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Frequency of Thyroid Dysfunction in Type 2 Diabetes Patients

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

Thyroid problems are more common in people with type 2 diabetes. They have microvascular problems as a result of hypothyroidism. Patients with diabetes and hypothyroidism have a higher risk of cardiovascular disease. Diabetic individuals who are screened for thyroid dysfunction will be able to receive early therapy for hypothyroidism. The goal of this study was to determine the extent of thyroid dysfunction in people with type 2 diabetes and the relationship between thyroid dysfunction and diabetic complications. This study is to be conducted at a tertiary care hospital in Chennai for a period of 1 year 200 patients were selected 100 were diabetics and 100 were controls (non-diabetic). 24 patients out of 100 subjects were detected to have thyroid dysfunction. 17 patients were detected to have SCH, 6 had primary hypothyroidism and I had primary hyperthyroidism. No case of subclinical hyperthyroidism was detected. TSH values were significantly higher in diabetics. Thyroid dysfunction especially SCH was prevalent in diabetics. There was a poor glycemic control in diabetics with thyroid dysfunction.

Keywords: Hypothyroidism; Type 2 diabetes; Neuropathy.

1. INTRODUCTION

Thyroid issues are more common in patients with type 2 diabetes mellitus. Over time, many diabetes people develop symptoms of thyroid dysfunction [1]. Insulin resistance is a condition in which the body's plays a key role in the development of hypothyroidism in human's

diabetic people with type 2 diabetes. To avoid the worsening of diabetic complications, it is vital to diagnose and treat hypothyroidism in diabetic patients [2,3]. Hypothyroidism can be detected with the aid of a simple blood test that is widely available. This can be done by a primary care physician who is familiar with diabetic patients. Thyroid dysfunction in diabetes individuals should be treated early to assist normalizes their glycemic and lipid profiles. Patients with diabetes who have subclinical hypothyroidism have been linked to an increased risk of nephropathy and cardiovascular disease [4,5]. Diabetic micro-angiopathic consequences such as retinopathy and neuropathy can deteriorate with time [6]. The goal of this study was to determine the prevalence of thyroid dysfunction with type 2 diabetes and investigate its link to diabetic complications.

2. MATERIALS AND METHODS

This study is to be conducted at a tertiary care hospital in Chennai from January 2015 to February 2016. Outpatients attending the outpatient department and inpatients admitted in the wards that were either previously or newly diagnosed diabetic- cases 100 are to be included in the study.

The non-diabetic volunteers- controls 100 without history of diabetes mellitus whose FBS was less than 110 mg /dl on two occasions are the control subjects. These volunteers included non-diabetic subjects who come in the hospital for routine check-ups as advised by their attending physicians.

2.1 Method of Collection of Data

Method of collection of data was done by taking detailed history , clinical examination and laboratory investigations through proforma specially designed for this study , after taking the informed consent.

2.1.1inclusion criteria

Adult patients between 40-70 years with type 2 diabetes mellitus either newly diagnosed or previously diabetic.

2.1.2 Exclusion criteria

Patients who were previously diagnosed to have thyroid dysfunction. Randomly selected diabetic patients are to be subjected to evaluation for thyroid function biochemically. Venous blood sample will be withdrawn and assayed for thyroid function (T3, T4, and TSH) and for the glycemic status (FBS, HbA1c). The following guidelines for detection of thyroid dysfunction were considered.

- Normal - when T3, T4 and TSH were within the normal range.
- Primary hypothyroidism - when TSH is more than 5.2 µIU /L and T3 , T4 is less than the normal value .
- Primary hyperthyroidism - when TSH is less than 0.2 µIU /L and T3, T4 is more than the normal values.
- Subclinical hypothyroidism - when TSH is more than 5.2 µIU/L and T3, T4 is within the normal range.
- Subclinical hyperthyroidism - when TSH is less than 0.2 µIU /L and T3, T4 are within the normal range.

3. RESULTS

The association between the study groups and age distribution is considered to be not statistically significant since p > 0.05. In euthyroid study group, the mean age is 52.35 years with majority belonging to 51-60 years age group (n=30, 38.96%) followed by 41-50 years age group (n=23, 29.87%). In thyroid dysfunction study group , the mean age is 55.09 years with majority belonging to 51-60 years age group (n=l00, 43.48) followed by 41-50 years age group (n=5, 21.74%) Table 1, 2.

Table 1. Age distribution of thyroid dysfunction

Age - Groups - TY2DM- Thyroid Status	**Euthyroid**	**Thyroid Dysfunction**	**Euthyroid** (%)	**Thyroid Dysfunction** (%)
:S 40 years	9	3	11.69	13.04
41-50 years	23	5	29.87	21.74
51-60 years	30	10	38.96	43.48
61-70 years	10	3	12.99	13.04
71-80 years	4	0	5.19	0.00
81-90 years	1	2	1.30	8.70
Total	**77**	**23**	**100**	**100**

Table 2. Mean age in years

Age Distribution - TY2DM - Thyroid Status	Euthyroid	Thyroid Dysfunction
Mean	52.35	55.09
SD	10.60	11.56
P Value Unpaired Test		**0.290**

The association between the study groups and gender status is considered to be not statistically significant since p > 0.05. In euthyroid study group, majority belonged to female gender group (n=40, 51.95%) followed by male gender group (n=37, 48.05%). In thyroid dysfunction study group, majority belonged to female gender group (n=l 7, 73.91%) followed by male gender group (n=6, 26.09%).Though there is no statistical significance, there is an increased incidence of thyroid dysfunction in females in comparison with males among diabetics Table 3.

The association between the study groups and duration of diabetes distribution is considered to be not statistically significant since p > 0.05. In euthyroid study group, the mean duration of diabetes is 5.38 years with majority belonging to 2-5 years duration of diabetes group (n=25, 32.47%).) followed by 6-10 years duration of diabetes group (n=23, 29.87%). In thyroid dysfunction stud y group, the mean duration of diabetes is 6.81 years with majority belonging to 6-10 years duration of diabetes group (n=14, 60 .87%).) followed by 2-5 years duration of diabetes group (n=4, 17.39%) Table 4.

The association between the study groups and thyroid function status is considered to be not statistically significant since p > 0.05. In male diabetic study group, majority belonged to euthyroid group (n=37, 86.05%) followed by SCH group (n=5, 11.63%). In female diabetic study group, majority belonged to euthyroid group (n=39, 68.42%) followed by SCH group (n=12, 21.05%) Table 5.

Table 3. Gender distribution in thyroid dysfunction

Gender Status - TY2DM - Thyroid Status	Euthyroid	Thyroid Dysfunction	Euthyroid (%,)	Thyroid Dysfunction (%)
Male	37	6	48.05	26.09
Female	40	17	51.95	73.91
Total	77	23	100	100
P Value Chi Squared Test			**0.061**	

Table 4. Mean duration of diabetes in years

Duration of Diabetes Distribution - TY2DM - Thyroid Status	Euthyroid	Thyroid Dysfunction
Mean	5.38	6.81
SD	4.24	4.08
P Value Unpaired t Test		**0.156**

Table 5. Thyroid Function Status

Thyroid Function Status - TY2DM - Gender	Male Diabetic	Female Diabetic	Male Diabetic (%)	Female Diabetic (%)
Euthyroid	37	39	86.05	68.42
SCH	5	12	11.63	21.05
Primary Hypothroid	1	5	2.33	8.77
Hyperthyroid	0	1	0.00	1.75
Total	43	57	100	100
P Value Fishers Exact Test			**0.192**	

Table 6. TSH in diabetics and controls

TSH Thyroid Test - Groups	Type 2 Diabetic Subj ec ts	Non Diabetic subjects	Type 2 Diabetic Subjects (%)	Non Diabetic subjects (%)
< 0.45 mu/1	1	1	1.00	1.00
0.45-4.5mu/1	72	94	72.00	94.00
4.6 to 6 mu/1	5	0	5.00	0.00
> 6 mu/1	22	5	22.00	5.00
Total	100	100	100	100
TSH Thyroid Test Distribution		**Type 2 Diabetic Subjects**		**Non Diabetic subjects**
Mean		4.16		2.79
SD		3.22		1.72
P Value Unpaired t Test				**P<0.00**

Table 7. T3 levels in diabetics and controls

T3 Thyroid Test -	Type 2 Diabetic Subjects	Non Diabetic subjects	Type 2 Diabetic Subjects (%)	Non Diabetic subjects (%)
< 80 ng/dl	6	1	6.00	1.00
80-180 ng/dl	92	98	92.00	98.00
> 180 ng/dl	2	1	2.00	1.00
Total	**100**	**100**	**100**	**100**
T3 Thyroid Test Distribution		**Type 2 Dia betic Subjects**		**Non Diabetic subjects**
Mean		129 .16		122.69
SD		45.47		36.96
P Value Unpaired t Test				**0.270**

The association between the study groups and TSH distribution is considered to be statistically significant since p < 0.05. In patients belonging to Type 2 DM study group, the mean TSH level is 4.16 mu/I with majority belonging 0.45-4.5 *mull* group (n=72, 72.00%) followed by > 6 *mull* group (n=22, 22.00%). In non-diabetic study group, the mean TSH level is 2.79 *mull* with majority belonging 0.45-4.5 *mull* group (n=84, 84.00%) followed by > 6 *mull* group (n=5, 5.00%) Table 6.

The association between the study groups and T3 distribution is considered to be not statistically significant since p > 0.05. In patients belonging to Type 2 DM study group, the mean T3 level is 129 .16 ng/dl with majority belonging to 80-180 ng/dl group (n=92, 92.00%) followed by < 80 ng/dl group (n=6, 6.00%). In non-diabetic study group, the mean T3 level is 122.69 ng/dl with majority belonging to 80-180 ng/dl group (n=98, 98.00%) followed by< 80 ng/dl group (n=l, 1.00%) Table 7.

Table 8. T4 levels in diabetics and controls

T4 Thyroid Test - Groups	Type 2 Diabetic Subjects	Non Diabetic subjects	Type 2 Diabetic Subjects (%)	Non Diabetic subjects (%)
< 4.6 mcg/dl	4	1	4.00	1.00
4.6-12 mcg/dl	95	98	95.00	98.00
> 12 mcg/dl	1	1	1.00	1.00
Total	100	100	100	100
T4 Thyroid Test Distribution		**Type 2 Diabetic Subjects**		**Non Diabetic subjects**
Mean		7.02		6.83
SD		2.30		2.05
P Value Unpaired t Test				**0.544**

Table 9. Mean HbAlc

HbAlc Distribution	Type 2 Diabetic Subjects	Non Diabetic subjects
Mean	8.55	5.01
SD	1.34	0.55
P Value Unpaired t Test		<0.00

The association between the study groups and T4 distribution is considered to be not statistically significant since p > 0.05. In patients belonging to Type 2 DM study group, the mean T4 level is 7.02 mcg/dl with majority belonging to 4.6-12 mcg/dl group (n=95, 95.00%) followed by < 4.6 mcg/dl group (n=4, 4.00%). In non-diabetic study group, the mean T4 level is 6.83 mcg/dl with majority belonging to 4.6-12 mcg/dl group (n=98, 98.00%) followed by< 4.6 mcg/dl group (n=l, 1.00%) Table 8.

In patients belonging to Type 2 DM study group, the mean HbAl c level is 8.55% with majority belonging 7.1-9% group (n=59, 59.00%) followed by 9.1-11 % group (n=24, 24.00%). In non-diabetic study group, the mean HbAlc level is 5.01% with majority belonging :S 5 % group (n=50, 50.00%) Table 9.

In patients belonging to Type 2 DM study group, the mean PPBS level is 188.91 mg/dl with majority belonging 151-200 mg/dl group (n=71, 71.00%) followed by 201-250 mg/dl group (n=17, 17.00%). In non-diabetic study group, the mean PPBS level is 130.72 mg/dl with majority belonging 150mg/dl group (n=l00, 100.00%).

4. DISCUSSION

In diabetic patients, hypothyroidism has been linked to an increased risk of nephropathy and cardiovascular disease. Subclinical hypothyroidism was identified to be a risk factor for nephropathy and cardiovascular disease in type 2 diabetic individuals in a study by Chen HS et al. [7]. In patients with type 2 diabetes, however, there was no link between thyroid dysfunction and nephropathy or cardiovascular disease, according to our findings [8-10].

The mean TSH level was elevated in Type 2 DM study group compared to the non-diabetic study group by 33% with a mean difference of 1.3 7 mu/I. The increased mean TSH level in Type 2 DM group study compared to the non-diabetic study group is statistically significant as the p value is 0.0002 as per unpaired t- test indicating a true statistical difference between study groups.

The mean HbAlc level was elevated in Type 2 DM study group compared to the non-diabetic study group by 41 % with a mean difference of 3.54 %. The increased mean HbA 1c level in Type 2 DM study group compared to the non-diabetic study group is statistically significant as the p value is <0.0001 as per unpaired t- test indicating a true statistical difference between study groups.A retrospective study done by Demitrost L *et al*. showed that hypothyroidism was seen in 11.4% of type 2 diabetic patients while hyperthyroidism was seen in only 1.5% of the cases [11]. A study to assess the prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus was done by Diez JJ *et al*. and it was found that 15.1% of the patients had overt hypothyroidism while overt hyperthyroidism was seen in 3.5% of the patients. The study also showed that thyroid dysfunction was not linked to the duration of diabetes, glycosylated hemoglobin and the presence of diabetic complications [12,13].

The mean PPBS level was elevated m Type 2 DM study group compared to the non-diabetic study group by 31 % with a mean difference of 58.19 mg/dl. The increased mean PPBS level in Type 2 DM study group compared to the non-diabetic study group is statistically significant as the p value is <0.0001 as per unpaired t-test indicating a true statistical difference between study groups.

Thyroid dysfunction is a typical occurrence in people who have type 2 diabetes. It is particularly noticeable in people who have had diabetes for a long time and in women. Thyroid dysfunction can improve diabetes patients' morbidity and prevent diabetic complications from worsening.

5. CONCLUSION

Finally, the findings of this cross-sectional investigation revealed a significant frequency of TD in the diabetic population, implying that thyroid disease screening among diabetic patients should be done on a regular basis. The increased cardiovascular risk in these patients can be attributed to the incidence of new cases of thyroid dysfunction being detected, as well as

the likely aggravation of traditional risk factors such as hypertension and dyslipidemia, which can arise from undiagnosed thyroid dysfunction. We emphasise, however, that more patients and prospective trials are needed to fully understand the impact of thyroid dysfunction in diabetic patients.

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline patients consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Author haS declared that no competing interests exist.

REFERENCES

1. Demitrost L, Ranabir S. Thyroid dysfunction in type 2 diabetes mellitus: A retrospective study. Indian J Endocrinol Metab. 2012;16:S334-5.
2. Donckier JE. Endocrine diseases and diabetes. In: Pickup JC, Williams G, editors. Textbook of Diabetes Mellitus. Chicester, UK. Blackwell Publishing Company. 2003;21-7.
3. Ghazali SM, Abbiyesuku FM. Thyroid dysfunction in type 2 diabetics seen at the University College Hospital, Ibadan, Nigeria. Niger J Physiol Sci. 2010;25:173-9.
4. Carvalho ALM, Leopoldino RWD, da Silva JEG, da Cunha CP: Adesão ao tratamento medicamentoso em usuários cadastrados no Programa Hiperdia no município de Teresina (PI). Cien Saude Colet. 2012;17 (7): 1885-1892.
5. Chubb SA, Davis WA, Inman Z, Davis TM: Prevalence and progression of subclinical hypothyroidism in women with type 2 diabetes: the Fremantle Diabetes Study. Clin Endocrinol (Oxf). 2005;62(4):480-486.
6. Hage M, Zantout MSM, Azar ST: Tyroid disorders and diabetes mellitus. J Thyroid Res. 2011;2011:439463
7. Chen HS, Wu TE, Jap TS, Lu RA, Wang ML, Chen RL, et al. Subclinical hypothyroidism is a risk factor for nephropathy and cardiovascular diseases in type 2 diabetic patients. Diabet Med. 2007;24:1336-44.
8. Unnikrishnan AG. Thyroid Disease in kerala: new data on thyroid autoimmunity. Kerala Medical Journal. 2011;4(2):39-40.
9. Papazafiropoulou A, Sotiropoulos A, Kokolaki A, et al. Prevalence of thyroid dysfunction among greek type 2diabetic patients attending an outpatient clinic. J Clin Med Res. 2010;2(2):75–78.
10. Bhavthankar S, Madole M, Somwanshi S, et al. Evaluation of Thyroid Hormones in Patients with Type II Diabetes Mellitus. Journal of Medical Education & Research. 2013;3(2)
11. elgazar EH, Esheba NE, Shalaby SA, Mohamed WF. Thyroid dysfunction prevalence and relation to glycemic control in patients with type 2 diabetes mellitus. Diabetes Metab Syndr. 2019;13:2513-7.
12. Al-Geffari M, Ahmad NA, Al-Sharqawi AH, Youssef AM, Alnaqeb D, Al-Rubeaan K. Risk factors for thyroid dysfunction among type 2 diabetic patients in a highly diabetes mellitus prevalent society. Int J Endocrinol. 2013;2013:417920
13. 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

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