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Original Research Article

Thyroid profile in type 2 diabetes mellitus

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ABSTRACT

Background: Diabetes mellitus is an endocrine disorder which involves multiple organ systems and leads to significant morbidity and mortality. Diabetes mellitus has been defined as "A metabolic syndrome characterized by chronic hyperglycemia and disturbance of carbohydrate, fat and protein metabolism associated with absolute or relative deficiency in insulin secretion and or insulin action". Thyroid diseases are also a common endocrinopathy seen in the adult population. Thyroid hormones are intimately involved in cellular metabolism. The present work is a modest attempt to study the prevalence of thyroid disorders in patients with type 2 diabetes mellitus.
Methods: The study was carried out in total 108 diabetic patients without known thyroid disorder admitted in various Medical wards of R.N.T. Medical college and attached group of hospitals, Udaipur. It was a cross Sectional study done over a period of 10 months.
Results: In the present study, 13% of patients with type 2 diabetes mellitus had abnormal thyroid profile. Out of which the most common presentation was sub clinical hypothyroidism found in 9.25% followed by1.9% had overt hypothyroidism and 1.9% had sub clinical hyperthyroidism. In persons with abnormal thyroid profile 85.7% were females and 14.3% were males which was statistically significant.
Conclusions: Prevalence of thyroid dysfunction is common among T2DM patients and is higher in females than in males. There is no significant correlation between thyroid dysfunction and age, diabetes control, family history, type of treatment and HbA1c level in diabetic patients.

Keywords: Diabetes Mellitus, Endocrinopathy, Hyperthyroidism, Thyroid dysfunction

INTRODUCTION

Diabetes mellitus Type 2 (T2DM) is one of the common endocrine disorder and incidences of diabetes are increasing day by day in clinical practice. In the first edition of the IDF Diabetes Atlas, released in 2000, the estimated global diabetes prevalence was 151 million risen to 371 million in 2012 with a prediction that by 2030 the number of people with diabetes will rise to 438 million.[1] Diabetes is defined as "A metabolic syndrome characterized by chronic hyperglycemia and disturbance of carbohydrate, fat and protein metabolism associated with absolute or relative deficiency of insulin secretion, action or both."[2] Exact etiopathogenesis of T2DM is not yet clear and possible mechanism describe are genetic, autoimmune, infection etc.T2DM may be associated with so many other autoimmune diseases and endocrinal diseases but incidences are exactly not known. Thyroid diseases are one of the common endocrine disorders in adult population. More than 12% of US population develop thyroid dysfunction during their lifetime.[3] Thyroid diseases are one of the common varieties of endocrinal disorder in India too. It has been estimated that about 42 million people in India suffer from thyroid disease.[4] Thyroid dysfunction may present clinically and biochemically in different forms like subclinical hypothyroidism, overt hypothyroidism, subclinical hyperthyroidism and overt hyperthyroidism. Thyroid and insulin hormone are involved in cellular metabolism.

Excess or deficit of either insulin or thyroid hormones results the functional derangement of the cellular metabolism. Diabetes and thyroid diseases may have association and insulin and thyroid hormones may affect their pathophysiological role. In unmanaged diabetic patient may induced a low T3 state characterized by low serum total and free T3 level, increase in reversal of T3(rT3) but near normal serum T4 and TSH concentration. The relation between T2DM and thyroid dysfunction has been a less explored arena and hence the present work is a modest attempt to study the prevalence of thyroid disorders in patients with type 2 diabetes mellitus.

The aim and objectives were to study the prevalence of thyroid disorders in patients with T2DM.To study the distribution of thyroid disorders in patient with T2DM regarding age, sex, duration of diabetes and type of treatment. To evaluate the relationship between glycemic control and occurrence of altered thyroid function in T2DM.

METHODS

The present study was cross sectional study done over a period of 10 months from March 2012 to December 2012 which includes 108 patients known diabetic or newly detected T2DM patients without known thyroid diseases admitted in various medical and endocrinal ward R.N.T. Medical college and attached group of hospitals Udaipur Rajasthan.

Inclusion criteria

- Known T2DM and newly detected T2DM.
- T2DM subjects who gave informed consent to participate in the study.

Exclusion criteria

- Patients not willing for study
- Patients with known thyroid disease
- Patients with chronic renal failure.
- Patients with acute illness (sepsis, acute MI, severe heart failure and recent admission in intensive care unit)
- Patients with hepatic dysfunction or with psychiatric illness.
- Pregnant patient.
- Patients on treatment with drugs interfering with thyroid function (amiodarone, propranolol, corticosteroids and oral contraceptives).

All 108 patients enrolled in this study undergone detail history regarding duration, severity Family history, type of treatment, compliance, control of glycemic status with co morbid condition like coronary artery disease, hypertension and cerebrovascular accident were noted. A thorough general and systemic examination was done. All these patients were investigated for routine investigation including complete blood count, renal function test, liver function test, lipid profile, X-ray chest, ECG, Echocardiography and Fundus examination. These patients underwent plasma glucose estimation at fasting and 2 hours after meal. Plasma glucose estimation was done by trinder's (Glucose oxidase) method and HbA1C was estimated by HPLC method. All these 108 patients underwent thyroid estimation which includes T3, T4, TSH, FT3, and FT4 by Ultrasensitive sandwich chemiluminescent immunoassay with fasting serum sample.

Binary logistic regression model was used to identify the risk factor associated with abnormal thyroid profile in diabetic population. The dependent variable was abnormal thyroid profile where independent variables were sex, duration of diabetes and family history of diabetes.

Summary statistics was done by Proportion, Mean, Median and Standard Deviation. The inferential statistics was done by ANOVA and Pearson's correlation. All measurements were done using SPSS version 21.0. 'p' value <0.05 was considered statistically significant.

RESULTS

The present study was undertaken on 108 diabetic patients admitted to various medical wards above the age of 18 years and we found 14 patients (13%) up to the age 40 years, 78 patients (72.2%) were between 41 – 60 years and 16 patients (14.8%) were of age more than 61 years. Regarding sex distribution 44 patients (40.7%) were male and 64 patients (59.3%) were females. In this study group 12 patients (11.1%) had duration of Diabetes Mellitus more than 10 years and 96 patients (88.9%) had duration of 10 years or less. On the basis of treatment history 60 patients (55.6%) were on oral hypoglycemic agent, 20 patients (18.5%) were on insulin and 28 patients (25.9%) were on combined treatment of insulin and oral hypoglycemic agent. Among these 108 patients 82 patients (75.9%) were on regular treatment where 20 patients (18.5%) were on irregular treatment and 6 patients (5.6%) were newly diagnosed. 42 patients (38.9%) had family history of Diabetes Mellitus and 66 patients (61.1%) had no family history of Diabetes Mellitus.

Table 1: Distribution of cases according to abnormal thyroid profile.

Thyroid Function	No.	Percentage
With normal thyroid profile	94	87.0
With abnormal thyroid profile	14	13.0
Total	108	100.0

All these enrolled 108 patients were distributed according to their HbA1C level and observe 2 patients (1.9%) had HBa1c level less than 6, 50 patients (46.3%) had 6.1-8

and remaining 56 patients (51.9%) had above it. Thyroid profile of these patients was as Table 1.

The Table 1 shows 13% (14/108) of the patients of diabetes mellitus had abnormal thyroid profile. On further analysis of different type of thyroid abnormality distribution as Table 2.

Table 2: Pattern of thyroid diseases.

Thyroid profile	No. of cases	Percentage
Normal	94	87.0
Overt hypothyroidism	2	1.9
Subclinical hypothyroidism	10	9.25
Overt hyperthyroidism	0	0.0
Subclinical hyperthyroidism	2	1.9
Total	108	100

The Table 2 shows that 9.25% (10/108) of the patients had sub clinical hypothyroidism, 1.9% (2/108) overt hypothyroidism, 1.9% (2/108) patients had subclinical hyperthyroidism.

Thyroid profile were analyzed with the age distribution and we found abnormal thyroid profile pattern 2 patients (14.3%) were found of age 61 years and more, 10 patients (71.4%) were found of age between 41-60 years and 2 patients (14.3%) were found to be 40 years or less and it had no statistical significance. Out of 14 patients with abnormal thyroid profile, 14.3% (2) were males and 85.7% (12) were females. Compared with normal thyroid profile group, this was statistically significant.

Table 3: Sex wise distribution of thyroid profile.

Sex		Abnormal thyroid profile		
		No	Yes	Total
Male	Count	42	2	44
	% of total	38.9%	1.9%	40.7%
Female	Count	52	12	64
	% of total	48.1%	11.1%	59.3%
Total	Count	94	14	108
	% of total	87.0%	13.0%	100.0%

(P=0.031; Significant)

Table 4: Thyroid profile vs duration of diabetes.

Duration (yrs)		Altered thyroid profile		
		No	Yes	Total
Up to 5	Count	70	6	76
	% Within abnormal thyroid profile	74.5%	42.9%	70.4%
	% of total	64.8%	5.6%	70.4%
6-10	Count	16	4	20
	Within abnormal thyroid profile	17.0%	28.6%	18.5%
	% of total	14.8%	3.7%	18.5%
>10	Count	8	4	12
	Within abnormal thyroid profile	8.5%	28.6%	11.1%
	% of total	7.4%	3.7%	11.1%
Total	Count	94	14	108
	Within abnormal thyroid profile	100.0%	100.0%	100.0%
	% of total	87.0%	13.0%	100.0%

(p = 0.028; Significant)

Table 5: Thyroid profile vs family history of diabetes.

Family history of DM		Abnormal thyroid profile		
		No	Yes	Total
No	Count	66	0	66
	% Within abnormal thyroid profile	70.2%	0.0%	61.1%
	% of total	61.1%	0.0%	61.1%
Yes	Count	28	14	42
	% Within abnormal thyroid profile	29.8%	100.0%	38.9%
	% of total	25.9%	13.0%	38.9%
Total	Count	94	14	108
	% Within abnormal thyroid profile	100.0%	100.0%	100.0%
	% of total	87.0	13.0%	10.0%

(P= 0.000; Significant)

Among the 14 patients with abnormal thyroid profile were further analyzed with duration of diabetes and found that 57.1% (8) had diabetes more than 5 years and 42.9% (6) had diabetes 5 years or less which was statistically significant.

These 14 patients with abnormal thyroid function were analyzed based on the different antidiabetic treatment and found no statistical significance in different groups. All these 14 patients with abnormal thyroid function had family history of diabetes where with normal thyroid functioning patient 29.8% (28) were found family history of diabetes mellitus.

DISCUSSION

Diabetes mellitus is a common endocrine disorder which involves multiple organ systems and leads to significant morbidity and mortality due to accompanying complications. Thyroid diseases are also a common endocrinopathy seen in the adult population. The present study was carried out in 108 patient of diabetes above the age of 18 years and the majority of patients were in age group between 41-60 years (72.2%) followed by above 60 year group (14.8%) and 18-40 years (13%).The result resembles to national diabetic statistics report 2017 where they observe maximum cases of T2DM between age 45-64 years.[5]

In the present study the male and female ratio was found 40.7% and 59.3%. After revealing literature, it was found that diabetes is more prevalent in male sex, early presentation in male sex due to hormonal effect, high body mass index, social habits, fat distribution etc. So many studies suggest different male and female ratio vary from 3-4:1. A study done by P S Singh et al, over rural population of western Uttar Pradesh and found that diabetes is more common in female sex as compared to male and matching with our study.[6]

The present study which was carried out over 108 T2DM patients and found 14 patients (13%) with abnormal thyroid profile. Abdel-Rahman et al, also conducted a similar type of study over 908 T2DM patients and found that the prevalence of thyroid disease was 12.5%.7 Chubb et al, in a cross - sectional study over 420 patients with T2DM and found that 8.6% of patients had subclinical hypothyroidism.[8] Similar study was done by Smithson MJ and found the same type prevalence of thyroid disease in the entire population of diabetic patients register in the general practice was 10.[9]

Regarding distribution of different thyroid disorders, the present study found 9.25% (10/108) of the patients had sub clinical hypothyroidism, 1.9% of the patients (2/108) had overt hypothyroidism and 1.9% patients had (2/108) subclinical hyperthyroidism. The similar study done by Abdel-Rahman et al, over 908 T2DM and found 10.3% of patients had hypothyroidism (overt and sub clinical) and 1.7% of patients had hyperthyroidism (overt and sub clinical).[7] Smithson et al, in their study of 233 diabetes mellitus patients found that 11 patients 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).[9]

In the present study 14 patients with abnormal thyroid profile were further analyzed with age of the patients and found 14.35% (2/14) patients were above age 60 years and 71.4% (10/14) were between 41-60 years. Though there is difference, when Compared between patients with normal and abnormal thyroid profile it has no significance (p=0.987).

Vondra et al, in his study found that thyroid disease in diabetic patients is 2-3 times higher than in nondiabetic subjects; it raises with age and is strongly influenced by female gender and autoimmunity which contradicts with our findings.[10]

In the present study 85.7% patients (12/14) were female and 14.3% patients (2/12) were male with abnormal thyroid profile. Compared between patients with normal and abnormal thyroid profile was statistically significant (p=0.031). Celani MF et al, Arthur M. Michalek et al, and Abdel-Rahman et al, in their study found that the prevalence of thyroid dysfunction was significantly higher in the female than in the male diabetic patients.[7,11,12] Also Vondra et al, and Cardoso et al, found significant correlation between female gender and altered thyroid profile.[10,13]

Out of 14 patients with thyroid abnormality, 57.1% patients (8/14) were on oral hypoglycemic agents,14.3% patients (2/14) were on Insulin and 28.6% patients (4/14) were on both oral hypoglycemic agents and Insulin. Compared with normal thyroid profile group it was no statistical significance (p=0.293) but Celani MF et al, in their study found that the prevalence of abnormal thyroid function test results was significantly higher in insulin treated patients than in those receiving oral hypoglycemic agents. This contradicts with this study.[11]

Out of 14 patients with abnormal thyroid profile 57.1% patients (8/14) had HbA1C value above 8% and the remaining 42.9% patients (6/14) had HbA1C 8 or less. The mean HbA1C level of the patients with abnormal thyroid profile was 9.29% compared to 8.67% in the patients with normal thyroid profile. This difference is not statistically significant (p=0.268).The findings are similar to the studies by Parr JH et al, and Chubb et al, who found no correlation between changes in free thyroid hormone concentrations and HbA1C level.[8,14] Celani MF et al, in their study in 91 diabetic patients with altered thyroid profile found that TSH level in serum decreased in subclinical hypothyroidism and increased in subclinical hyperthyroidism with significant fall in HbA1C level. This contradicts with our findings.[11]

CONCLUSION

The present study of thyroid dysfunction in T2DM concludes that thyroid dysfunction is one of the common endocrinal abnormality seen among T2DM patients and closely associated with female sex. However, there was no close correlation of thyroid abnormality with age, family history, type of treatment and HbA1c level. Routine screening for thyroid profile in T2DM 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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