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Across Sectional Study on Thyroid Profile in Type II Diabetes Mellitus

(Original Article)

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Abstract

Background & Objectives: *Diabetes Mellitus (DM) is a common endocrine disorder which involves multiple organ systems and leads to significant morbidity and mortality due to accompanying complications. DM has been defined as A METABOLIC SYNDROME characterized by chronic hyperglycemia & disturbance in carbohydrate, fat, protein metabolism with absolute or relative deficiency in insulin secretion or insulin action. There are macro and micro vascular complications of diabetes involving kidneys, eyes, blood vessels, nerves and heart. Thyroid diseases are also a common endocrinopathy seen in adult population.*

Thyroid hormones are intimately involved in cellular metabolism. Thus excess or deficit of either insulin or thyroid hormones could result in functional derangement of cellular metabolism. This study would be an attempt to study the prevalence of thyroid disorders in patients with type II diabetes.

Materials & Methods: *This cross sectional study included 100 patients with type II diabetes without previous thyroid abnormalities after meeting inclusion criteria during Jan 2015 to June 2015 held at Mamata Medical College & General Hospital- Khammam, TS state.*

Results: *Out of 100 patients with type II DM, 14 had abnormal thyroid profile of which 13 had subclinical hypothyroidism, 1 patient had overt hypothyroidism, 61% were females, more among those with duration up to 5 years (68%).*

Conclusion: *The prevalence of thyroid dysfunction is more common among type II DM patients than in general population. The prevalence is higher in females than in males.*

Key Words: *Type II Diabetes Mellitus (DM), Metabolicsyndrome, Subclinical hypothyroidism.*

INTRODUCTION

Diabetes mellitus is a group of metabolic diseases characterised by hyperglycemia resulting from defects in insulin secretion, insulin action or both[1]. The chronic hyperglycemia of diabetes is associated with long term damage, dysfunction and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels[2].

Diabetes mellitus is the common endocrine disorder which involves multiple organ systems

and lead to significant morbidity and mortality due to accompanying complications. The IDF Diabetic Atlas 2012 states that the prevalence of diabetes mellitus is more than 371 millions[3]. Thyroid diseases are the second most common endocrinopathies seen in the adult population. Thyroid hormones are initially involved in cellular metabolism.

The association between these two disorders has long been recognised although the prevalence of thyroid dysfunction in diabetic population varies widely between studies. Withinsulin and thyroid hormone being intimately involved in cellular metabolism and thus excess or deficit of these hormones result in functional derangement of the other.Enhanced sensitivity and specificity of TSH has greatly enhanced assessment of thyroid function.

There are numerous lines of evidence to suggest that type 1DM is an autoimmune disorder. These include the presence of insulitis, presence of antibodies, auto- reactive T- cells against islet antigens, an association with some other known organ specific autoimmune diseases (thyroid disorders and pernicious anaemia) 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 auto - immune process[4].

In euthyroid individuals with diabetes mellitus, the serum T3 levels, basal TSH levels and TSH response to the thyrotropin releasing hormone (TRH)may all be strongly influenced by the glycemic status. Poorly controlled diabetes, both type 1and type 2, may induce a "Low T3 state characterised by low serum total and free T3 levels, increase in reverse T3(r T3) but near normal serum T4 and TSH concentrations[5]. Low serum T3 is due to reduced peripheral conversion of thyroxine (T4) to tri- iodothyroxine (t3) via 5' monodeiodination reaction and may normalise with improvement in glycemic status but even with good diabetes control, the normal nocturnal TSH peak may not be restored in C-peptide negative patients[6].

Present study is a modest attempt to study the prevalence of thyroid disorders in patients with type 2 diabetes mellitus.

OBJECTIVES

To study the prevalence of thyroid disorders in patients with type 2 diabetes mellitus, the distribution of thyroid disorders in regard to their demographic data and to evaluate the relationship between glycemic control and occurrence of altered thyroid function in type 2 diabetes mellitus.

METHODOLOGY

The present study was carried out in the Department of General Medicine, Mamata Medical College& General Hospital,Khammam.

1.Study design: Cross sectional study.

2. Period of study: Jan 2015 to June 2015.

3.Materials: Questionnaire, FBS,PLBS, Thyroid profile(FT3,FT4, and TSH), HbA1C.

4.Study group: The study group included 100 patients

Inclusion criteria

Known type2 diabetes mellitus and newly detected type 2 diabetes mellitus patients who gave an informed consent to participate in the study.

Exclusion criteria

- Patients not willing for study.
- Patients with known thyroid disease.
- Patients with chronic renal failure and diabetic nephropathy.
- Patients with acute illness (sepsis, acute MI, severe heart failure, recent admission in intensive care unit).
- Patients with hepatic dysfunction.
- Patients with psychiatric illness.
- Pregnancy.
- Patients on treatment with drugs interfering with thyroid function

(Amiodarone, Propranolol, Corticosteroids and Oral contraceptives[7])

All patients in the study group were selected without any bias for sex, duration, severity or control of diabetes. A thorough history was recorded with particular emphasis on symptoms of hypothyroidism and hyperthyroidism. Family history regarding diabetes mellitus and treatment history of oral hypoglycaemics or insulin along with duration was also included.

Blood sugars: Both fasting and postprandial blood sugars are estimated by GOD POD method.

HbA1C: Blood sample collected in EDTA coated tubes and HbAIC is estimated by Biorad- HPLC method.

Thyroid Profile: Methods used:

1. TSH – Ultrasensitive sandwich chemi luminescent immuno assay
2. FT3 &FT4 – Competitive chemi luminescent immune assay.

DEFINITIONS

Diabetes Mellitus: The WHO in consultation with an expert committee of the American Diabetes Association has approved the following diagnostic criteria for diabetes mellitus, which was used to diagnose new cases.

Table1. ADA Criteria for the diagnosis of Diabetes Mellitus

Symptoms of diabetes plus random blood glucose concentration ≥ 11.1mmol/L(200mg/dl)
Fasting plasma glucose ≥ 7.0mmol/L (126mg/dl) or
Hb1A1C > 6.5% or
Two hour plasma glucose ≥ 11.1mmol/L (200mg/dl)during an oral glucose tolerance test

The patients on antidiabetic therapy were also considered as having diabetes mellitus[4].

Thyroid profile Reference values:

- TSH : 0.34 – 4.25 IU/ml
- FT4 : 0.7 – 1.24 ng/dl
- FT3 : 2.4 - 4.2pg/ml

Overt hypothyroidism is defined as TSH> 5.5 IU/ml with FT4< 0.7ng/dl.

Subclinical hypothyroidism is defined as TSH> 5IU/ml with normal FT3 and FT4 levels.

Overt hyperthyroidism is defined as TSH<0.3IU/ml with FT4>1.3ng/dl.

Sub clinical hyperthyroidism is defined as TSH <0.1iu/ml with normal ft3 and ft4 levels[8].

RESULTS

The study sample included 100 patients with type 2 diabetes both inpatients and attending the outpatient department. Following were the observations

Table2. Distribution Of Cases According To Type Of Treatment

TYPE OF TREATMENT	NO OF CASES	PERCENTAGE
OHA	78	78%
INSULIN	15	15%
BOTH	07	7%
TOTAL	100	100%

Table3. Distribution Of Cases According To Family History Of Diabetes Mellitus

Family H/O DM	No Of Cases	Percentage
Yes	39	39
No	61	61
Total	100	100

Table 4. Distribution Of Cases According To Abnormal Thyroid Function

Thyroid Fuction	No. Of Cases	Percentage
Normal	86	86
Abnormal	14	14
Total	100	100

Out of 14 patients with abnormal thyroid profile, all the 14 patients (100%) were aged between 41-60 years. Compared to normal thyroid profile group it has no statistical significance.

Table 5. Abnormal thyroid profile versus age group

AGE GROUPS (Yrs)		Abnormal Thyroid Profile		Total
		No	Yes	
Upto 40	Count	6	0	6
	% within abnormal Thyroid profile	7%	0	6%
	% of total	6%	0	6%
41-60	Count	60	14	74%
	% within abnormal Thyroid profile	69.8%	100%	74%
	% of the total	60%	14%	74%
>60	Count	20	0	20
	% within abnormal Thyroid profile	23.2%	0	20%
	% of total	20%	0	20%
Total	Count	86	14	100
	% within abnormal Thyroid profile	100%	100%	100%
	% of total	86%	14%	100%

Table 6. Abnormal thyroid profile Vs. Sex

Sex		Abnormal Thyroid Profile		Total
		No	Yes	
Male	Count	38	1	39
	% within abnormal thyroid profile	44.2%	7.1%	39%
	% of total	38%	1%	39%
Female	Count	48	13	61
	% within abnormal thyroid profile	55.8%	92.9%	61%
	% of total	48%	13%	61%
Total	Count	86	14	100
	% within abnormal thyroid profile	100%	100%	100%
	% of total	86%	14%	100%

CHI SQUARE VALUE = 5.47 P VALUE = 0.0193Significant

Out of the 14 patients with abnormal thyroid profile, 7.1% (1) was male and 92.9% were females. Compared with normal thyroid profile group, this was statistically significant.

Table 7. Distribution Of Cases According To Abnormal Thyroid Function

Thyroid Profile	No.Of Cases	Percentage
Normal	86	86
Hypothyroidism	1	1
Sub Clinical Hypo	13	13
Hyperthyroidism	0	0
Sub Clinical Hyper	0	0
Total	100	100

Table 8. Abnormal thyroid profile Vs Duration of Diabetes Mellitus

Duration of DM (yrs)		Abnormal Thyroid Profile		Total
		No	Yes	
Upto 5 yrs	Count	58	10	68
	% within abnormal thyroid profile	67.4%	71.4%	68%
	% of total	58%	10%	68%
6-10	Count	17	4	21
	% within abnormal thyroid profile	19.8%	28.6%	21%
	% of total	17%	4%	21%
>10	Count	11	0	11
	% within abnormal thyroid profile	12.8%	0	11%
	% of total	11%	0	11%
Total	Count	86	14	100
	% within abnormal thyroid profile	100%	100%	100%
	% of total	86%	14%	100%

CHI SQUARE VALUE = 2.26 P VALUE = 0.323 Not Significant

Out of the 14 patients with abnormal thyroid profile,71.4%(10/14)and duration of diabetes 5 years or less, 28.6% had duration between 6-10 years. Compared with normal thyroid profile group, this was statistically significant.

Table 9. Abnormal thyroid profile Vs type of treatment

Treatment	No of pt's	Thyroid disorders	Sub clinical hypo	Hypothyroid
OHA	78	11	10	1
INSULIN	15	2	2	0
OHA'S and Insulin	7	1	1	0

CHI SQUARE = 2.14 P value = 0.293 Not significant

Out of the 14 patients with abnormal thyroid profile, 78.6% (11/14) were on OHA, 14.3% (2/14) were on insulin &7.1% (1/14) on both OHA & insulin. Compared with normal thyroid profile group, this was not statistically significant.

Table 10. Abnormal thyroid profile Vs Family history of Diabetes Mellitus

Family history		Abnormal Thyroid profile		Total
		No	Yes	
No	Count	50	61	11
	% within abnormal thyroid profile	58.15	78.6%	61%
	% of total	50%	11%	61%
Yes	Count	36	3	39
	% within abnormal thyroid profile	41.9%	21.4%	39%
	% of total	36%	3%	39%
Total	Count	86	14	100
	% within abnormal thyroid profile	100%	100%	100%
	% of total	86%	14%	100%

CHI SQUARE VALUE = 1.34 P VALUE = 0.247 NotSignificant

Out of the 14 patients with abnormal thyroid profile, 21.4% (3/14) had family history of diabetes mellitus, 78.6% (11/14) had no family history. Compared with normal thyroid profile group, this was not statistically significant.

Table 11. Abnormal Thyroid profile Vs HbA1c level

HbA1c level		Abnormal Thyroid Profile		Total
		No	Yes	
<7%	Count	28	5	33
	% within abnormal thyroid profile	32.6%	35.7%	33%
	% of total	28%	5%	33%
>7%	Count	58	9	67
	% within abnormal thyroid profile	67.4%	64.3%	67%
	% of total	58%	9%	67%
total	Count	86	14	100
	% within abnormal T. profile	100%	100%	100%
	% of total	86%	14%	100%

CHI SQUARE VALUE = 0.01 P VALUE = 0.9203 Not Significant

Out of 14 patients with abnormal thyroid profile, 64.3% (9/14) had HbA1c value above 7 and the remaining 35.7% (5/14) had HbA1c 7 or less. Compared with normal thyroid profile group, this was not statistically significant.

DISCUSSION

A total of 100 type 2 diabetics were studied.

AGE DISTRIBUTION

In the present study of 100 type 2diabetic patients, 6 patients (6%) were upto 40 years, 74 patients (74%) were between 41-60 years and 20 patients (20%) were 61 years or more. This shows that the disease was more prevalent between 41-60 years of age.

This observation was similar to IDF ATLAS, 2012 report which states that the greatest numbers of people with type2 diabetes mellitus are between 40-59 years of age. This observation was also similar to WHO report[3]. Which predicts that while the main increase in diabetes would be in the >65 years age group in the developed countries, in India and developing countries the highest increase would occur in the age group of 45-65 years of age group. This observation is also similar to Kapur et al, who reported that maximum numbers of cases were diagnosed between 40 and 59 years of age with no significant difference between the genders[9].

GENDER DISTRIBUTION

In the present study 39% (39) of the studied population were males and 61% (61) were females. Female to male ratio was 1.5:1.

This observation was similar to Arthur M. Michalek et al who reported that prevalence of diabetes among women was higher than in men[10]. This is in contrast to Jali et al[11] and Flatau E et al[12] who reported that diabetes was more prevalent in men than in women.

FAMILY HISTORY OF DIABETES MELLITUS

In the present study, 39% of patients had family history of Diabetes and the remaining 61% had no family history.

This study is similar to that of Tattersal and Fojans[13] and Vishwanthan[14]. Vishwanathan et al conducted a study on 107 subjects. Out of 73 subjects who gave positive family history

diabetes, 19 subjects (26%) later developed diabetes.

HBAIC LEVEL

In the present study, 67% patients had HbA1C level more than 7% and 33% had level HbA1C less than 7%. More than two- thirds of the diabetics had poor glycemic control. Paolo fumelli in his study of 562 diabetic patients found that all the patients had level HbA1C greater than 8%[15].

ABNORMAL THYROID PROFILE

In the present study, 14% of the patients with diabetes mellitus had abnormal thyroid profile

The present study is similar to Abdel-Rahman et al[16] who in his study of 908 type 2 diabetic patients found that the prevalence of thyroid disease was 12.5%, 6.6% of whom were newly diagnosed and 5.9% had known thyroid dysfunction. The prevalence of thyroid disease in the non diabetic control group was 6.6%.

Chubb et al in a cross-sectional study of 420 patients with type2 diabetes mellitus found that 8.6% of patients had subclinical hypothyroidism[17].

D.H.Akbar et al in their study of 100 type2 diabetics found that the prevalence of thyroid dysfunction was 16% and in control group of non diabetics, it was 7%[18].

Smithson M J in his study found that the prevalence of thyroid disease in the entire population of diabetic patients registered in the general practice was 10.8%. In the control group of non diabetics, the prevalence was 6.6%[19].

DISTRIBUTION OF THYROID ABNORMALITIES

In the present study,13% (13)of the patients had reports suggestive of sub clinical hypothyroidism and 1%(1) patient had report suggestive of overt hypothyroidism.

This study was similar to Abdel-Rahman et al who in their study of 908 type2 diabetic patients found that 10.3% of patients had hypothyroidism(overt and sub clinical) and 1.7% of patients had hyperthyroidism (overt and sub clinical)[13].Smithson et al in their study of 233 diabetes mellitus patients found that 11patients were found to have undiagnosed thyroid disease, out of which 9 were having hypothyroidism(overt and sub clinical) and 2 were having hyperthyroidism(overt and sub clinical)[19].

Celani MF et al in their study of 290 type2diabetes mellitus patients found that 91 patients(31.4%) had abnormal TSH concentrations out of which 48.3% had sub clinical hypothyroidism,24.2% had sub clinical hyperthyroidism,23.1% had overt hypothyroidism and 4.4% had overt hyperthyroidism[20].

SIGNIFICANCE OF AGE IN PATIENTS WITH ABNORMAL THYROID PROFILE

Among the patients with abnormal thyroid profile, all the patients (100%) were aged between 41 to 60 years. Though there is difference, when compared between patients with normal and abnormal thyroid profile it has no significance (p=0.057).

The present study findings contradict with that of Chubb et al who in their study found that age and anti-TPO status correlates with altered thyroid profile in diabetic patients[17].

Vondra et al in his study found that thyroid diseases in diabetic patients is 2-3 times higher than in non diabetic subjects; it raises with age, and is strongly influenced by female gender and autoimmune diabetes[21]. This also contradicts with our findings.

ANALYSIS OF SEX DISTRIBUTION IN CAES WITH ABNORMAL THYROID PROFILE

In the present study 92.9% (13/14) patients were found to be female compared to 7.1% (1/14) male in the group with abnormal thyroid profile. Compared between patients with normal and abnormal thyroid profile this was statistically significant (p=0.0193).

Celani MF et al[20], Arthur M. Michalek et al[10] and Abdel – Rahman et al[16] in their study found that the prevalence of thyroid dysfunction was

significantly higher in the female than in the male diabetic patients.

Vondra et al[21] found significant correlation between female gender and altered thyroid profile.

SIGNIFICANCE OF TYPE OF TREATMENT IN PATIENTS WITH ABNOMAL THYROID PROFILE:

Out of 14 patients with thyroid abnormality, 78.6% (11/14) were on OHA, 14.3% (2/14) were on insulin and 7.7% (1/14) were on both OHA/Insulin. Compared with normal thyroid profile group it has no statistical significance (p=0.293)

The findings of our study are similar with Chubb et al[17], who in their study found that altered thyroid profile was associated with anti- TPO status and age. Celani MF et al[20] in their study found that the prevalence of abnormal thyroid function test results was significantly higher in insulin treated patients than in those receiving OHA. This contradicts with our study.

ANALYSIS OF HbA1C LEVEL IN CASES WITH NORMAL AND ABNORMAL THYROID PROFILE

Out of 14 patients with abnormal thyroid profile, 64.3% (9/14) had HbA1C value above 7% and the remaining (35.7%) had HbA1C 7 or less. The mean HbA1C level of the patients with abnormal thyroid profile was 8.31% compared to 7.57% in the patients with normal thyroid profile. This difference is not statistically significance (p=0.228).

The findings are similar to Chubb et al[17] who found no correlation between changes in free thyroid hormone concentrations and HbA1C level. Celani MF et al[20] in their study in 91 diabetic patients with altered thyroid profile found that TSH level in serum decreased in sub clinical hypothyroidism and increased in sub clinical hyperthyroidism with significant fall in HbA1C level. This contradicts with our findings.

CONCLUSION

Prevalence of thyroid dysfunction is more common among type 2 diabetes mellitus patients than in general population.

Prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus is higher in females than in males.

Routine screening for thyroid dysfunction in type 2 diabetes mellitus patients may be justified especially in females because the progression to overt thyroid dysfunction is associated with significant morbidity including the adverse effects on glycemic control, lipid profile, bone mineral density and cardiovascular events.

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