insulin resistance and impairment in pancreatic beta cells ( $\beta$  cells) function which leads to disturbances in the metabolism of carbohydrates, proteins, and lipids.<sup>1</sup> Prevalence of DM is rapidly growing worldwide; in 2000, the estimated prevalence of DM was 2.8% and was predicted to rise to 4.4% by 2030.<sup>2</sup>

Thyroid diseases are second common endocrine disorder after DM.<sup>3</sup> Thyroid hormone plays an important role in energy

homeostasis and metabolism and contributes to glucose regulation and insulin action.<sup>4,5</sup>

Prevalence of thyroid diseases is more common in patients with DM than general population and hypothyroidism was frequently encountered in patients with type 2 DM.<sup>6,7</sup> The association between them has been reported and it has been shown to influence each other. Since both thyroid hormones and insulin are widely involved in cellular metabolism, therefore, excess or deficiency of each of them may contribute to disruption of the function of the other hormone.<sup>8</sup>

Presence of thyroid dysfunction in patients with DM has been proven to worsen microvascular and macrovascular complications of DM and increase overall morbidity and mortality; thus, diagnosing thyroid dysfunction in patients with DM will

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help clinicians optimize metabolic control and reduce DM-related complications.<sup>9</sup>

The association of thyroid dysfunction in patients with DM is widely studied by researchers across the world; while until recently, no such study is conducted in Kurdistan, Iraq. The present study was designed to establish the prevalence and characteristics of thyroid disorders in individuals with type 2 DM.

### Materials and Methods

This cross-sectional study was carried out at Ble General Hospital in Erbil City, Iraq. A sample of 90 patients who had type 2 DM with their age between 40-70 years were selected using convenience method of sampling. Those patients with type 1 DM or known history of thyroid dysfunction, those who were pregnant or were on medications affecting thyroid function such as amiodarone, lithium, steroids, and those with history of neck irradiation were excluded from the study. Data were collected and recorded using a specially-designed questionnaire after getting an informed consent from the patients.

A detailed history focusing on duration and onset of DM, comorbidities, history of thyroid disease, neck irradiation, and treatment for DM was taken; then, a thorough physical examination was performed. Later on, all patients were sent for laboratory tests including lipid profile, hemoglobin A1c (HbA1C), and thyroid function test [thyroid stimulating hormone (TSH), free triiodothyronine (FT3), free thyroxine (FT4)]. Thyroid hormone levels were measured by chemiluminescence immunoassay (CLIA) using VIDAS machine (bioMérieux Inc., France). Normal values of thyroid hormones using this test were as TSH between 0.4-4.2 mIU/ml, FT4 between 10.30-23.17 pmol/l, and FT3 ranging between 2.2-4.2 pg/ml. According to this test, the patients were categorized into four groups of thyroid dysfunction as Subclinical

hypothyroidism (defined as high serum level of TSH and normal FT4 and FT3 levels), overt hypothyroidism (described as high level of TSH coupled with low FT4 and FT3 levels), subclinical hyperthyroidism (defined as decreased level of TSH and high FT4 and FT3 levels), and hyperthyroidism (low TSH level and high FT4 and FT3 levels).

The data were managed by Microsoft Excel (version 2016) using chi-square test and Fisher's exact test. A P-value less than 0.050 was considered statistically significant.

### Results

In the present study, 90 patients with type 2 DM were screened for thyroid abnormality. 46 patients were female and 44 patients were male. Age of the patients ranged between 40 to 70 years. In this study, 82.3% of the patients had normal thyroid function, 11.1% had subclinical hypothyroidism, and 3.3% had overt hypothyroidism. Hyperthyroid patients were 2.2% and just 1.1% of patients were revealed to have subclinical hyperthyroidism. This is shown in table 1.

**Table 1. Frequency and percentage of patients with diabetes with thyroid dysfunction**

Thyroid dysfunction	n (%)
Normal thyroid function	74 (82.3)
Subclinical hypothyroidism	10 (11.1)
Hypothyroidism	3 (3.3)
Subclinical hyperthyroidism	1 (1.1)
Hyperthyroidism	2 (2.2)
Total	90(100)

Among all patients who had DM, 25 ones aged between 40-50 years, 34 patients were between 50-60 years, and 31 patients were more than age of 60. Majority of the patients who had thyroid dysfunction were more than the age of 60 (68.8%); this is in contrast to those patients with DM without thyroid dysfunction in whom just 27.0% fell in this group. 18.8% of patients were between the age of 50-60 years and just 12.5% were below the age of 50 years. On the other hand, in those patients who did

**Table 2. The association of age and sex with thyroid dysfunction in patients with diabetes**

Variable	Age group (year)			P	Sex		P
	40-50 (n = 25)	50-60 (n = 34)	> 60 (n = 31)		Male (n = 44)	Female (n = 46)	
Thyroid dysfunction							
Present (n = 16)	2 (12.5)	3 (18.8)	11 (68.8)	0.022	7 (43.8)	9 (56.3)	0.655
Absent (n = 74)	23 (31.1)	31 (41.9)	20 (27.0)		37 (50.0)	37 (50.0)	

Amounts are presented as frequency (Percent).

not have thyroid dysfunction, 41.9% were between the age of 50-60 years and 31.1% were between 40-50 years of age. Fisher’s exact test revealed a significant association between the age and presence of thyroid dysfunction in patients with DM (P = 0.022).

In the current study, 56.3% of the patients with thyroid dysfunction were female and 43.8% were male. This is in comparison to those patients without thyroid dysfunction in whom 50.0% were male and 50.0% were female. These differences were not statistically significant (P = 0.655). This information is shown in table 2.

Using HbA1c as an index for categorization of the patients with DM, it was revealed that 100% of patients with thyroid dysfunction had HbA1c of  $\geq 6.5\%$  and 91.1% of the patients without thyroid problem had HbA1c  $\geq 6.5\%$ . There was no significant association between HbA1c and thyroid dysfunction (P = 0.179).

According to duration of DM, the patients were divided into four groups of > 10, 6-10, 1-5, and  $\leq 1$  year, and the percentages of thyroid dysfunction in these groups were 18.8%, 56.3%, 18.8%, and 6.3%, respectively. On the other hand, in those without thyroid dysfunction, the percentages were 27.0%, 24.3%, 23.0%, and 25.7%, respectively. There was no significant association between duration of DM and presence of thyroid dysfunction (P = 0.419) as is shown in table 3.

## Discussion

In this study, 90 patients with type 2 DM were screened for thyroid dysfunction. Of them, 16 patients (17.7%) had thyroid dysfunction; remaining 74 patients (82.3%) were euthyroid. These findings are consistent with studies of Khurana et al.<sup>8</sup> which revealed overall prevalence of thyroid dysfunction of 16.0% and Papazafiropoulou et al.<sup>10</sup> which showed the prevalence rate of 12.3% among patients with DM. Another study indicated that thyroid dysfunction was present in 16.0% of Saudi patients with type 2 DM.<sup>11</sup> Similarly, a study from Jordan reported the overall prevalence of thyroid disease in 12.5% of patients.<sup>12</sup>

Subclinical hypothyroidism was the most common thyroid abnormality reported in 11.1% of patients followed by hypothyroidism which was seen in 3.3%; hyperthyroidism and subclinical hyperthyroidism were seen in 2.2% and 1.1% of patients, respectively. These findings were in line with results of Perros et al.,<sup>11</sup> Khurana et al.,<sup>8</sup> Radaideh et al.,<sup>12</sup> and Centeno Maxzud et al.<sup>13</sup>

In this study, no significant difference was observed in prevalence of thyroid dysfunction between male and female subjects; these findings are in contrast with several studies which showed higher prevalence of thyroid dysfunction in female patients.<sup>8,11,14</sup>

**Table 3. Association of hemoglobin A1c (HbA1c) and duration of diabetes with thyroid dysfunction in patients with diabetes**

Variable	HbA1c Group			P	Duration of Diabetes (year)				P
	< 6.5% (n = 6)	$\geq 6.5\%$ (n = 84)			$\leq 1$ (n = 20)	1-5 (n = 20)	6-10 (n = 27)	> 10 (n = 23)	
Thyroid dysfunction									
Present (n = 16)	0 (0)	16 (100)	0.179	1 (6.3)	3 (18.8)	9 (56.3)	3 (18.8)	0.419	
Absent (n = 74)	6 (8.1)	68 (91.9)		19 (25.7)	17 (23.0)	18 (24.3)	20 (27.0)		

Amounts are presented as number (Percent).

All patients with thyroid abnormality had HbA1C value greater than 7.0%. Moreover, this study demonstrated high prevalence of thyroid abnormality in subjects older than 60 years of age which was assumed significant statistically ( $P = 0.022$ ). A study done by Jali et al. also reported increasing prevalence of thyroid dysfunction with advancing of age.<sup>15</sup> This study could not establish significant association between duration of DM and thyroid abnormality.

### Conclusion

There is a high prevalence of thyroid dysfunction in patients with type 2 DM. Subclinical hypothyroidism followed by hypothyroidism was the most common abnormality; the incidence is higher in elderly patients and in patients with uncontrolled DM. Thus, it is advised to do regular screening of patients with type 2 DM for potential thyroid abnormality.

### Conflict of Interests

Authors have no conflict of interests.

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### References

1. DeFronzo RA. Banting Lecture. From the triumvirate to the ominous octet: A new paradigm for the treatment of type 2 diabetes mellitus. *Diabetes* 2009; 58(4): 773-95.
2. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004; 27(5): 1047-53.
3. Duntas LH, Orgiazzi J, Brabant G. The interface between thyroid and diabetes mellitus. *Clin Endocrinol (Oxf)* 2011; 75(1): 1-9.
4. Iwen KA, Schroder E, Brabant G. Thyroid hormones and the metabolic syndrome. *Eur Thyroid J* 2013; 2(2): 83-92.
5. Crunkhorn S, Patti ME. Links between thyroid hormone action, oxidative metabolism, and diabetes risk? *Thyroid* 2008; 18(2): 227-37.
6. Palma CC, Pavesi M, Nogueira VG, Clemente EL, Vasconcellos MF, Pereira LJ, et al. Prevalence of thyroid dysfunction in patients with diabetes mellitus. *Diabetol Metab Syndr* 2013; 5(1): 58.
7. Mouradian M, Abourizk N. Diabetes mellitus and thyroid disease. *Diabetes Care* 1983; 6(5): 512-20.
8. Khurana A, Dhoat P, Jain G. Prevalence of thyroid disorders in patients of type 2 diabetes mellitus. *J Indian Acad Clin Med* 2016; 17(1): 12-5.
9. Brenta G. Diabetes and thyroid disorders. *The British Journal of Diabetes & Vascular Disease* 2010; 10(4): 172-7.
10. Papazafiropoulou A, Sotiropoulos A, Kokolaki A, Kardara M, Stamataki P, Pappas S. Prevalence of thyroid dysfunction among greek type 2 diabetic patients attending an outpatient clinic. *J Clin Med Res* 2010; 2(2): 75-8.
11. Perros P, McCrimmon RJ, Shaw G, Frier BM. Frequency of thyroid dysfunction in diabetic patients: Value of annual screening. *Diabet Med* 1995; 12(7): 622-7.
12. Radaideh AR, Nusier MK, Amari FL, Bateiha AE, El-Khateeb MS, Naser AS, et al. Thyroid dysfunction in patients with type 2 diabetes mellitus in Jordan. *Saudi Med J* 2004; 25(8): 1046-50.
13. Centeno Maxzud M, Gomez Rasjido L, Fregenal M, Arias Calafiore F, Cordoba Lanus M, D'Urso M, et al. Prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus. *Medicina (B Aires)* 2016; 76(6): 355-8.
14. Michalek AM, Mahoney MC, Calebaugh D. Hypothyroidism and diabetes mellitus in an American Indian population. *J Fam Pract* 2000; 49(7): 638-40.
15. Jali MV, Kamar S, Jali SM, Pawar N, Nalawade P. Prevalence of thyroid dysfunction among type 2 diabetes mellitus patients. *Diabetes Metab Syndr* 2017; 11(Suppl 1): S105-S108.