PREVALENCE OF HYPOTHYROIDISM IN TYPE 2 DIABETES MELLITUS

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Abstract

Introduction: Thyroid hormone deficiency can lead to adverse health effects even death, if left untreated. It is a pathological condition known as hypothyroidism. Most common symptoms of hypothyroidism in adults are weight gain, fatigue, lethargy, cold intolerance, constipation, and dry skin. These clinical presentations can differ with age and sex, among other factors. Thyroid Stimulating Hormone (TSH), is associated with an increased risk of developing a number of clinical conditions, like cardiovascular diseases, diabetes, lung disease, malignant condition, and psychiatric disorders, both before and after the diagnosis of thyroid dysfunction. Type 2 Diabetes Mellitus (T2DM) is the chronic endocrine disease which is characterized by hyperglycemia resulting in impaired insulin secretion insulin resistance.

Material and Methods: This prospective observational study was carried out at OPD of Dept. of Medicine at Govt. Doon Medical College and Hospital. The study period was between Jan 2019 to August 2019. The anthropometric measurements and demographic characteristics of patients included in the study were recorded. The clinical details and medications are entered into Excel sheet of Microsoft Excel 2013. Biochemical tests were done and reports were entered.

Results: Prevalence of hypothyroidism in T2DM is found to be 10.94% in our study. Average BMI was observed to be 28.01 kg/m² with SD of 3.39 kg/m². Level of T3 and T4 were observed to be 0.98(0.23) ng/ml and 1.24(0.29) ng/ml respectively. Fasting blood glucose level was 133.05(17.81) mg/dl and post prandial blood glucose level was 201.54(27.33) mg/dl. Among all 112 patients, 71(63.39%) of cases had a family history of diabetes.

Conclusion: It is noted that one-tenth of patients with type 2 diabetes mellitus has hypothyroidism. BMI was noted to be more than 28 kg/m² among all patients. Hypothyroidism may be prevalent in T2DM patients due to duration of diabetes, obesity. To confirm the findings, more studies in this area are required.

Keywords: T2DM, Hypothyroidism, TSH, T3, T4.

Introduction:

Thyroid hormone deficiency is a pathological condition known as hypothyroidism, which can lead to adverse health effects even death, if left untreated. Definition of hypothyroidism is predominantly biochemical due to absence of specific symptom and variation in clinical presentation. A clinical manifestation of thyroid hormone deficiency ranges from life threatening to no symptoms or signs. Most common symptoms of hypothyroidism in adults are weight gain, fatigue, lethargy, cold intolerance, constipation, and dry skin. These clinical presentations can differ with age and sex, among other factorsⁱ. The thyroid hormones thyroxine (T₄) and triiodothyronine (T₃) are essential in the regulation of a number of vital pathways like lipolysis, gluconeogenesis and oxidative phosphorylationⁱⁱ. Prevalence of hypothyroidism in India is about 11%ⁱⁱⁱ.

Thyroid Stimulating Hormone (TSH), is associated with an increased risk of developing a number of clinical conditions, like cardiovascular diseases, diabetes, lung disease, malignant condition, and psychiatric disorders, both before and after the diagnosis of thyroid dysfunction. Whether this increased burden of morbidity also manifests as increased mortality in patients with thyroid dysfunction is controversial^{iv}, ^v. there is chronic association of Diabetes and hypothyroidism. Both the diseases have chronic effects on cardiovascular system and increased mortality^{vi}.

Type 2 Diabetes Mellitus (T2DM) is the chronic endocrine disease which is characterized by hyperglycemia resulting in impaired insulin secretion insulin resistance^{vii}. Due to increases prevalence of obesity, diabetes is also increasing. The global prevalence is estimated to be 11.1% in 2033, affecting 600 million people^{viii}. In India diabetes is

estimated to affect about 6.5% to 19.5% of adult Indians.^{ix}

Subclinical hypothyroidism sometimes is associated with higher risk of heart failure and stroke in the young adult population¹. Also there is higher prevalence of subclinical hypothyroidism in patients with type 2 diabetes mellitus and higher prevalence of microvascular complications in the patients having both the conditions^x. According to various studies the prevalence of hypothyroidism among patients with diabetes is reported from 4.8 to 31.4%^{xi}.

This study was conducted with an aim to find the prevalence of hypothyroidism among T2DM.

MATERIALS AND METHODS:

This prospective observational study was carried out at OPD of Dept. of Medicine at Govt. Doon Medical College and Hospital Dehradun. The study period was between January 2019 to August 2019. The anthropometric measurements and demographic characteristics of patients included in the study were recorded. The clinical details and medications are entered into Excel sheet of Microsoft Excel 2013. Biochemical tests were done and reports were entered.

Patients included were diagnosed T2DM cases attending OPD of Medicine department. TSH test was done on all patients. History of diabetes (in years), family history of diabetes, blood pressure, pulse rate was recorded. History of smoking, alcoholism, drug abuse was noted. HbA1c, fasting blood glucose level tests were carried out. BMI of each patient was calculated.

TSH assay was done on each patient by ELISA using commercially available kits. Classification of patients was done accordingly as follows:

Euthyroid (TSH 0.5-4.9 μ IU/ml),

Subclinical hypothyroid (TSH 5- 9.9 μ IU/ml),

Clinical hypothyroid (TSH $\geq$ 10 μ IU/ml or previously on thyroxine replacement for hypothyroidism).

Patients were labeled as hyperthyroid if they have been or are on antithyroid medications or have a TSH $<$ 0.5 μ IU/ml.

RESULTS

A total of 1023 T2DM patients who attended Medicine OPD in study period were screened for

hypothyroidism among which 112 were diagnosed as hypothyroidism and were included in the study.

Table 1: Prevalence of hypothyroidism in diabetic patients

Total patients	Hypothyroidism patients N (%)
1023	112(10.94%)

Among 1023 diabetic patients, 112 were suffering with hypothyroidism. Prevalence of hypothyroidism in T2DM is found to be 10.94% in our study.

Table 2: Demographic parameters

Parameters	Mean(SD)
Age(in years)	48.31(4.22)
BMI(kg/m ²)	28.01(3.39)
T3 (ng/ml)	0.98(0.23)
T4 (ng/ml)	1.24(0.29)
TSH(μ IU/ml)	12.21(3.99)
Total Serum Cholesterol(mg/dl)	208.11(21.32)
Triglycerides(mg/dl)	125.69(24.72)
HbA1c(%)	10.23(2.57)
Fasting Blood Glucose Level(mg/dl)	133.05(17.81)
Post Prandial Blood Glucose Level (mg/dl)	201.54(27.33)

In present study the mean (SD) age of cases was found to be 48.31(4.22) years. Average BMI was observed to be 28.01 kg/m² with SD of 3.39 kg/m². Level of T3 and T4 were observed to be 0.98(0.23) ng/ml and 1.24(0.29) ng/ml respectively. Mean(SD) of TSH levels was 12.21(3.99) μ IU/ml. Total Serum cholesterol levels were found to be 208.11 mg/dl on average with SD of 21.32mg/dl. Hb1Ac count is seen as 10.23(2.57) on average. Fasting blood glucose level was 133.05(17.81) mg/dl and post prandial blood glucose level was 201.54(27.33) mg/dl.

Table 3: Hemodynamic characteristics

Parameters	Mean(SD)
SBP	129.31(6.02)
DBP	86.77(4.50)
Pulse Rate	81.64(7.72)

SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure

The mean (SD) SBP and DBP were found to be 129.31(6.02) mm/Hg and 86.77(4.50) mm/Hg respectively.

Table 4: History of diabetes

Type of history	
Personal(in years) Mean(SD)	3.7(2.25)
Family N (%)	71(63.39%)

It was observed that average years with diagnosed T2DM was 3.7 years on average with SD of 2.25 years. Among all 112 patients, 71(63.39%) of cases had a family history of diabetes.

DISCUSSION:

Present study was conducted to know the presence of hypothyroidism among patients with type 2 diabetes mellitus. Various tests were conducted such as tests for thyroid, total serum cholesterol, fasting and post prandial blood glucose level, triglycerides and HbA1c. BMI of cases was calculated. Patient was diagnosed with hypothyroidism on basis of thyroid stimulating hormone levels. It was found that 112 patients had hypothyroidism out of 1023 patients with T2DM, thus the prevalence of hypothyroidism was 10.23%. In a study by Demitrost L. et. al done on 202 patients with type 2 diabetes mellitus reported that 11.4% had hypothyroidism and 16.3% had subclinical hypothyroidism^{xii}. Similar results were noted in another study by Nair A et. al. in which the prevalence of hypothyroidism in patients with type 2 diabetes mellitus was found to be 9.83%^{xiii}. In a study from South India found prevalence of subclinical hypothyroidism to be 11.25%, overt hypothyroidism in 12% hyperthyroidism in 0.75% versus 1% in diabetic subjects^{xiv}.

The mean age of cases in this study was found to be 48.31 years with standard deviation of 4.22 years. Majority of the cases belonged to middle age group. In present study BMI was observed to be 28.01 kg/m² on average with standard deviation of 3.39 kg/m². In a study by Nair A et. al. the prevalence of hypothyroidism was higher in elderly patients with BMI more than 25 (kg/m²)¹³.

T3, T4 and TSH were found to be 0.98(0.23) ng/ml, 1.24(0.29) ng/ml and 12.21(3.99) µIU/ml respectively.

There is prolonged peripheral glucose accumulation, gluconeogenesis, diminished hepatic glucose output due to reduced glucose absorption from gastrointestinal tract^{xv}. Insulin resistance leads to glucose stimulated insulin secretion in cases of overt or subclinical hypothyroidism^{xvi}. There is diminished rate of insulin stimulated glucose transport rate caused by perturbed expression of glucose transporter type 2 gene (GLUT 2) translocation in subclinical hypothyroid cases. Anorectic conditions in hypothyroidism may also contribute to reduced insulin^{xvii}.

In our study average years with diagnosed T2DM was 3.7 years on average with SD of 2.25 years. Among all 112 patients, 71(63.39%) of cases had a family history of diabetes. In a study by Nair A. noted that there was an association between duration of diabetes and hypothyroidism, which suggested contribution cumulative effect if hyperglycemia¹³.

CONCLUSION:

It is noted that one among 10 patients with type 2 diabetes mellitus has hypothyroidism. BMI was noted to be more than 28 kg/m² among all patients. Hypothyroidism may be prevalent in T2DM patients due to duration of diabetes, obesity. More studies in this area are required to confirm the findings.

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