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Original Research Article

A study of prevalence of thyroid disorders in type 2 diabetic patients in tertiary care hospital

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ABSTRACT

Background: Insulin and thyroid being intimately involved in cellular metabolism, excess or deficit of one of these hormones leads to abnormality of the other. Association between type 1diabetes and hypothyroidism may be autoimmune. Association of poorly controlled diabetes and thyroid results in a low T3 state and loss of TSH response to TRH. The objective of the present endeavor is to study the thyroid functions in diabetics and to know the spectrum of thyroid dysfunction in DM.
Methods: It is a prospective cross-sectional study of 100 diabetic patients admitted in medical wards in a duration of 6 months from November 2017 to May 2018 of both sexes in between age group of 30-80years. All these patients underwent thyroid profile tests. Detailed history and examination done on these patients.
Results: Out of total 100 patients included in the study, thyroid disorder was present in 29%. Hypothyroidism in 1 patient, sub clinical hypothyroidism in 15 patients, hyperthyroidism was present in 13 patients. Females (36%) had high incidence than males (22%). Elderly people had higher incidence of subclinical hypothyroidism (18.2%), clinical features of hyperthyroidism present in 8 patients, Poor hypoglycemic control seen in hyperthyroid individuals (55.5%). Duration of diabetes had no relation with incidence of thyroid disorders.
Conclusions: Prevalence of thyroid disorders in diabetic patients was 29%. Elderly population had more incidence. Subclinical hypothyroidism more common than other conditions. It was more common in females than in males. There is no relation in between duration of diabetes and thyroid disorder. Severe complications were noted in patients with sub clinical hypothyroidism.

Keywords: Hypothyroidism, Hyperthyroidism, Subclinical hypothyroidism, Type 2 diabetes

INTRODUCTION

Among all the endocrine metabolic diseases, diabetes mellitus is the most common disorder seen. The impact of this disease on the quality of life and on morbidity and mortality through its complications that affect the small and large vessels resulting in retinopathy, nephropathy, neuropathy, IHD and large vessel obstruction has been emphasized by the findings of national commission on diabetes and DCCT trial.

Diabetes being the most common endocrine metabolic disorder, there was curiosity to understand and learn the association of this with another common endocrine gland function that is thyroid gland.

The association between these two disorders has long been recognized although the prevalence of the thyroid dysfunction in diabetic population varies widely between studies. With insulin and thyroid hormone being intimately involved in cellular metabolism, excess or deficit of one of these hormones result in functional

derangement of the other enhanced sensitivity and specificity of TSH has greatly enhanced assessment of thyroid dysfunction.[1]

Hypothyroidism leads to reductions in hepatic glucose output, gluconeogenesis, and peripheral glucose utilization thus predisposing to hypoglycemia.[2] Use of medications for diabetes also alters thyroid function. Use of metformin has been shown to cause TSH suppression in patients receiving levothyroxine and insulin increases the level of FT4 while suppresses the level of T3 by inhibiting the hepatic conversion of T4 to T3.[3,4]

There are numerous lines of evidence to suggest that type 1 DM is an autoimmune disorder. These include the presence of insulitis, presence of antibodies, auto reactive T cell's against islet antigens, an association with some other known organ specific autoimmune diseases and a strong association between HLA genes and lastly remission of the disease with immune-modulator therapy. Thus, association between thyroid and type 1 diabetics may be an auto immune process.[5]

Association of poorly controlled diabetes and thyroid results in a low T3 state and loss of TSH response to TRH. Regardless of glycemic control, there is an absence of nocturnal TSH peak.

A previous study from India suggested a thyroid disease prevalence of 31.2% among T2 DM patients.[6]

The aim of this study is to establish the relationship between the diabetes and thyroid dysfunction probably as a consequence to the auto immune pathology. The thyroid dysfunction was assessed on the basis of clinical findings and laboratory estimation of serum T3 and T4 and TSH levels and structural disturbances were made out by FNAC of the thyroid gland. The present study was taken upto note the prevalence of thyroid dysfunction in type 2 diabetics and spectrum of thyroid dysfunction.

METHODS

A prospective cross-sectional study was conducted in Narayana medical college and hospital a tertiary care hospital from November 2017 to May 2018 for a period of 6months which included 100 patients who were diagnosed as type 2 diabetes on the basis of ADA criteria. All the type 2 diabetic patients admitted in the wards in Department of General Medicine were examined, history was collected, and diabetes status were estimated by analyzing random blood sugar or fasting blood sugar or Post prandial blood sugar and were screened with investigations such as thyroid profile (TSH, T3, T4). Initially TSH was measured and in TSH elevated patients, free T4 was measured if it was normal with few or no apparent clinical features then it was considered as subclinical hypothyroidism and they were further evaluated with TPO antibodies. If both TSH and free T4 were low with symptoms such as tiredness, dry skin, constipation, weight gain with poor appetite, hair loss, cold intolerance, menorrhagia, parasthesias and signs such as dry coarse skin, cool peripheral extremities, puffy face, bradycardia, peripheral edema, delayed tendon relaxation, carpel tunnel syndrome then it was considered as overt hypothyroidism. If TSH low and free T4 was high with symptoms such as irritability, heat intolerance, palpitations, weight loss with increased appetite, diarrhoea, oligomenorrhea, and signs such as tachycardia, atrial fibrillation, tremor, goiter, lid retraction or lag then primary hyperthyroidism was considered. And if TSH low and unbound T4 normal then free T3 was measured and classified as T3 toxicosis if T3 high and if it was normal sub clinical hyperthyroidism was considered:

- Normal thyroid readings during this trial are T3 levels considered from range 0.7-2.0ng/ml,
- T4 levels considered 4.5-11microg/dl and TSH levels range considered is 0.4-5.0microIU/ml.

Inclusion criteria

- Diagnosed as type 2 diabetes on the basis of ADA criteria.[7]
- All diabetics irrespective of glucose control and treatment.

Exclusion criteria

- Patients with Type 1 DM, gestational diabetes, pancreatitis.
- Type 2 diabetes patients with known case of hypothyroidism or hyperthyroidism.
- On medication for any thyroid disorder.

RESULTS

In this study, 100 established diabetic patients were screened for thyroid dysfunction. Out of which 29 were found to have thyroid disorder. Among 29 cases, low thyroid function was noted in 16 patients and 13 had hyperfunctioning of thyroid gland.

Out of 16 hypothyroid cases,1 had overt hypothyroidism and 15 had sub clinical hypothyroidism. Hyperthyroidism was noted in 13 cases (Table 1).

Table 1: Statistical analysis.

Serum TSH	Number of patients
Normal/abnormal	71/29
Primary hypothyroidism	1
Subclinical hypothyroidism	15
Hyperthyroidism	13

In the present study of 100 patients,50 were males and 50 were females. Prevalence of thyroid dysfunction was more among females. 11 out of 50 male patients had thyroid dysfunction and 18 out of 50 females had thyroid

dysfunction (Table 2). The p value for age match was p=0.123 which is not significant. The p value for incidence of sub clinical hypothyroidism in males and females was p=0.04 which is significant.

Table 2: Sex wise distribution.

Sex	Normal	Hyper-thyroidism	Hypo-thyroi-dism	Sub-clinical hypothyro-idism
Male	39	6 (12%)	1 (2%)	4 (8%)
Female	32	7 (14%)	0	11 (22%)

In this study we had 68 cases with type 2 diabetes below the age of 60 years and 32 cases above or equal to the age of 60 years. Out of 68 cases, 5 had sub clinical hypothyroidism, one had hypothyroidism and 12 had hyperthyroidism. Out of 32 elderly patients 10 had sub clinical hypothyroidism, 1 had hyperthyroidism.

In this study prevalence of sub-clinical hypothyroidism was more in elderly (31.25%) compared to adult and middle age group (7.36%). Prevalence of hyperthyroidism was more in adult and middle age group (17.65%) compared to elderly population (3.12%).

Table 3: Age wise distribution.

Age (yrs)	Hypo-thyroidism	Hyper-thyroidism	Sub-clinical hypothy-roidism	Normal
Male				
<60	1	6	0	29
>60	0	0	4	10
Total	1	6	4	39
Female				
<60	0	5	6	21
>60	1	6	1	11
Total	7	11	7	32

In this study sub-clinical hypothyroidism is more among females (22%) than in males (8%). Hyperthyroidism prevalence had no significant difference in females (14%) and males (12%) (Table 3).

Authors' have divided the 100 diabetes patients in this study into three groups according to the duration of diabetes.

Table 4: In relation to duration of diabetes.

Duration	No. of patients	Thyroid disorder	%
0-5 yrs	54	18	33.33
6-10 yrs	36	10	27.77
>11 yrs	10	1	10

Fifty-four people were in the duration of 0-5 yrs and 36 were 6-10yrs and the remaining 10 had more than 10 years duration of diabetes (Table 4).

P value (chi-square value) was 0.0012. Increased duration of diabetes had no significance with relation to increase in thyroid dysfunction in this study (p=0.0012).

Out of 100 patients with diabetes, symptoms of thyroid disorder were present in 8 patients.

All the 8 patients with symptoms of thyroid disorder were hyperthyroid, remaining cases had no symptoms of thyroid disease. The symptoms being heat intolerance, sweating, palpitations, fatigue/weakness, increased appetite and menstrual disturbances.

Nineteen patients were on both OHA's and Insulin for treatment of diabetes, out of which 9 had thyroid disorders (4 had sub-clinical hypothyroidism and 5 were hyperthyroid). None of the patients had hypothyroidism. Patients with hyperthyroidism had poor glycemic control (14%) compared to sub-clinical hypothyroidism (Table 5). This could be due to the effect of thyroid hormone on insulin.

Table 5: In relation to treatment of diabetes.

Treat ment	No. of patients	Hyper-thyroi-dism	Hypo-thyroi-dism	Sub-clinical hypothyro-idism
OHA	74	19	8	11
Insulin	7	1	0	1
OHA+ Insulin	19	9	5	4

In this study, out of 100 patients with type 2 diabetes 43 patients had complications of diabetes in the form of retinopathy, nephropathy and neuropathy based on clinical and laboratory evidences. 12 out of these 43 patients had thyroid disorders (Table 6).

Table 6: Thyroid dysfunction in patients with diabetic complications.

DM comp-lications	Total no. of patients	Total no. of patients with thyroid disorder	Subclinical hypo: hyperthyro-idism ratio
Retinopathy	11	4	3:1
Nephropathy	17	4	3:1
Neuropathy	15	4	2:2

DISCUSSION

Among the endocrinal metabolic diseases diabetes occupies the major share. India has the dubious distinction of being home to the largest number of people

suffering from diabetes in any country. The disease is responsible for significant mortality and morbidity due to its complications.

A total of 100 type 2 diabetic patients were studied. All were confirmed diabetics who previously had plasma glucose levels of >126mg/ dl or RBS of >199mg/dl on more than one occasion and were receiving treatment such as insulin, OHA's or physical exercise therapy. All these patients comprised of rural population.

Prevalence and spectrum of thyroid disorders in type 2 diabetics

In this study of 100 patients with type 2 diabetes, 50 were males and 50 were females. Prevalence of thyroid dysfunction was seen in 29% of patients and number of reports have also indicated higher than normal prevalence of thyroid disorders.

Nigeria found that prevalence of thyroid disorder in T2DM was 46% out of which, 26.6% and 19.9% had hypothyroidism and hyperthyroidism respectively.[8]

In Jordan, it was reported that thyroid dysfunction was present in 12% of T2DM patients.[9] 12.3% of Greek diabetic patients were found to have thyroid dysfunction. 16% of Saudi patients with T2DM were found to have thyroid dysfunction.[10] Thyroid disease overall prevalence in T2DM patients was 10.813% among them hypothyroidism was 36%, subclinical hypothyroidism was 51.3%, hyperthyroidism was 12%.[6] An overall prevalence of 13.4% of thyroid diseases in diabetics was seen with the highest prevalence among females 31.4%.[11]

Out of 202 type 2 DM patients, 16.3% had subclinical hypothyroidism, 23% had hypothyroidism, 4 had subclinical hyperthyroidism and 3 were hyperthyroid. And maximum cases were of hypothyroidism seen in age group of 45-64 years.[12]

The prevalence of thyroid disorder in diabetic patients was 14.7%, sub clinical hypothyroidism was 12%. Prevalence of anti TPO antibodies was 10.8%.[13]

The subclinical hypothyroidism was associated with a higher prevalence of vascular complications in type 2 diabetes.[14]

In this study authors had found that 17% hyperthyroid patients had a poor glycemic control compared to that of hypothyroid patients. Authors did not find hypoglycaemia in any of studied patients with sub-clinical hypothyroidism.

Hyperthyroidism impairs glycemic control in diabetic subjects, while hypothyroidism may increase susceptibility to hypoglycaemia thus complicating diabetes management. Furthermore, it seems that unidentified thyroid dysfunction could negatively impact diabetes and its complications. A higher frequency of retinopathy and nephropathy was observed in diabetic patients with subclinical hypothyroidism. Therefore, management of sub-clinical hypothyroidism in patients with diabetes may prove beneficial.

Limitations of this study are as time period is limited and number of patients is limited results in large population are unpredictable.

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