

Study of Prevalence of Thyroid Dysfunction in Patients with Type 2 Diabetes Mellitus

Navneet Agrawal¹, Manoj Gulati²

ABSTRACT

Introduction: Type 2 diabetes mellitus and thyroid dysfunction shares the common endocrinopathies. Thyroid dysfunction complicates diabetes management and related complications. The present study was performed to find the prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus (Type 2 DM).

Material and Methods: The present retrospective study included 100 patients of Type 2DM who were coming to Diabetes Obesity & Thyroid Centre, Gwalior for consultation. A brief history and examination was done, blood samples were taken and sent to Thyrocare labs, Mumbai for investigations including thyroid function tests and HbA1c.

Results: Most of the patients belong to age group of ≥ 50 years (66%) with mean age of 54.63 ± 8.85 years and there was male predominance. Mean T3 (ng/dl), T4 ($\mu\text{g/dl}$), TSH ($\mu\text{IU/ml}$) and HbA1c (%) level was 99.75 ± 20.58 , 9.32 ± 1.93 , 4.20 ± 4.51 and 7.58 ± 0.72 respectively. In present study, 27.8% had associated thyroid dysfunction, out of that 15.2% had subclinical hypothyroidism, 10.6% had clinical hypothyroidism and 2% had hyperthyroidism.

Conclusion: Thyroid hormone dysfunction is common in patients with type 2 DM and as it affects the metabolic control, there is a need for thyroid estimation in type 2 diabetics.

Keywords: thyroid dysfunction, type 2 diabetes mellitus, triiodothyronine, thyroxine, thyroid stimulating hormone

INTRODUCTION

The connection between thyroid dysfunction and diabetes mellitus is reported by different clinical trials around the world. Diabetes affects thyroid functions at various levels and thyroid hormones influence carbohydrate metabolism and pancreatic functions to variable extents. In patients with diabetes, thyroid function is significantly altered such as thyrotropin-releasing hormone (TRH) release from hypothalamus and conversion of T4 to T3.¹

A study on 7097 type 1 diabetes mellitus (T1DM) patients reported a prevalence of 9.5% of thyroid dysfunction.² A clinic based study comprising of both T1DM and type 2 diabetes mellitus (T2DM) patients (1310 patients) reported a higher prevalence (13.4%) of thyroid dysfunction.³

In a patient with diabetes, the most common type of thyroid dysfunction is hypothyroidism. It results in reduced hepatic glucose production which means a reduced insulin dose is required in a patient with hypothyroid diabetics.⁴ On the other hand impaired insulin stimulated glucose utilization in peripheral tissues has been reported in both clinical and subclinical hypothyroidism which accounts for insulin resistance. So, hypothyroidism predisposes to hypoglycemia, and at the same time, causes insulin resistance.⁴

Also in patients with T2DM, hyperthyroidism is reported to be more common compared to normal people. In many patients, uncontrolled hyperthyroidism may be the reason for poor

glycemic control and recurrent diabetic ketoacidosis.⁵

In response to hyperthyroidism gut absorption of glucose is increased along with endogenous glucose production.⁵

The present study was a clinic based analysis to find the prevalence of thyroid disorders in patients with T2DM.

MATERIAL AND METHODS

It was a retrospective analysis of 100 patients of T2DM who came for consultation at Diabetes, Obesity and Thyroid centre, Gwalior. Before the start of the study, informed consent was taken from the patients and the ethical approval was taken from the local authorities.

Patients with history suggestive of T2DM of either sex on oral hypoglycemic agent and/or insulin, even not taking any medication for diabetes were included. Diagnosis of T2DM was done as per the criteria suggestive by American Diabetes Association. HbA1c of $\geq 6.5\%$ was considered as diabetic.

A brief history regarding details of diabetes, glycemic control, family history of diabetes and thyroid disorders and other comorbidities was taken and blood samples were sent to Thyrocare Lab Mumbai for investigations.

Thyroid functions were classified as Normal, (thyroid-stimulating hormone (TSH) = $0.30 - 5.5 \mu\text{IU/ml}$; thyroxine (T4) = $4.5 - 12.0 \mu\text{g/dl}$ and triiodothyronine (T3) = $60 - 200 \text{ ng/dl}$), Hypothyroidism (total T4 $< 4.5 \mu\text{g/dl}$ and TSH $> 5.5 \mu\text{IU/ml}$), Subclinical hypothyroidism (T4 is within normal limits but TSH $> 5.5 \mu\text{IU/ml}$) and Hyperthyroidism (serum TSH $< 0.3 \mu\text{IU/ml}$).

STATISTICAL ANALYSIS

All the data were analyzed using IBM SPSS version 20 software. Analysis was performed using chi-square test and independent sample student t test. P values < 0.05 was considered to be significant.

RESULTS

In present study, most of the patients were above the age group of ≥ 50 years (66%). Mean age of study population was 54.63 ± 8.85 years. There were 36% female and 64% males. The mean average blood glucose of study population was $206.09 \pm 52.08 \text{ mg/dl}$.

¹Diabetologist, Department of Diabetes, Obesity and Thyroid Centre, ²Consultant, Department of Physician, Parivaar Hospital, Gwalior, India

Corresponding author: Dr Navneet Agrawal, 33, Lalitpur Colony, Near Shankar Chowk, Lashkar, Gwalior 474001, India

How to cite this article: Navneet Agrawal, Manoj Gulati. Study of prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus. International Journal of Contemporary Medical Research 2016;3(8):2212-2214.

Thyroid Dysfunction		Total patients (%)	HbA1c % (mean±SD)
Hypothyroidism	TSH (>5.5µIU/ml)	10.6	8.82 ± 0.62
	T3(T3 <60 ng/dl)		
	T4 (<4.5µg/dl)		
Subclinical hypothyroidism	TSH (>5.5µIU/ml)	15.2	7.98 ± 0.56
	T3 (60-200 ng/dl)		
	T4 (4.5 - 12.0 µg/dl)		
Hyperthyroidism	TSH (<0.3 µIU/ml)	2	6.84±1.02
	T3 (>200 ng/dl)		
	T4 (>12.0 µg/dl)		
TSH; thyroid-stimulating hormone, T3; triiodothyronine, T4; thyroxine, HbA1c; glycated hemoglobin			
Table-1: Distribution of thyroid dysfunction and HbA1c in study population			

Mean T3 (ng/dl), T4 (µg/dl), TSH (µIU/ml) and HbA1c (%) level was 99.75±20.58, 9.32±1.93, 4.20±4.51 and 7.58 ±0.72 respectively.

DISCUSSION

Diabetes mellitus is serious health related problem affecting a large number of populations worldwide. The associations between diabetes and thyroid disorders have long been reported and they have been shown to mutually influence each other.¹

In present study, there was a male predominance with mean age of study group being 54.63±8.85 years. The present study recorded a high prevalence of thyroid dysfunction (27.8%) in patients with type 2 DM, as also reported in a study done by Díez et al in Spain, who have reported 32.4% prevalence of thyroid dysfunction.⁶

Another study done by Perros et al had reported a prevalence of 13.4% in patients with diabetes.³ Radaideh et al did a similar study in Jordan and reported that the overall prevalence of thyroid dysfunction in T2DM patients to be 12.5%.⁷ In present study 15.2% had subclinical hypothyroidism and 10.6% had clinical hypothyroidism.

Reports have shown that onset of diabetes come approximately one decade before the diagnosis of thyroid dysfunction.⁹

Bharat et al did a similar study on 60 diabetic patients and reported higher TSH level ($P<0.05$) and lower T4 level ($P<0.05$) in patients with diabetes as compared to normal patients. They found similar T3 level in both the group ($P>0.05$).¹⁰ In present study also hypothyroidism was more prevalent in diabetic patients, which is similar to the study done by Islam et al and Suzuki et al.^{11,12}

Demitrost et al observed that 16.3% had subclinical hypothyroidism, 11.4% had hypothyroidism and 1.5% were hyperthyroidism cases in their study.¹³ Our data is in accordance with their findings.

The reason behind the abnormal thyroid hormone level in diabetic patients may be due to insulin which increases the free T4 level while it decreases the T3 level by stopping the T4 to T3 conversion and reduced TRH synthesis in diabetic patients.¹² Reports have also shown that glycaemic control is also determined by insulin which is reported to regulate TSH and TRH level.¹⁴

A disturbance in thyroid level may also exaggerate chances of cardiovascular disease in patient with diabetes by inter-relationships with insulin resistance, dyslipidaemia and endothelial dysfunction.¹⁰

Inability to diagnose abnormal thyroid hormone levels in

patients with diabetes is often a reason for poor diabetic management.¹⁵ If a patient is showing unexplained alteration in metabolic control, thyroid function tests should be performed.¹⁶

Study limitation

The present study was done with small number of patients; a large randomized clinical trial is required to confirm the findings of the present study.

CONCLUSION

The prevalence of thyroid dysfunction in patients with T2DM in present study was 27.8%. 15.2% had subclinical hypothyroidism, 10.6% had clinical hypothyroidism and 2% had hyperthyroidism. All patients with type 2 DM should be selectively screened for thyroid dysfunction to achieve a good metabolic control.

REFERENCE

1. Shah SN. Thyroid disease in diabetes mellitus. JAPI. 2007; 32:1057-1059.
2. Kordonouri O, Klinghammer A, Lang EB, Grueters-Kieslich A, Grabert M, Holl RW. Thyroid autoimmunity in children and adolescents with type 1 diabetes: a multicenter survey. Diabetes Care. 2002;25:1346-50.
3. Perros P, McCrimmon RJ, Shaw G, Frier BM. Frequency of thyroid dysfunction in diabetic patients: value of annual screening. Diabet Med. 1995;12:622-7.
4. Maratou E, Hadjidakis D J, Kollias A et al. Studies of Insulin resistance in patients with clinical and subclinical hypothyroidism. European journal of Endocrinology. 2009;160:785-90.
5. Wang C. The Relationship between Type 2 Diabetes Mellitus and Related Thyroid Diseases, Journal of Diabetes Research. 2013;2013:1-9.
6. Díez JJ, Sánchez P, Iglesias P. Prevalence of thyroid dysfunction in patients with type 2 diabetes. Exp Clin Endocrinol Diabetes. 2011;119:201-7.
7. 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;25:1046-50.
8. Ramesh V, Geetha R, Anitha D, Swamy NRVK, Panneerselvam TT. The Study of Thyroid Dysfunction among Type 2 Diabetic Patients. Int J Curr Res Aca Rev. 2015;3:14-8.
9. Udiog CE, Udoh AE, Etukudoh ME. Evaluation of thyroid function in diabetes mellitus in Calabar, Nigeria. Indian J Clin Biochem. 2007;22:74-8.
10. Bharat, Hijam D, Gangte D, Lalnunpui, Premchand, Devi I et al. Thyroid Status in Diabetes Mellitus. J Glycomics

- Lipidomics. 2013;3:1-4.
11. Islam S, Yesmine S, Khan SA, Alam NH, Islam S. A comparative study of thyroid hormone levels in diabetic and non-diabetic patients. *Southeast Asian J Trop Med Public Health*. 2008;39:913-6.
 12. Suzuki Y, Nanno M, Gemma R, Tanaka I, Taminato T. The mechanism of thyroid hormone abnormalities in patients with diabetes mellitus. *Nihon Naibunpi Gakkai Zasshi*. 1994;70:465-70.
 13. Demitrost L, Ranabir S. Thyroid dysfunction in type 2 diabetes mellitus: A retrospective study. *Indian J Endocrinol Metab*. 2012;16(Suppl 2):S334-5.
 14. Saunders J, Hall SE, Sönksen PH Thyroid hormones in insulin requiring diabetes before and after treatment. *Diabetologia*. 1978;15:29-32.
 15. Kalra S, Kalra B, Chatley G. Prevalence of hypothyroidism in pediatric type 1 diabetes mellitus in Haryana, Northern India. *Thyroid Res Pract*. 2012;9:12-4.
 16. Sol'a EC, Morillas S, Garz M, Balaguer G, Hern'andez-Mijares A. Association between diabetic ketoacidosis and thyrotoxicosis. *Acta Diabetologica*. 2002;39:235-7.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 15-06-2016; **Published online:** 16-07-2016