

A study of thyroid functions in patients of type II diabetes milletus

Deepak G Bhosle¹, Ankur Vashisht^{2*}

¹Professor and HOD, ²Resident, Department of Medicine, Bharati Vidyapeeth Deemed University Medical College, Pune, Maharashtra.
Email: ankur_ishu@yahoo.co.in

Abstract

Background: Thyroid hormones have long been known as regulators of glucose metabolism. Both Hyperthyroidism and Hypothyroidism may act as disruptors of glucose homeostasis leading to a lack of metabolic control in Diabetic patients. Our study aims to screen Thyroid function test in patients with Type 2 Diabetes Mellitus and observe the different ways by which Thyroid profile varies in Type 2 Diabetes Mellitus. **Aim and Objective:** To evaluate the Thyroid function abnormalities in patients with Type 2 Diabetes Mellitus. **Methodology:** This study was carried out in 50 randomly selected type 2 Diabetes Mellitus patients according to the recommendation of WHO and National Diabetes Data Group (ADA,2012). Data collection includes detailed history regarding the presence of associated illness like Coronary artery disease, Hypertension, Cerebrovascular accident, symptoms of thyroid disorder and associated complications like Diabetic retinopathy and Diabetic neuropathy. Family history of Type 2 Diabetes Mellitus and Thyroid disorder was noted. Different investigations for diabetes and thyroid hormone were carried out. **Results and Discussion:** The prevalence of thyroid dysfunction among patients with DM was 32%. It was observed that mean T3, T4 and TSH levels among patients was $1.35 \pm 0.54 \mu\text{g/dl}$, $8.01 \pm 2.41 \mu\text{g/dl}$, $3.74 \pm 2.42 \mu\text{IU/ml}$ respectively. It was observed that there was no statistically significant relation between thyroid dysfunction and BMI, dyslipidemia, cardiovascular complications and Diabetic Complications among patients with DM.

Key Words: diabetes milletus.

*Address for Correspondence:

Dr. Ankur Vashisht, Resident, Department of Medicine, Bharati Vidyapeeth Deemed University Medical College, Pune, Maharashtra, INDIA.

Email: ankur_ishu@yahoo.co.in

Received Date: 10/12/2017 Revised Date: 19/01/2018 Accepted Date: 02/02/2018

DOI: <https://doi.org/10.26611/106527>

Access this article online

Quick Response Code:



Website:

www.medpulse.in

Accessed Date:
07 February 2018

INTRODUCTION

Diabetes and thyroid diseases are two common endocrinopathies seen in the general population. Diabetes is a group of aetiologically different metabolic defects characterised by hyperglycaemia resulting from defects in insulin secretion, insulin action, or both.¹ The World Health Organization (WHO) has projected that the global prevalence of diabetes will rise to 300 million (7.8%) by

2030.² Factors such as sedentary lifestyle, dietary indiscretions, ethnicity, hypertension and obesity are thought to be major contributions to this epidemic. Thyroid disorders are also common, with variable prevalence among different populations. Abnormal thyroid hormone levels can also be found in individuals with diabetes.³ Insulin resistance is a key pathological feature of type 2 diabetes and also occurs in both hypothyroidism and hyperthyroidism.⁴ The relation between type 2 diabetes and thyroid dysfunction is an important area of research as it could give further insights into the pathophysiological processes of metabolic syndrome, atherosclerosis, and related cardiovascular disorders. Hence, the aim of this study was to evaluate the thyroid function abnormalities in type 2 Diabetes Mellitus.

MATERIAL AND METHODS

This study was carried out in 50 randomly selected type 2 diabetes mellitus patients according to the

recommendation of WHO and National Diabetes Data Group (ADA,2012). The selection was done irrespective of their age and sex.

Inclusion Criteria: Patients with Type 2 Diabetes Mellitus.

Exclusion Criteria

1. Patients with type1 Diabetes Mellitus.
2. Drug induced Diabetes egpropranolol, thiazides.
3. Drug that can cause Thyroid dysfunctioneg. Lithium, amiodarone ,rifampicin.
4. Pancreatitis. Blood sugars were estimated by GOD POD METHOD. Family history of Type 2 Diabetes Mellitus and Thyroid disorder was noted.

The presence of associated illness like Coronary artery disease, Hypertension, Cerebrovascular accident and associated complications like Diabetic retinopathy, and Diabetic neuropathy were noted. A thorough history was recorded with particular emphasis on symptoms of Thyroid disorder like tiredness, weight gain/loss, cold/heat intolerance, constipation, change in voice, menstrual irregularities, behavioural changes, palpitation, dry skin/decreased sweating, somnolence/ insomnia, tremors. Scoring of the symptoms was done according to WAYNE SCALE⁵ and BILLEWICZ SCALE⁶ for Hyperthyroidism and Hypothyroidism respectively. Apart from all the routine investigations Thyroid function test were done in all patients. T3 ,T4 estimation was done by CLIA (Chemiluminescence Immuno Assay) system by ABBOTT ARCHITECT 1000SR. FT4 and ANTI-TPO antibodies were done as necessary. Lipid profile results were categorized as either normal or dyslipidaemic according to the Worlds health organization risk categorization of plasma lipid values. Subjects were classified normal weight if BMI is<25 or abnormal weight if BMI is 25 or higher. ECG was done in all 50 patients by SCHILLER machine after 15 minutes of supine rest. Cardiac stress test or 2D ECHO were done if required.

RESULTS

It was observed that majority of patients were in age group 51-60 years (46%) followed by 41-50 years (28%). Majority of patients were female (56%) and males were 44%. It was observed that majority of patients were having DM since 5-10 years (46%). The patients with DM >10 years were 20%. 52% patients were overweight followed by normal (36%). The patients with BMI as underweight were only 12%.

Table 1: Distribution of patients according to co-morbidity

| Co-morbidity | No. of Patients | Percentage |
|--------------------------------|-----------------|------------|
| Hypertension | 12 | 24.00 |
| Dyslipedemia | 11 | 22.00 |
| Coronary artery Disease | 03 | 06.00 |
| CVA | 02 | 04.00 |
| Diabetic Complications | 07 | 14.00 |
| Family H/O Type II DM | 04 | 08.00 |
| Family H/O Thyroid dysfunction | 03 | 06.00 |

(* Multiple response Present)

Table 2: Distribution according to prevalence of thyroid dysfunction among patients

| Thyroid Function Tests | No. of Patients | Percentage |
|------------------------|-----------------|------------|
| Normal | 34 | 68.00 |
| Abnormal | 16 | 32.00 |
| Total | 50 | 100 |

Table 4: Comparison of various parameters among diabetic and diabetic with thyroid dysfunction

| Parameters | T2DM Subjects | T2DM With TD | P value |
|-------------------|---------------|---------------|---------|
| FBS | 158.11±15.23 | 172.12±15.26 | >0.05 |
| PBS | 185.21 ±23.16 | 190.42 ±23.25 | >0.05 |
| Hb1Ac | 7.26±0.73 | 7.41±0.78 | >0.05 |
| LDL | 112.11 ±24.09 | 121.21 ±24.23 | >0.05 |
| HDL | 44.11±5.09 | 40.19±5.39 | >0.05 |
| VLDL | 32.61± 7.16 | 37.71± 7.18 | >0.05 |
| Total cholesterol | 200.83 ±28.25 | 209.32 ±28.92 | >0.05 |
| Triglycerides | 161.21 ±31.16 | 169.21 ±31.45 | >0.05 |

P>0.05 Not Statistically Significant)

Table 5: Diagnostic efficacy of Billewicz Score for diagnosing hypothyroidism

| Score | Hypothyroidism | | Total |
|--------------|----------------|-----------|-----------|
| | Yes | No | |
| ≥25 | 04 | 11 | 15 |
| <25 | 07 | 28 | 35 |
| Total | 11 | 39 | 50 |

Table 6:

| | |
|---------------------------|---------------|
| Sensitivity | 36.36% |
| Specificity | 87.50% |
| Positive predictive value | 50% |
| Negative predictive value | 80% |

Table 7: Diagnostic efficacy of Wayne Score for diagnosing hyperthyroidism

| Score | Hyperthyroidism | | Total |
|--------------|-----------------|-----------|-----------|
| | Yes | No | |
| ≥20 | 03 | 14 | 17 |
| <20 | 02 | 31 | 33 |
| Total | 05 | 45 | 50 |

Table 8:

| | |
|---------------------------|------------|
| Sensitivity | 60% |
| Specificity | 68.89% |
| Positive predictive value | 17.65% |
| Negative predictive value | 93.94% |

DISCUSSION

In the present study, it was observed that majority of patients were in age group 51-60 years (46%) followed by 41-50 years (28%). Similar findings were seen in Vikram B Vikhe *et al*⁷ and Firdushi Begum⁸. Similar findings were seen in study by Monthir Mahmood Suhail⁹ on thyroid function tests of Type 2 Diabetic patients the mean ages was 53.00 ± 11.90 years with female dominance. In the present study, majority of patients were female (56%) as compared to males (44%). Similar findings were seen in Vikram B Vikhe *et al*⁷ and Firdushi Begum⁸. In the present study, it was observed that prevalence of thyroid dysfunction among patients with DM was 32%. Similar findings were seen by Monthir Mahmood Suhail⁹ (20%), Vikram B Vikhe *et al*⁷ (30%). The prevalence of thyroid dysfunction among DM patients was common in age group 51-60 years (16%) followed by age group >60 years (8%) with female dominance (22%). In a study by Firdushi Begum⁸ hypothyroid diabetics 37.13% were in the age group of 46-55 years and hyperthyroid diabetics 50% were in this age group. Vikram B Vikhe *et al*⁷ found incidence of thyroid disorder more in females as compare to males in type 2 DM. In our study the majority of patients presented with subclinical hypothyroidism (14%), followed by primary hypothyroidism (8%), primary hyperthyroidism (8%) and subclinical hyperthyroidism (2%). Similar findings were observed in Asmabi Makandar *et al*¹⁴ and Vikram B Vikhe *et al*⁷. It was observed that mean T3, T4 and TSH levels among patients was $1.35 \pm 0.54 \mu\text{g/dl}$, $8.01 \pm 2.41 \mu\text{g/dl}$, $3.74 \pm 2.42 \mu\text{IU/ml}$ respectively. In a study done by Vikram B Vikhe *et al*⁷ observed serum levels of T3 and T4 were significantly lower in diabetic whereas level of serum TSH was higher in diabetic patients. The abnormal thyroid hormone levels found in the diabetics may be the outcome of the various medications the diabetics were receiving and may depend on the glycemic status. Many investigators have reported that treatment of diabetes with sulfonylurea as led to an increased incidence of hypothyroidism. It is known to suppress the levels of FT4 and T4 while causing raised levels of TSH. Insulin, an anabolic hormone enhances the level of FT4 while it suppresses the levels of T3 by inhibiting hepatic conversion of T4 to T3. Suzuki *et al* attributed the abnormal thyroid hormone levels found in diabetes to the presence of Thyroid Hormone Binding Inhibitor (THBI), an inhibitor of extra thyroidal conversion enzyme of T4 to T3 and dysfunction of hypothalamus – hypophyseal thyroid axis. These situations may prevail in diabetics and would be aggravated in poorly controlled diabetics. Stress which is associated with diabetes mellitus may also cause changes in the hypothalamus anterior pituitary axis in

these diabetics. It was observed that there was no statistically significant relation between thyroid dysfunction and BMI, dyslipidemia, cardiovascular complications and Diabetic Complications among patients with DM. The findings were in contrast to Jain G *et al*¹⁵ who observed statistically significant association between thyroid dysfunction and BMI. A study by Chubb *et al*¹⁶ did not find any significant relationship between subclinical hypothyroidism and the presence of dyslipidemia. In a study by Ravishankar *et al*¹⁰ diabetic complications and thyroid disorders have no statistical significance. It was observed that there was no statistically significant relation between blood sugar parameters and lipid profile of thyroid dysfunction patients and euthyroid DM patients. ($P > 0.05$). DM appears to influence thyroid function in two sites; first, at the level of hypothalamic control of thyroid-stimulating hormone release and second, at the conversion of T4 to T3 in the peripheral tissue. Marked hyperglycemia causes reversible reduction of the activity and hepatic concentration of T4-5 deiodinase, causing low serum concentrations of T3 and elevated levels of T4. DM is associated with increased insulin level and C-peptide level. Insulin is an anabolic hormone known to enhance TSH turnover, which is protein in nature. Recently, C-peptide has been shown to enhance Na^+/K^+ ATPase activity, an action that may also increase protein synthesis. Such an action would induce increased turnover of TSH, a protein hormone. Stress, which is associated with diabetes, may also cause changes in the hypothalamus–anterior–pituitary axis in diabetics. It appears that the presence of subclinical hypothyroidism and hyperthyroidism may result from hypothalamus–hypophyseal–thyroid axis disorders. There is growing evidence of an association between thyroid dysfunction and diabetes. Uncontrolled hyperthyroidism in diabetes may trigger hyperglycaemic emergencies while recurrent hypoglycaemic episodes have been reported in diabetic patients with hypothyroidism. Furthermore, thyroid dysfunction may amplify cardiovascular disease risk in diabetic patients though inter-relationships with dyslipidaemia, insulin resistance, and vascular endothelial dysfunction. In present study, efficacy of Billewicz Score for diagnosing hypothyroidism showed that Billewicz Score sensitivity, specificity, PPV and NPV were 36.36%, 87.50%, 50% and 80% respectively. It was observed that Wayne Score sensitivity, specificity, PPV and NPV were 60%, 68.89%, 17.65% and 93.94% respectively. B.A. Kolawole *et al*¹⁷ conducted a study on relationship between thyroid hormone levels and hyperthyroid signs and symptoms by Wayne scale. It was observed that Wayne scale showed no significant correlation with thyroid hormone levels. The Wayne

score may however be more reliable in the initial assessment of suspected thyrotoxicosis.

CONCLUSION

Diabetes Mellitus and thyroid diseases are the two common endocrinopathies seen in the adult population. The prevalence of thyroid dysfunction was found to be higher in diabetic patients. It was observed that there was no statistically significant relation between thyroid dysfunction with BMI, diabetic complications and dyslipidemia among patients with DM. The early diagnosis and management of thyroid dysfunction in case of diabetics for prevention of complications is needed. It is therefore important to diagnose thyroid dysfunction in diabetic patients and this practice should be inculcated in clinical settings.

REFERENCES

1. Tunbridge WMG, Evered DC, Hall R, Appleton D, Brewis M, Clarke F et al (1977). The spectrum of thyroid disease in a community: the Whickham survey. *ClinEndocrinol.* 1977;7:481-493.
2. Wild, S., Roglic, G., Green, A., Sicree, R. and King ,H. (2004). Global prevalence of diabetes. *Diabetes Care.*2004; 27:1047- 1053.
3. Gray, R.S., Irvine, W.J. and Clarke, B.F.(1979). Screening for thyroid dysfunction in diabetics. *Br Med J.* 1979;2 (6 202): 1439.
4. Brenta G, Ceh FS, Pisarer M, et al. Acute hormone withdrawal in athyreotic patients results in a state of insulin resistance. *Thyroid* 2009; 19(6): 665–9.
5. Weinstan SP, O’Boyle M, Fisher M, et al. Regulation of GLUT 2 glucose transporter expression in liver by thyroid hormone: evidence for hormone regulation of the hepatic glucose system. *Endocrinology* 1994; 135(2): 649–54.
6. Mokano T, Uchimura K, Hayashi R, et al. Glucose transporter 2 concentrations in hyper- and hypothyroid rat livers. *J Endocrinol*1999; 160(2): 285–9.
7. Vikram B Vikhe, Shubhangi A Kanitkar, Krunal K Tamakuwala, Anu N Gaikwad, MeenakshiKalyan, Rajani R Agarwal. Thyroid Dysfunction In Patients With Type 2 Diabetes Mellitus At Tertiary Care Centre. *National Journal Of Medical Research* 2013; 3 (4): Page 377-380.
8. Dr. Firdushi Begum A Study of Thyroid Function in Diabetes Mellitus *JMSCR* 2014; 2 (6): 1531-1539. *Science and Public Health | 2015 | Vol 4 | Issue 6* 769-772.
9. MonthirMahmoodSuhail. Thyroid Function Tests of Type 2 Diabetic Patients in Baghdad Governorate (ElMahmoodiya District). *Medical Journal of Babylon-2014; Vol. 11- No. 1 :162-168*
10. Dr. Ravishankar, S.N, Dr. Champakamalini, Dr. Venkatesh, Dr. Mohsin. A prospective study of thyroid - dysfunction in patients with Type 2 diabetes in general population*iMedPub Journals* 2013Vol. 5 No. 1:2 :1-9.
11. LalooDemitrost and Salam Ranabir. Thyroid dysfunction in type 2 diabetes mellitus: A retrospective study. *Indian J EndocrinolMetab.* 2012 Dec; 16(Suppl 2): S334–S335
12. P. Perros, R. J. McCrimmon, G. Shaw, and B. M. Frier, “Frequency of thyroid dysfunction in diabetic patients: value of annual screening,” *Diabetic Medicine*, vol. 12, no. 7, pp. 622– 627, 1995.
13. A. Papazafropoulou, “Prevalence of thyroid dysfunction among greek Type 2 diabetic patients attending an outpatient clinic,” *Journal of Clinical Medicine Research*, vol. 2, no. 2, pp. 75–78, 2010.
14. AsmabiMakandar, Amit D Sonagra, Nadia Shafi. Study of thyroid function in type 2 diabetic and non-diabetic population. *International Journal of Medical Science and Public Health | 2015 | Vol 4 | Issue 6* 769-772.
15. Jain G, Marwaha TS, Khurana A, Dhoat PS. Prevalence of Thyroid disorders in Patients of type 2 Diabetes Mellitus. *Int J Med and Dent Sci* 2013; 2(2): 153-161.
16. Chubb SA, Davis WA, Inman Z, Davis TM. Prevalence and progression of subclinical hypothyroidism in women with type 2 diabetes: the Fremantle Diabetes Study. *ClinEndocrinol (Oxf)* 2005;62(4):480-486.
17. B.A. Kolawole, R.T. Ikem, O.O. Lawal.Relationship between Thyroid Hormone levels and Hyperthyroid Signs and symptoms.*Nig J Clinical Practice* Vol.5(1) 2002: 29-31

Source of Support: None Declared
Conflict of Interest: None Declared