

Evaluation of Thyroid Hormone Dysfunction in Patients of Type 2 Diabetes Mellitus

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Abstract

Background: The co-existence of both diabetes and thyroid disorders has been associated with increased long-term morbidity and mortality. The present study was conducted to find out the relationship between type 2 DM and thyroid dysfunction in patients with type 2 diabetes.

Material and Methods: A total of 160 diabetic patients and 80 controls were randomly selected from diabetic & medicine OPD/IPD/ICU in Department of Medicine, MLB Medical College Jhansi over the period of 2012 to 2014. Thyroid profile was sent and cases were compared to controls using Chi square test.

Results: The study showed that thyroid dysfunction was more prevalent in diabetic subjects than in controls. Difference in TSH was more significant between study and control groups ($p < 0.01$). The difference of mean of free T4 between cases & control was statistically low in females ($p < 0.0001$) but the mean of free T4 in males although low in cases as compared to control was not statistically significant ($p = 0.38$). The mean TSH was more in cases as compared to controls in both males & females & the difference was statistically significant in both males (0.0042) and females (0.0104). Subclinical hypothyroidism was significantly more common than overt hypothyroidism.

Conclusions: The study shows that hypothyroidism was associated with Type 2 Diabetes Mellitus. TSH level is more affected than FT4 level indicating that subclinical hypothyroidism is more common than overt hypothyroidism in Type 2 Diabetes patients. The study also showed that the thyroid status of females was more deranged as compared to males.

Keywords: Diabetes mellitus, Hypothyroidism, TSH, subclinical hypothyroidism.

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Introduction

Diabetes is the single most important metabolic disease which can affect nearly every organ system in the body. The worldwide prevalence of diabetes mellitus has risen dramatically over the past two decades. Based on current trends, the International Diabetes Federation projects that 438 million individuals will have diabetes by the year 2030.¹

Diabetes mellitus can be autoimmune in origin and is associated with many other autoimmune disorders such as autoimmune thyroiditis, celiac disease, and vitiligo. It may also associated with such as metabolic syndromes, hypo/hyperthyroidism and obesity.

A number of reports have also indicated a higher than normal prevalence of thyroid disorders in type 2 diabetic patients, with hypothyroidism being the most common disorder. Studies of obese individuals have revealed normal levels at T4 & TSH but increase in T3 in minority of subjects. The increase in T3 is probably secondary to increased carbohydrate intake and they

decrease as do values in non-obese subjects in response to caloric restriction.

Also thyroid hormone in excess decreases the insulin content of the pancreas, perhaps by decreasing levels at proinsulin mRNA stage. The co-existence of both diabetes and thyroid disorders has been associated with increased long-term morbidity and mortality.

Thus, the present study was conducted to find out the relationship between type 2 DM & thyroid dysfunction in patients with type 2 diabetes, as the benefits of identifying at an early stage, and even in asymptomatic patients is considerable.

Methodology

This case control study was conducted in Department of Medicine, M.L.B. Medical College, and Hospital, Jhansi in randomly selected patients with type 2 diabetes mellitus attending the department in 2012 to 2014. Informed consent was taken from all the subjects. Each patient was then subjected to detailed history and clinical examination including age, sex, and duration of diabetes and existence of symptoms- numbness, hyperaesthesia and any visual problem, history of taking any diabetic medication. Patients who are pregnant, having history of radiation therapy to neck or any other chronic illness other than diabetes were excluded from the study. Free T4 and TSH levels were sent of both groups. Cases and control were compared using Chi square test and p value < 0.05 was considered significant.

Observation and Results

In the present study total 160 patients of diabetes mellitus and 80 healthy controls of age between 30-70 years attending the medicine department of M.L.B. Jhansi were taken for evaluation. The mean age in the present study was 52.45 ± 12.05 in case group and 53.64 ± 11.16 in control group. Majority of the cases (40.1%) and controls (37.5%) were in age groups of 51-60 years. (Table 1.)

Table 1. Age wise distribution of cases and controls

S. No.	Age group (in yrs.)	Cases (n=160)		Control (n=80)	
		No.	%	No.	%
1.	30-40	32	20	10	12.5
2.	41-50	44	27.5	24	30
3.	51-60	48	30	28	35
4.	> 60	36	22.5	18	22.5

Out of 160 diabetic cases, 47 were having hypothyroidism, against 8 out of 80 non-diabetics. Among diabetics having hypothyroidism, subclinical hypothyroidism (19.375%), was more prevalent than overt hypothyroidism (10%). Similar pattern was found in control group with 6.25% having subclinical hypothyroidism & 3.75% having overt hypothyroidism (Table 2).

Table 2. Result of thyroid profile in Cases and controls

Thyroid profile	Case		Control	
	No.	%	No.	%
Subclinical Hypothyroidism	31	19.375	5	6.25
Overt Hypothyroidism	16	10	3	3.75
Euthyroidism	111	69.375	71	88.75
Hyperthyroidism	2	1.25	1	1.25

In this study the difference in mean Free T4 between cases (1.22) & controls (1.27) was not significant ($P=0.51$) but mean TSH was significantly abnormal in diabetes group in comparison with control group ($P=0.0009$). (Table 3.)

Table 3. Comparison of thyroid profile in cases and controls.

Thyroid Profile	Cases	Controls	P-value
FT4			
Range	0.08-10.4	0.1-12.8	0.51
Median	1.12	1.315	
Mean \pm SD	1.22 ± 0.97	1.27 ± 0.01	
TSH			
Range	0.3-24.86	0.2-22.84	0.0009
Median	3.485	2.12	
Mean \pm SD	3.92 ± 2.4	2.76 ± 2.52	

The hypothyroidism was found to be most prevalent in diabetics with duration of diabetes between 5-10 years. 35.87% of the cases with duration of diabetes 5-10 years were found to have hypothyroidism followed by 22.5% of cases with duration of diabetes > 10 years. (Table 4.)

Table 4. Correlation between thyroid dysfunction and duration of diabetes.

Duration of diabetes (yrs.)	Hypothyroidism		Euthyroidism	
	N	%	N	%
<5 (n=28)	5	17.85	22	78.57
5-10 (n=92)	33	35.87	58	63.04
>10 (n=40)	9	22.5	31	77.5

Discussion

Thyroid disease is common in the general population, and the prevalence increases with age. The assessment of thyroid function by modern assays is both reliable and inexpensive. Screening for thyroid dysfunction is indicated in certain high-risk groups, such as neonates and the elderly.

Hypothyroidism is by far the most common thyroid disorder in the adult population and is more common in older women. It is usually autoimmune in origin, presenting as either primary atrophic hypothyroidism or Hashimoto's thyroiditis. Thyroid failure secondary to radioactive iodine therapy or thyroid surgery is also common. Rarely, pituitary or hypothalamic disorders can result in secondary hypothyroidism.

According to Patricia Wu², diabetic patients have a higher prevalence of thyroid disorders compared with the normal population. Because patients with one organ-specific autoimmune disease are at risk of developing other autoimmune disorders, and thyroid disorders are more common in females, it is not surprising that up to 30% of female type 1 diabetic patients have thyroid disease. The rate of postpartum thyroiditis in diabetic patients is three times that in normal women.

In a similar study by Ravi Shankar S.N.³ et al, the prevalence of thyroid disorders in Diabetics was 29%. Elderly population had more incidence than those below sixty. Sub-clinical hypothyroidism was more common among females.

Palma et al⁴ also studied the prevalence of thyroid disorder among diabetes and found that the prevalence of thyroid disorder in all diabetic patients was 14.7%. The most frequent thyroid disorder was subclinical hypothyroidism, in 13% of patients with T1DM and in 12% of patients with T2DM. These studies are in concordance with our study.

Suzuki *et al*⁵ attributed the abnormal thyroid hormone levels found in diabetes to the presence of Thyroid Hormone Binding Inhibitor (THBI), an inhibitor of extra thyroidal conversion enzyme of T4 to T3, and dysfunction of the hypothalamus-hypophyseal-

thyroid-axis. These situations may prevail in diabetics and would be aggravated in poorly controlled diabetics. Stress, which is associated with diabetes mellitus, may also cause changes in the hypothalamus anterior-pituitary axis in these diabetics. It appears that the presence of sub-clinical hypothyroidism and hyperthyroidism may result from hypothalamus-hypophyseal-thyroid-axis disorders as suggested by Celani *et al*⁶.

Although the benefits of treating overt thyroid disease are clear, the management of sub-clinical hypothyroidism or hyperthyroidism is not yet solved and conclusive intervention studies are required. Progression to overt thyroid dysfunction is associated with consequent morbidity including the adverse effects on lipid and bone metabolism. The association of type 2 DM and thyroid dysfunction is consistent with an increased cardiovascular risk and finding underscore the importance of thyroid screening for all diabetic patients.

Conclusion

Thus, thyroid dysfunction was found to be more prevalent in diabetic subjects in comparison to controls. Subclinical hypothyroidism was significantly more common than overt hypothyroidism and both overt & subclinical hypothyroidism were more common in diabetic females as compared to males. There were enough hypothyroid cases (both asymptomatic and symptomatic) even though the sample size was small, to warrant a conclusion that routine testing of thyroid functions in all diabetics will be beneficial and should be recommended.

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