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Prevalence of Subclinical Hypothyroidism in Type 2 Diabetes Mellitus- A Cross-Sectional Study Done at Vaatsalya Hospital Shimoga

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Original Research Article

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Abstract: Diabetes Mellitus is a common endocrine disorder, association between thyroid dysfunction and Type 2 DM mutually influence each other by altering the glycaemic profile and lipid profile. This study aims to find the prevalence of sub-clinical hypothyroidism in patients with type 2 diabetes mellitus patients. In this study 100 patients with type 2 diabetic with no clinical features of hypothyroidism were selected and screened for hypothyroidism, using thyroid stimulating hormone (TSH) and serum free T4 levels. Sub-clinical hypothyroidism was present in 18 % of cases, prevalence being more common in females (22.8%) compared to males (15.3). Higher levels of HbA1c being more significantly associated with sub clinical hypothyroidism. Duration of diabetes did not significantly affect the prevalence of subclinical hypothyroidism. Hypertriglyceridemia was more significantly associated with diabetics associated with subclinical hypothyroidism compared to patients with diabetes only. There is increased incidence of subclinical hypothyroidism in patients with type 2 diabetes mellitus and is also associated with hypertriglyceridemia and high HbA1c levels.

Keywords: Subclinical Hypothyroidism, Overt Hypothyroidism, HbA1c, hypertriglyceridemia.

INTRODUCTION

Type 2 diabetes mellitus and thyroid dysfunction are most commonly encountered endocrine disorders in outpatient practise.

The International Diabetes Federation (IDF) estimates that total number of diabetic to be around 40.9 million in India and may rise to 69.9 million by the 2025 [1]. Hypothyroidism results from deficiency of thyroid hormone. Subclinical hypothyroidism is diagnosed when serum TSH is raised and serum free T4 is normal. Subclinical hypothyroidism is found in about 6.1% of women and 3.4% of men [2]. If associated with positive TPO antibody there is about 4% annual risk of developing overt hypothyroidism [3]. Patients with type 2 diabetes mellitus have an increased prevalence of thyroid disorders compared to non-diabetic population and are more common in females than in males [2]. A study done in Scotland screened for thyroid disease in diabetics showed a prevalence of 13.4% and subclinical hypothyroidism being most common [5].

Insulin resistance and its associated disorders are more common in patients with subclinical hypothyroidism [6]. Thyroid hormones also alter glucose homeostasis by regulating circulating insulin and counter-regulatory hormones levels, intestinal absorption, hepatic synthesis and peripheral uptake of glucose [7]. Both endocrine disorders can lead to alteration in lipid profile but the pattern of alteration profile differs in the two diseases, diabetes mellitus causes alterations in high density lipoprotein and hypothyroidism mainly affects the low-density lipoprotein cholesterol [8, 9] and both disorders can elevate serum triglyceride levels. Hence both disorders have increased atherogenic risk and adverse cardiac and vascular outcomes [10, 11].

Our study aimed to see the prevalence of subclinical thyroid disorders in patients with type 2 diabetes mellitus.

MATERIALS AND METHODS

This study was conducted at the Vaatsalya hospital Shimoga, for duration of 6 months (April 1st to October 30th, 2017). One hundred diabetics aged above 40 years were considered in the study and were

compared with 100 age matched non-diabetics as control. After taking an informed written consent from all patients, relevant history, physical examination and necessary laboratory investigations like fasting blood sugar (FBS), glycated haemoglobin (HbA1c), free T4 and thyroid stimulating hormone (TSH), fasting lipid profile, ECG, urine routine, renal function tests, liver function tests were performed.

Type of study: Case control study

Inclusion criteria

- One hundred patients with age above 40 years with a history of type 2 DM

Exclusion criteria

- Patients not willing to give consent,
- Those with a past history of thyroid disease
- patients with critical illnesses, and abnormal liver or renal function

All analyses were conducted using the Statistical Package for the Social Sciences (SPSS) 16 software.

Hypothyroidism was diagnosed if serum TSH >5.5 µIU/mL with serum free T4 <1.8 ng/dL with or without clinical features of hypothyroidism. Normal values: HbA1c <6.5%, total cholesterol <200 mg/dL, serum HDL >40 mg/dL, serum LDL <100 mg/dL, and triglycerides <150 mg/dL.

RESULTS

In our study out of 100 individuals with type 2 diabetes patients aged more than 40 years were considered, between April 1st to October 30th, 2017 and were compared with age matched 100 non-diabetic controls.

Table-1: age and sex distribution of the study subjects

Variable	Type 2 DM(n=100)	Non-Diabetic(n=100)
Age (years)	**57.2±8.5**	**47.7 ± 3.1**
Gender		
Males	**65**	**46**
Females	**35**	**54**

Table 1 shows the age and sex distribution of the study subjects. The mean age of Type 2 Diabetic subjects was 57.2 ± 8.5 and it included 65 males and 35 females, non-diabetic controls included 46 males and 54 females with mean age of 47.7 ± 3.1.

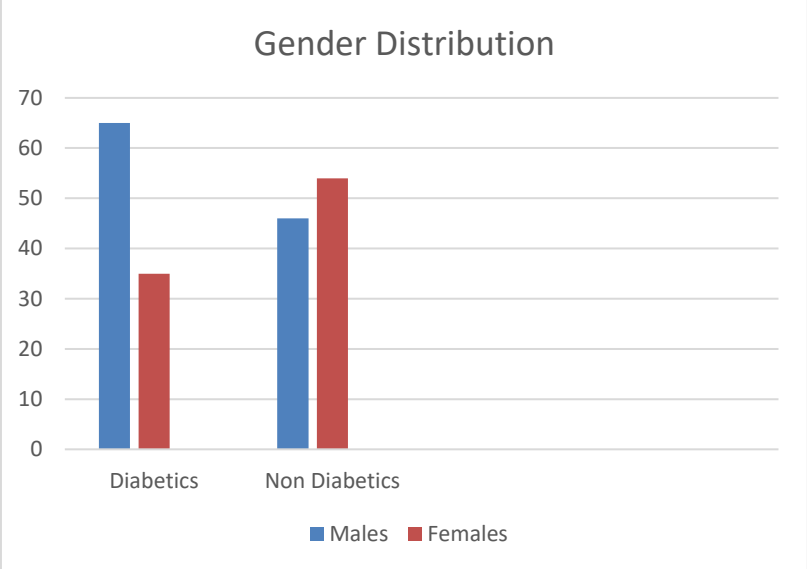

Fig-1: Shows gender distribution of the study population

Table-2: shows the comparison of FBS and TSH among the cases and controls

Parameter	Type2 DM	Healthy Controls	p-Value
Fasting blood glucose(mg/dL)	155 ± 9.5	90.1 ± 10.7	0.001
TSH. (µIU/ml)	4.77 ± 3.8	3.4 ± 2.5	0.002

Table 2 shows the comparison of FBS and TSH among the cases and controls. FBS showed significant difference between the cases and controls (p value -0.001). Serum levels of TSH was significantly higher in Type 2 diabetic subjects (4.87 ± 3.8) when compared to controls (3.43 ± 2.7) with a p value of 0.002

Table-3: Prevalence of sub clinical and overt hypothyroidism in diabetics and non-diabetics

Thyroid Status	Type2 DM	Non-Diabetics
Euthyroid	77	86
Subclinical Hypothyroidism	18	10
Overt Hypothyroidism	5	4

Table 3 Prevalence of sub clinical and overt hypothyroidism in diabetics and non-diabetics**.** In the Type 2 Diabetics, 23 had abnormal thyroid dysfunction and remaining 77 were euthyroid. Of the 23 cases of thyroid dysfunction, 18 had Subclinical hypothyroidism, 8 were overt hypothyroid.

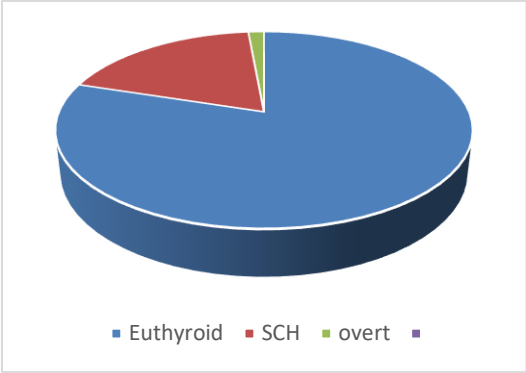

Fig-2: Prevalence of sub clinical and overt hypothyroidism in diabetics and non-diabetics

Table-4: Relationship between HbA1c and TSH Levels among Individuals Included in the study

TSH (µIU/mL)	0.3 – 5.5	>5.5	Total
HbA1c < 7%	28	1	29
HbA1c 7–10%	47	8	55
HbA1c >10%	9	7	16
Total	84	16	100

Table-5: Gender-wise distribution of thyroid disorders in Type2 Diabetic subjects

Type2 DM	Euthyroid	Subclinical Hypothyroidism	Overt Hypothyroidism
Males	52	10	3
Females	25	8	2

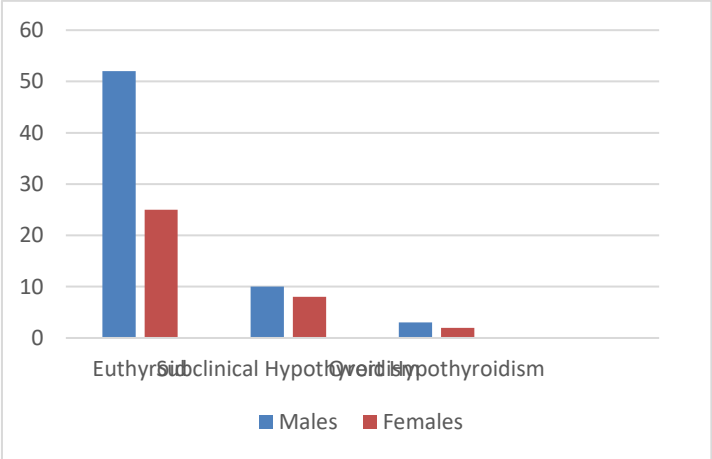

Fig-3: Gender-wise distribution of thyroid disorders in Type2 Diabetic subjects

Table-6: Prevalence of dyslipidaemia in Individuals with and without Subclinical and Overt hypothyroidism

Lipid profile	Normal (%)	SCH (%)	OHT (%)	Total
LDL Cholesterol (mg/dL)				
>100	233	12	3	48
<100	34	6	2	42
HDL Cholesterol (mg/dL)				
>40	50	6	1	57
<40	27	12	4	43
Serum Triglycerides (mg/dL)				
<150	57	6	1	64
>150	20	12	4	36

DISCUSSION

Subclinical hypothyroidism is a common endocrine disorder, but frequently underdiagnosed. SCH is diagnosed mainly based on biochemical parameters rather than clinical findings, defined by a raised serum TSH with a normal serum free T4 level, irrespective of the presence or absence of clinical features of hypothyroidism.

Thyroid hormones play an important role in glucose regulation by causing modifications in the circulating levels of insulin and counter-regulatory hormones, intestinal absorption, hepatic production and glucose uptake by peripheral tissues [7]. The effect of SCH on the glycaemic control appears to be controversial. Many studies did not show a statistically significant correlation between thyroid dysfunction and glycaemic control. A study done in Greek on patients with type 2 DM revealed a reduced HbA1c level in patients with coexisting hypothyroidism (7.38% compared to 7.81%) but this was not statistically significant [12].

Hypothyroidism effects lipid profile in patients with Type 2 DM, but the pattern of lipid profile varies in different studies. A meta-analysis revealed that subclinical hypothyroidism does not seem to be associated with dyslipidaemia [13]. A study conducted by Chubb et al did not show any significant relationship between subclinical hypothyroidism and dyslipidaemia [14] but, a study conducted by Kim et al found elevated total and LDL cholesterol in diabetics with SCH compared to euthyroid patients [15].

The aim of our study was to determine the prevalence of subclinical hypothyroidism among patients with type 2 diabetes mellitus. The present study was conducted on 100 with type 2 DM and found that prevalence of SCH to be 18 % in the diabetic individuals and 10% in the control population and prevalence was found to be more in females. There was no significant correlation between the age of the individual and prevalence of SCH. HbA1c levels are higher among individuals with SCH, and this was found to be statistically significant. The serum levels of LDL cholesterol were higher in the SCH group and serum triglyceride levels were significantly higher in the SCH group as compared to the euthyroid group.

CONCLUSION

In this study a high prevalence of hypothyroidism was noted in Type 2 DM, with Subclinical Hypothyroidism being most common. So, screening for thyroid dysfunction in type 2 Diabetes mellitus subjects will help to identify the microvascular complications at an earlier stage and hence preventing morbidity and mortality.

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