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Original Research Article

Prevalence of hypothyroidism in type 2 diabetic adult Indian females and its correlation with age, HbA1c, BMI and duration of diabetes

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ABSTRACT

Background: Patients with type 2 diabetes mellitus are more prone to thyroid disorders. Hypothyroidism in them leads to an aggravation of microvascular complications. Screening for thyroid dysfunction in diabetic patients will allow early treatment of hypothyroidism. The aim of this study was to assess the prevalence of hypothyroidism in patients with type 2 diabetes mellitus and its correlation with age, HbA1c, BMI and duration of diabetes.
Methods: This was a cross sectional study that was conducted at department of medicine GSVM medical college, Kanpur. 200 female patients with type 2 diabetes mellitus attending the outpatient department without any prior history of thyroid disease, chronic liver disease or acute illness were recruited for the study.
Results: Our study describes 14% prevalence of hypothyroidism (subclinical hypothyroidism 13.5%) among 200 diabetic subjects. Hypothyroidism was more common in older age group maximum seen in age group 70-79 years (66.7%). Hypothyroidism was more common in subjects having diabetes for a longer duration; maximum seen in 25-30 years group (40%). No correlation was found between BMI and hypothyroidism.
Conclusions: The prevalence of hypothyroidism was 14% among female patients with type 2 diabetes mellitus in this study. Overt hypothyroidism was 0.5 % and subclinical hypothyroidism was more common (13.5%) among the study subjects. Hypothyroidism was more common in older age group. and in subjects having diabetes for longer duration. No corelation was found between prevalence of hypothyroidism and body mass index (BMI).

Keywords: BMI, HbA1c, Hypothyroidism

INTRODUCTION

Patients with type 2 diabetes mellitus are at higher risk to develop thyroid disorders. Many diabetic patients show features of thyroid dysfunction over a period of time.[1] Uncontrolled type 2 diabetes mellitus affects plasma T3 as well as T4 levels. The possible reason postulated for an association between diabetes mellitus and hypothyroidism could be genetic biochemical or of hormonal origin. Resistance to insulin has an important role in the development of hypothyroidism in patients with type 2 diabetes mellitus. The prevalence of hypothyroidism in India is 11%, compared with only 2% in the UK and 4·6% in the USA. women are affected more commonly with overall prevalence of About 85% of affected subjects. In diabetic patients, hypothyroidism leads to an aggravation of hypertension, dyslipidaemia, and cardiovascular disease.[2] Thus, in diabetic females it is important to recognize and treat hypothyroidism to slow down the progression of diabetic complications.[3] A simple blood test is enough to diagnose hypothyroidism which can be ordered by the primary care physician who is treating diabetic patients. Early treatment of hypothyroidism in diabetic females may help in improving their glycaemic control and lipid profile. Sub-clinical hypothyroidism in diabetic patients have been reported to be associated with an increased risk of microvascular and macrovascular complications.[4,5] Microvascular complications of diabetes like retinopathy, nephropathy and neuropathy can worsen in the presence of co-existing hypothyroidism due to dyslipidaemia. Screening for thyroid disorders in diabetic patients may

allow early treatment of sub clinical and overt hypothyroidism.[6] This study was done to find out the prevalence of hypothyroidism in adult Indian female population with type 2 diabetes mellitus and find out its correlation with age, HbA1c, dyslipidaemia and duration of diabetes.

METHODS

This was a cross sectional study that was conducted at department of Medicine GSVM medical college, Kanpur from December 2020 to October 2022 after having clearance from the Institutional Ethics Committee (IEC Ref. No. EC/123/may/2022). Considering a prevalence of 32% of thyroid dysfunction in diabetic subjects seen in a previous study with an absolute precision of 5% at 5% level of significance, the sample size was calculated to be 200 (using the sample size formula for proportions).

Convenient sampling technique was used to include diabetic patients attending the medicine OPDs of the hospital.

Inclusion criteria

Adult Indian females, known or newly diagnosed case of type-2 diabetes mellitus, patients willing to give written signed informed consent to participate in the study.

Exclusion criteria

Pregnancy/lactation, type-1 DM and other types of diabetes mellitus, gestational DM, critically ill patients, pre-existing thyroid disorder/patient on antithyroid medications, history of thyroid surgery, history of radiotherapy, systemic auto-immune diseases, patients on medication which affect thyroid function e.g., lithium, amiodarone, phenytoin, carbamazepine.

Data collection for age, sex, HbA1c, weight, duration of diabetes noted in the proforma of the study subjects. Body mass index (BMI) was assessed in all the subjects. Body weight was taken to the nearest 0.1 kg. Subjects were standing straight and relaxed without footwear and Height was measured in centimeters to the nearest 0.1 cm by using the stadiometer. BMI was further calculated by using the formula body weight in kilograms divided by the square of height in meters. BMI from 25 to 29.9 kg/m2 was considered as overweight and BMI above 30 kg/m2 was considered as obesity for the study purpose. The laboratory investigations that were performed were HbA1c (glycosylated haemoglobin), blood sugar (8 hours fasting and 2 hours post prandial), lipid profile and urine routine microscopy and urine albumin-creatinine ratio, complete blood count, liver function test, kidney function test. fundus examination after pupil dilation was done for Screening for diabetic retinopathy. Diabetic retinopathy was further classified into non proliferative or proliferative in the study subjects. Twelve lead ECG was done for evaluation of cardiovascular disease. Subjects were screened for ischemic heart disease by using changes suggestive of ischemia on ECG. Monofilament test was done in subjects to diagnose diabetic neuropathy. Diabetic nephropathy was said to be present if there was albuminuria. Microalbuminuria was defined as 24-hour urinary albumin excretion of 30 to 300 mg/day while macroalbuminuria was defined as 24-hour urinary albumin more than 300 mg/day.

Serum TSH (thyroid stimulating hormone), free T3 (triiodothyronine) and free T4 (thyroxine) were measured in the 8 hours fasting serum samples of the study subjects using chemiluminescent immunoassay method technology. The normal range of TSH was 0.5 5.5 U/ml, 1.4 4.4 pg/ml for free T3 and 0.7 1.8 ng/dl for free T4. Sub clinical hypothyroidism was defined as subjects with TSH value >5.5 U/ml and normal free T3 and T4 levels.

Statistical analysis

Analysis of data was performed using SPSS version 20.0. Continuous variables were expressed as means and standard deviation. Categorical variables were expressed as percentages. Comparison between variables was done by using appropriate statistical tests of significance. Association between variables was considered statistically significant if p value was less than 0.05.

RESULTS

Mean age of study subjects was 52.53±9.7 years. Among the 200 diabetics patients, 26 (13%) were aged <40 years, 51 (25.5%) were aged 40-49 years, 62 (31%) were aged 50-59 years, 58 (29%) were aged 60-69 years and only 3 (1.5%) were aged above 70 years.

Table 1: Age distribution of study subjects.

Age group (years)	Number	Percentage
<40	26	13
40-49	51	25.5
50-59	62	31
60-69	58	29
70-79	3	1.5
Total	200	100
Mean±SD	52.53±9.7 years	

Table 2: Distribution of study subjects according to their BMI.

BMI	Number	Percentage
<25 kg/m^2	35	17.5
25-30 kg/m^2	163	81.5
30-35 kg/m^2	2	1
Total	200	100
Mean±SD	26.41±1.62 kg/m^2	

Mean BMI of study subjects was 26.41±1.62 kg/m^2. Among the 200 diabetics patients, BMI of 35 (17.5%)

was <25 kg/m^2, 163(81.5%) was 25-30 kg/m^2, and only 2 (1%) were having 30-35 kg/m^2.

Table 3: Distribution of study subjects according to duration of diabetes.

Duration of diabetes	Number	Percentage
<5 years	45	22.5
5-9 years	47	23.5
10-14 years	35	17.5
15-19 years	39	19.5
20-24 years	24	12
25-30 years	10	5
Total	200	100
Mean±SD	11.25±6.91 years	

Mean duration of diabetes of study subjects was 11.25±6.91 years. Among the 200 diabetics patients, 45 (22.5%) were having duration of <5 years, 47 (23.5%) were having duration of 5-9 years, 35 (17.5%) were having duration of 10-14 years, 39 (19.5%) were having duration of 15-19 years, 24 (12%) were having duration of 20-24 years and only 10 (5%) were having duration of 25-30 years.

Table 4: Distribution of study subjects according to HbA1c levels.

HbA1C levels (%)	Number	Percentage
<7	24	12
7-9	137	68.5
9-11	24	12
11-13	15	7.5
Total	200	100
Mean±SD	8.23±1.65%	

Mean HbA1c level of study subjects was 8.23±1.65%. Among the 200 diabetics patients, 24 (12%) were having HbA1c <7%, 137 (68.5%) were having HbA1c 7-9%, 24 (12%) were having HbA1c 9-11%, and 15 (7.5%) were having HbA1c 11-13%.

Table 5: Distribution of study subjects according to complications.

Complications	Number	Percentage
Nephropathy	64	32
Neuropathy	60	30
Retinopathy	68	34

Among 200 diabetic subjects, 64 (32%) were having nephropathy, 60 (30%) were having neuropathy, 68 (34%) were having retinopathy.

Among 200 diabetic subjects, 27 (13.5%) were having subclinical hypothyroidism and 1 (0.5%) was having clinical hypothyroidism.

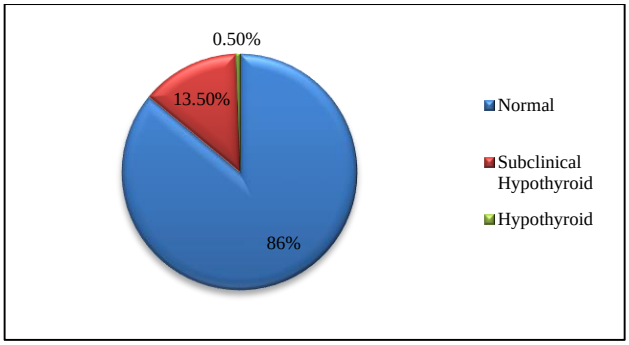

Figure 1: Distribution of study subjects according to thyroid status.

Hypothyroidism was more common in older age group of 70-79 years (66.7%), followed by 60-69 years (20.7%), 50-59 years (14.5%), 40-49 years (5.9%) and <40 years (7.7%). This difference in prevalence of hypothyroidism in different age groups was found to be statistically significant (p=0.013).

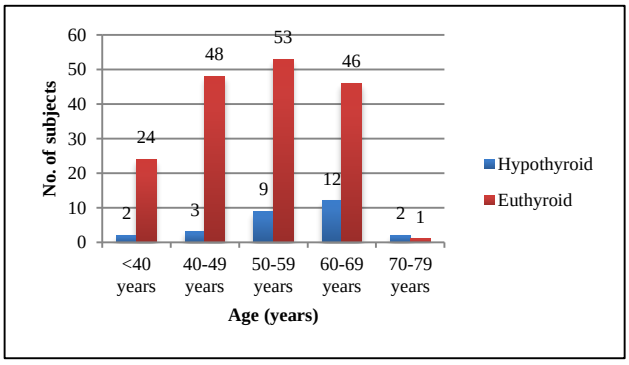

Figure 2: Thyroid dysfunction in relation to age.

Hypothyroidism was more common group of BMI 30-35 kg/m^2 (50%), followed by <25 kg/m^2 (17.1%), 25-30 kg/m^2 (12.9%). This difference in prevalence of hypothyroidism in different BMI groups was found to be statistically insignificant (p=0.271).

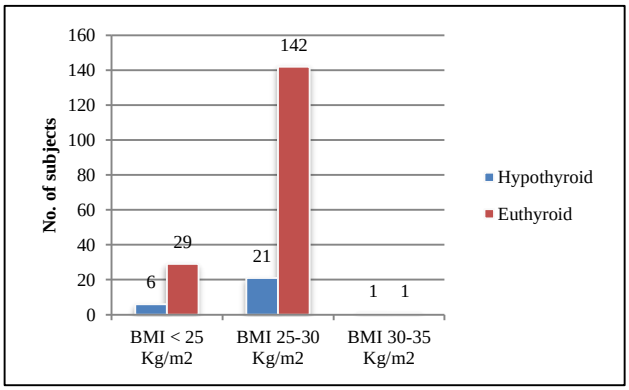

Figure 3: Thyroid dysfunction in relation to BMI.

Hypothyroidism was more common in subjects having diabetes for 25-30 years group (40%), followed by 20-24

years (20.8%), 15-19 years (20.5%), 10-14 years (14.3%), <5 years (6.7%) and 5-9 years (6.4%). This difference in prevalence of hypothyroidism in different duration groups was found to be statistically significant (p=0.034).

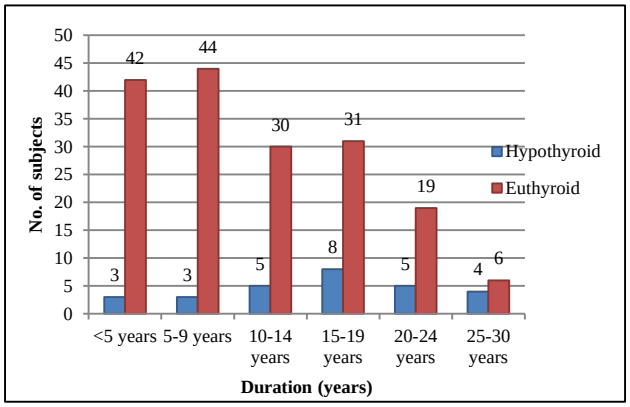

Figure 4: Thyroid dysfunction in relation to duration of diabetes.

DISCUSSION

Diabetes mellitus is a multi-factorial disorder and a complex interaction between diabetes mellitus and thyroid disorder. Because of insulin and thyroid hormones are closely involved in cellular metabolism, any abnormality of one of them may result in the functional derangement of other.

Insulin resistance that is typically seen in patients with type 2 diabetes mellitus plays a major role in the development of thyroid dysfunction in such patients. Thyroid dysfunction can occur in the form of hypothyroidism and hyperthyroidism. Sub-clinical hypothyroidism can also occur in diabetic patients and can contribute to diabetic complications like retinopathy, neuropathy, and cardiovascular disease.

Multiple studies revealed the increased prevalence of thyroid disorders in type 2 diabetics. A recent meta-analysis Han et al of 61 studies performed worldwide described adjusted pooled prevalence of subclinical-hypothyroidism in type 2 diabetes mellitus patients was 10.2%.[8] Meanwhile, type 2 diabetes mellitus was associated with a 1.93-fold increase in the risk of subclinical-hypothyroidism.

However, the studies from India showed the much higher prevalence of thyroid disorders. For example, Gurjeet reported 15% prevalence of subclinical-hypothyroidism in type 2 diabetics in Punjab; Demitrost from Manipur reported the same to be 16.3%; Anil et al from South India found this prevalence to be 11.25% and recently Chaturvedi et al from Meerut reported this prevalence as high as 27%.[1,9-11] Most of the studies from India also reported the prevalence of subclinical hypothyroid is higher in diabetics as compared with nondiabetics.[5,11] Our study describes 14% prevalence of hypothyroidism (subclinical hypothyroidism 13.5%) in people with diabetes. This is consistent with the results of previously published reports. We did not have any control arm.

Hypothyroidism was more common in older age group of 70-79 years (66.7%), followed by 60-69 years (20.7%), 50-59 years (14.5%), 40-49 years (5.9%) and <40 years (7.7%). This difference in prevalence of hypothyroidism in different age groups was found to be statistically significant (p=0.013), this is also like Demitrost et al.[1]

The difference in prevalence of hypothyroidism in different BMI groups was found to be statistically insignificant (p=0.271). no corelation was found between hypothyroidism and BMI. This was not like Demitrost et al.[1]

Hypothyroidism was more common in subjects having diabetes for 25-30 years group (40%), followed by 20-24 years (20.8%), 15-19 years (20.5%), 10-14 years (14.3%), <5 years (6.7%) and 5-9 years (6.4%). This difference in prevalence of hypothyroidism in different duration groups was found to be statistically significant (p=0.034). These results are similar to Nair et al.

There was a limitation of the study. We did not perform anti-thyroid peroxidase (anti TPO) antibody test in our study. Thus, autoimmune hypothyroidism could not be assessed.

CONCLUSION

The prevalence of hypothyroidism was 14% among female patients with type 2 diabetes mellitus in this study. Overt hypothyroidism was 0.5% and subclinical hypothyroidism was more common (13.5%) among the study subjects.

Hypothyroidism was more common in older age group. No correlation was found between prevalence of hypothyroidism and Body mass index (BMI). Hypothyroidism was more common in subjects having diabetes for longer duration.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee (IEC Ref. No. EC/123/may/2022)

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