



CROSS SECTIONAL STUDY ON THE PREVALANCE OF THYROID ABNORMALITIES IN PEOPLE WITH NEWLY DIAGNOSED TYPE 2 DIABETES MELLITUS AND PEOPLE WITHOUT DIABETES MELLITUS

Rangaswamy M

Assistant professor, Department of general medicine, Govt Vellore medical college hospital,vellore

Vijayakumar N

Junior resident, Department of general medicine, Govt. medical college, Omandhurar Govt. estate,chennai

ABSTRACT

Background and objectives: To compare the prevalence and distribution of thyroid function abnormalities in people with newly diagnosed type 2 diabetes mellitus and people without diabetes mellitus.

Methods: In this cross sectional study 194 subjects with newly diagnosed type 2 diabetes mellitus and 190 subjects without diabetes mellitus were investigated for blood sugar, free T3,free T4,TSH, total cholesterol and triglyceride levels. Statistical analysis was done using SPSS 16 software. The difference between various parameters was considered statistically significant when the p value was < 0.05

Results: The prevalence of thyroid dysfunction was significantly higher in people with newly diagnosed type 2 diabetes mellitus(23.7%) than people without diabetes mellitus(6.3%)(p value < 0.001). Prevalence of thyroid dysfunction among males is 9.94% and among females is 20.20%(p value 0.004). Among people with newly diagnosed type 2 diabetes mellitus the prevalence of subclinical hypothyroidism, overt hypothyroidism, subclinical hyperthyroidism, overt hyperthyroidism are 16.5%, 4.6%, 2.1%, 0.5% respectively. Among non diabetic subjects the prevalence of subclinical hypothyroidism, overt hypothyroidism and subclinical hyperthyroidism are 4.7%, 1.1%, 0.5% respectively.

Interpretation and Conclusions: Thyroid function abnormalities are more common in people with newly diagnosed type 2 diabetes mellitus than non-diabetic subjects and the prevalence is higher in females than males. Subclinical hypothyroidism is the most common thyroid abnormality both in diabetic and non diabetic subjects. Our study emphasis the need to check thyroid function status in people with diabetes mellitus.

KEYWORDS : type 2 diabetes mellitus, thyroid dysfunction, TSH, free T3, free T4.

INTRODUCTION

Diabetes mellitus is a common endocrine disorder that involves multiple organs of the body leading to significant morbidity and mortality due to its accompanying complications. The burden of diabetes mellitus in India as estimated by World Health Organisation was 31.7 million in the year 2000 and 50.8 million in the year 2010¹. This number is expected to rise to 87 million in the year 2030¹. The Indian Council of Medical Research estimated that India has a prevalence of 77.2 million people with prediabetes and 62.4 million people with diabetes in the year 2011².

Thyroid disorders are the second common endocrine disorders occurring next to diabetes mellitus. The prevalence of thyroid diseases are higher in people with diabetes mellitus than those without diabetes mellitus^{3,4}. Insulin and thyroid hormones play vital role in maintenance of cellular metabolism. Abnormality in one hormone level may alter the functional state of other hormone. Of all the thyroid dysfunctions subclinical hypothyroidism is the most common abnormality as per previous studies^{5,6,7}

Autoimmunity is the main reason explaining the association between type 1 diabetes mellitus and thyroid dysfunction. Though the mechanism behind association between type 2 diabetes mellitus and thyroid dysfunction is not clear it could be due to abnormal TSH response to TRH, absence of nocturnal TSH peak and a low T3 state³. Recognition and management of thyroid dysfunction in diabetes mellitus helps to achieve a good glycemic control, decrease the cardiovascular risk and improve the general wellbeing. This study aims to estimate the prevalence of thyroid function abnormalities in people with newly detected diabetes mellitus and to compare it with the non diabetic population attending the outpatient department of Government Vellore medical college Hospital during the period between august 2014 and July 2015.

AIMS AND OBJECTIVES

To compare the prevalence and distribution of thyroid function abnormalities in people with newly diagnosed with type 2 diabetes mellitus and people without diabetes mellitus.

MATERIALS AND METHODS

This cross sectional study on prevalence of thyroid function abnormalities among people with newly diagnosed type 2 diabetes mellitus and non diabetic subjects was done in Government Vellore Medical College Hospital, Vellore.

Study design: cross sectional study

Sample size: 384

Study period: August 2014 - July 2015

Place of study: Government Vellore Medical College, Vellore

Inclusion criteria:

People with newly diagnosed type 2 diabetes mellitus of age more than 30 years.

Healthy subjects of age more than 30 years without diabetes mellitus.

Exclusion criteria:

Pregnant women

People with known thyroid disorder

Acute illness/infection

People taking drugs that alter thyroid function

People not willing to participate in the study

Methodology:

People with newly diagnosed type 2 diabetes mellitus who attended the outpatient department of Government vellore medical college hospital were included in one group and healthy people accompanying the patients coming to outpatient department were included in other group. After obtaining written and informed consent from the study population detailed history was elicited and physical examination was performed. Venous blood was drawn from the subjects and sample was sent for blood sugar, free T3, free T4, TSH, Total cholesterol and triglyceride levels. Patient details regarding the general information, clinical findings and investigation results are all filled in specially designed proforma.

Statistical analysis:

Statistical analysis was done using SPSS 16 software. Quantitative data was expressed in mean, median, mode and standard deviation. Qualitative data was expressed by Chisquare test . The difference was considered statistically significant when p value < 0.05

Operational guidelines:

- Subclinical hypothyroidism
 - Normal free T3 and free T4
 - Elevated TSH
- Overt hypothyroidism
 - Low free T3/free T4
 - Elevated TSH
- Subclinical hyperthyroidism
 - Normal free T3 and free T4
 - Decreased TSH
- Overt hyperthyroidism
 - High free T3/ free T4
 - Decreased TSH

RESULTS AND ANALYSIS:

A total sample of 384 subjects were studied of which 191(49.7%) were males and 193 were females(50.3%). Of the total sample 194(50.52%) were newly diagnosed diabetics and 190(49.47%) were non diabetic subjects.

Table 1. Distribution of study population based on the diabetic status.

GROUP	MALES	FEMALES	TOTAL
Diabetic subjects	90(46.39%)	104(53.60%)	194
Non diabetic subjects	101(53.15%)	89(46.84%)	190
Total	191	193	384

In the study population 46.6% were in the age group 30 to 49 years, 47.1% were in the age group 50-69 years and 6.2% were in the age of 70 years and above.

Table 2. Age distribution of the study population

AGE IN YEARS	DIABETIC SUBJECTS	NON DIABETIC SUBJECTS
30-49	95(49%)	84(44.2%)
50-69	87(44.8%)	94(49.5%)
70 AND ABOVE	12(6.2%)	12(6.3%)
TOTAL	194(100%)	190(100%)

Mean age of the study population in people with newly diagnosed diabetes mellitus is 50.67+ 10.07 years. Mean age of the study population in non diabetic subjects is 51.03+ 9.99 years.

Out of 194 subjects with newly diagnosed type 2 diabetes mellitus 23.7% had thyroid dysfunction . Among the non diabetic subjects 6.3% had thyroid dysfunction . The percentage of thyroid function abnormalities is significantly higher in people with newly diagnosed type 2 diabetes mellitus (23.7%) than people without diabetes mellitus (6.3%)(p < 0.001). Among people with newly diagnosed type 2 diabetes mellitus the prevalence of subclinical hypothyroidism, overt hypothyroidism, subclinical hyperthyroidism, overt hyperthyroidism are 16.5%, 4.6%, 2.1%, 0.5% respectively. Among non diabetic subjects the prevalence of subclinical hypothyroidism, overt hypothyroidism and subclinical hyperthyroidism are 4.7%, 1.1% and 0.5% respectively. Among the total study population of 384 subjects, 58 subjects (15.10%) had thyroid dysfunction. Of these 58 subjects with thyroid dysfunction, 39 subjects were females and 19 were males.(p = 0.004).

Table 3. DISTRIBUTION OF THYROID FUNCTION ABNORMALITIES IN SUBJECTS WITH NEWLY DETECTED DIABETES MELLITUS

Sex	Euthyroid	Subclinical hypothyroid	Overt hypothyroid	Subclinical hyperthyroid	Overt hyperthyroid
Male	75(83.3%)	12(13.3%)	2(2.2%)	1(1.1)	0
Female	73(70.2%)	20(19.2%)	7(6.7%)	3(2.9%)	1(1%)

Among the diabetic subjects the common thyroid abnormalities are subclinical hypothyroidism followed by overt hypothyroidism, subclinical hyperthyroidism and overt hyperthyroidism in that order in both sexes.

Table 4. DISTRIBUTION OF THYROID FUNCTION ABNORMALITIES IN NON DIABETIC SUBJECTS

Sex	Euthyroid	Subclinical hypothyroid	Overt hypothyroid	Subclinical hyperthyroid	Overt hyperthyroid
Male	97(96%)	3(3%)	1(1%)	0	0
Female	81(91%)	6(6.7%)	1(1.1%)	1(1.1%)	0

Among the non diabetic subjects subclinical hypothyroidism is the most common thyroid dysfunction in both sexes.

CORRELATION WITH DYSLIPIDEMIA:

- The mean total cholesterol value in diabetic subjects is 186.64+ 36.43mg/dl.
- The mean total cholesterol value in non diabetic subjects is 175.21+ 29.73mg/dl.
- This difference in total cholesterol values between diabetic and non diabetic subjects is statistically insignificant.(P > 0.05)
- The mean triglyceride value in diabetic subjects is 130.13+ 32.19mg/dl.
- The mean triglyceride value in nondiabetic subjects is 122.93+ 22.68mg/dl.
- This difference in triglyceride values between diabetic and non diabetic subjects is statistically significant(p < 0.05)

TABLE 5. DISTRIBUTION OF DYSLIPIDEMIA IN DIABETIC AND NON DIABETIC SUBJECTS

DYSLIPIDEMIA	Newly diagnosed type 2 DM	NON DIABETIC SUBJECTS	TOTAL
PRESENT	45(23.2%)	20(10.5%)	65
ABSENT	149(76.8%)	170(89.5%)	319
TOTAL	194(100%)	190(100%)	384

- 23.2% of people with newly diagnosed diabetes mellitus and 10.5% of non diabetic subjects had dyslipidemia. This difference in the prevalence of dyslipidemia between diabetic and non diabetic subjects is statistically significant (p value = 0.001)

Table 6. DISTRIBUTION OF DYSLIPIDEMIA IN HYPOTHYROID AND EUTHYROID SUBJECTS

Thyroid status	Dyslipidemia	No dyslipidemia	Total
Euthyroid	35(10.73%)	291(89.26%)	326(100%)
Hypothyroid	29(55.76%)	23(44.23%)	52(100%)

- Prevalence of dyslipidemia in euthyroid subjects is 10.73%. Prevalence of dyslipidemia in hypothyroid subjects is 55.76%. This difference is statistically significant (p value = 0.0003)

DISCUSSION:

Among the 384 subjects studied, 58(15.10%) had thyroid dysfunction and 326(84.90%) were euthyroid. Prevalence of thyroid dysfunction in people with newly diagnosed type 2 diabetes mellitus is 23.7%. Prevalence of thyroid dysfunction in non diabetic subjects is 6.3%. This difference is statistically significant (p value < 0.001). Prevalence of thyroid dysfunction in type 2 diabetes mellitus have been well studied in many studies. In our study the prevalence of thyroid dysfunction was studied among newly diagnosed type 2 diabetes mellitus.

Table 7. Prevalence of thyroid dysfunction in diabetes mellitus in various studies

Study	Prevalence in percentage
our study	23.7
Vinu vij et al ³	28.75
Vibha uppal et al ⁴	24.5

Vikram et al ⁶	30
Celani et al ⁸	31.4
Kiran babu et al ⁹	28
Radaideh AR et al ¹⁰	12.5
DH Akbar et al ¹¹	16

This shows that the thyroid function abnormalities are common in diabetic populations and their prevalence vary in different studies as mentioned in the above table. Our study findings regarding the prevalence of thyroid dysfunction in diabetes mellitus is close to the prevalence seen in the studies done by vibha uppal et al⁴, vinu vij et al³, laloo demitrost et al⁵, kiranbabu et al⁹.

Subclinical hypothyroidism is the most common thyroid function abnormality noted in our study both in diabetic and non diabetic subjects. The prevalence of subclinical hypothyroidism in diabetic population (16.5%) is significantly higher than the non diabetic population (4.7%) ($p < 0.05$). This finding is much similar to the study done by vikram et al⁶, by vinu vij et al³. In our study, following subclinical hypothyroidism, overt hypothyroidism, subclinical hyperthyroidism and overt hyperthyroidism are the thyroid function abnormalities seen in that order both in diabetic and non diabetic subjects.

In our study 20.20% of females and 9.94% of males had thyroid dysfunction. Thus thyroid dysfunction is significantly higher in females than males ($p = 0.004$). Our finding is consistent with the findings of previous studies done by, laloo demitrost et al⁵, gurjeet singh et al⁷, celani et al⁸, anilkumar et al¹² where the prevalence of thyroid dysfunction is higher in females than males.

In this study the prevalence of dyslipidemia is significantly higher in people with hypothyroidism (55.76%) than euthyroid people (10.73%) (p value = 0.0003). The prevalence of dyslipidemia in diabetic subjects (23.2%) is higher than non diabetic subjects (10.5%) (p value = 0.001). In the study conducted by Gurjeet singh et al⁷; the mean total cholesterol, triglycerides, LDL, VLDL were significantly higher in diabetic population than non diabetic population ($p < 0.0001$). This is partly supported by our study where triglyceride level is significantly higher in diabetic than non diabetic subjects. In our study other parameters of lipid profile were not tested.

CONCLUSION

Thyroid function abnormalities are common in people with newly diagnosed type 2 diabetes mellitus than non diabetic subjects.

Thyroid function abnormalities are more common in females than males.

Subclinical hypothyroidism is the most common thyroid abnormality in both diabetic and non diabetic population followed by overt hypothyroidism, subclinical hyperthyroidism and overt hyperthyroidism.

Prevalence of dyslipidemia is higher in people with hypothyroidism than euthyroid people.

Lastly, our study emphasis the need to check thyroid function abnormalities in diabetic patients.

CONFLICT OF INTEREST: Nil

REFERENCES:

1. A ramachandran, AK Das, SR Joshi et al current status of diabetes in India and need for novel therapeutic agents: supplement to japi June 2010.vol 58
2. Anjana RM, Pradeepa R, Deepa M, et al: prevalence of diabetes and prediabetes in urban and rural india: phase 1 results of the ICMR-INDIAB study. Diabetologia. 2011, 54:1069-78.
3. Vinu Vij, Pallavi Chitnis, Vijay Kumar Gupta et al EVALUATION OF THYROID DYSFUNCTION AMONG TYPE II DIABETIC PATIENTS: *ijpbs [volume 2] issue 4 [oct-dec 2012] 150-155*
4. Vibha Uppal Chitranjan Vij Gurdeep Kaur Bedi Anil Vij Basu Dev Banerjee et al: Thyroid Disorders in Patients of Type 2 Diabetes Mellitus. *Ind J Clin Biochem (Oct-Dec*

- 2013) 28(4):336-341 DOI 10.1007/s12291-012-0293-9
5. Laloo Demitrost and Salam Ranabir, Thyroid dysfunction in type 2 diabetes mellitus: A retrospective study. *Indian J Endocrinol Metab.* 2012 December; 16(Suppl 2): S334-S335
6. Vikram B Vikhe, Shubhangi A Kanitkar, Krupal K Tamakuwala, Anu N Gaikwad, Meenakshi Kalyan, Rajani R Agarwal et al thyroid dysfunction in patients with type 2 diabetes mellitus at tertiary care centre; national journal of medical research print ISSN: 2249 4995 | eISSN: 2277 8810
7. Gurjeet Singh et al Evaluation of Thyroid Dysfunction Among type 2 diabetic Punjabi Population advances in bio search Volume 2, Issue 2, December 2011
8. Celani et al; prevalence of abnormal thyrotrophin concentrations measured by a sensitive assay in type 2 diabetes mellitus. *Diabetes Res.* 1994; 27(1):15-25.
9. Kiran Babu, Atul Kakar, SP Byotra. Prevalence of thyroid disorder in type 2 diabetes mellitus patients *Journal Association of Physicians India* Jan 2001; 49:43
10. A. R. M. Radaideh, M. K. Nusier, F. L. Amari et al., "Thyroid dysfunction in patients with type 2 diabetes mellitus in Jordan," *Saudi Medical Journal*, vol. 25, no. 8, pp. 1046-1050, 2004
11. D. H. Akbar, M. M. Ahmed, and J. Al-Mughales, "Thyroid dysfunction and thyroid autoimmunity in Saudi type 2 diabetics," *Acta Diabetologica*, vol. 43, no. 1, pp. 14-18, 2006
12. Anilkumar, narasimhashetty ; prevalence of thyroid dysfunction among type 2 diabetic subjects in south India; *International Journal of clinical cases and investigations* 2013.vol 5, 93:100, 1st July 2014) (Toft AD. Clinical practice. Subclinical hyperthyroidism. *N Engl J Med.* 2001; 345:512-516