Estimation of thyroid profile in Type II diabetes mellitus.

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Abstract:

Introduction: Type 2 diabetes mellitus (T2DM) is associated with increased incidence of thyroid dysfunction (TD). The coexistence of thyroid dysfunction in T2DM patient is an important barrier in achieving treatment goal. The present study was aimed to know the status of thyroid dysfunction in T2DM in patients. **Materials and Method:** This is a retrospective observational study of thyroid hormones in 100 diagnosed T2DM patients based on American Diabetes Association (ADA) criteria attending the department of medicine. Thyroid dysfunction was classified on the basis of American Thyroid Association (ATA) criteria. **Results:** Thyroid dysfunctions were more in diabetic group compared to control group (24% versus 5%). This was statistically significant with P value <0.05. Subclinical hypothyroidism was more in diabetic group compared to control group (12% versus 3%, P value <0.01). Hypothyroidism was again more in diabetic group compared to control group (9% versus 1%, P value < 0.02). **Conclusion:** This study showed high prevalence of thyroid dysfunctions in patients of type 2 diabetes mellitus. Hence, we conclude that screening for thyroid dysfunction among patients with diabetes mellitus should be routinely performed, so as to recognize these dysfunctions early. The coexistence of hypothyroidism or hyperthyroidism with diabetes mellitus leads to increase complications. The ability to early diagnose and treat unsuspected thyroid dysfunctions and those patients whose conditions are difficult to manage in diabetics may result in reduced morbidity and mortality and improve quality of life.

Key Words: Thyroid dysfunction (TD), Tetra-iodothyronin (T4), Tri-iodothyronin (T3), Thyroid stimulating hormone (TSH), Type 2 diabetes mellitus (T2DM).

Introduction:

Thyroid diseases and diabetes mellitus are the two most common endocrine disorders encountered in clinical practice which have been shown to mutually influence each other, and association between both the conditions has long been reported. Diabetes mellitus is characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. According to World Health Organization (WHO), the worldwide prevalence of

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diabetes in 2002 was 170 million and the number projected to grow up to 366 million or more by 2030. Sedentary lifestyle, various diet patterns, ethnicity and a genetic predisposition are the major factors responsible for the causes of the epidemic.[1]

Thyroid disorders are also common in the general population and it is the second most common endocrine disorder. As a result, it is common for an individual to be affected by both thyroid disease and diabetes. Various studies have reported the low prevalence of thyroid dysfunction among diabetic patients, between 2.2 to 17 % in their respective population. However, few studies have showed higher prevalence of thyroid dysfunction in diabetes from 31 % to 46.5 %.[2,3,4]

Thyroid hormones and insulin are the antagonists and both are involved in cellular metabolism of carbohydrates, proteins, and lipids. The functional impairment occurs in thyroid hormone as well as insulin if their levels changed. Diabetes mellitus (DM) appears to influence thyroid function in two sites; firstly, at the level of hypothalamic control of thyroid stimulating hormone (TSH) release and secondly at the conversion of T4 to T3 in the peripheral tissue. Hyperglycemia causes reversible reduction of the activity and hepatic concentration of T4-5-deiodinase, low serum T3, increase in reverse T3 and also variation in the level of T4.The recognition of this interdependent relationship between thyroid disease and diabetes is of importance to guide clinicians on the optimal management of both these conditions. The prevalence of thyroid dysfunctions in type 2 diabetes mellitus varies in literature from very low (5.5%) to very high (75%).[5,6,7]

Materials and Methodology:

Study Area :

The cross sectional study was conducted in civil hospital, ahmedabad during february 2019 to december 2019. 100 cases of type 2 diabetes mellitus were taken into study. All the cases in diabetic group were confirmed diabetics who were on treatment for diabetes mellitus. Blood samples were collected and run for Glucose and thyroid profile. Diagnosis of diabetes was done by ADA 2014 criteria. This criterion consists of Glycated hemoglobin A1C (HbA1C) ≥6.5%, fasting plasma glucose (FPG) ≥126 mg/dL, two-hour 75 gm plasma glucose≥200 mg/dL or random plasma glucose ≥200 mg/dL. 100 healthy volunteers without history of diabetes, matched with cases based on age (±2 Years) and sex were taken as controls.

Inclusion criteria:

Cases were diabetic patients on treatment, with no diabetic complications and no previous thyroid dysfunctions. Inclusion criteria for control having normal blood glucose level and having thyroid profile done. Normal range for thyroid hormones were taken as, T3 (0.60 – 1.81 ng/ml), T4 (3.2 – 12.6 µg/dl) and TSH (0.35 – 5.50 mIU/L). Normal range for Fasting plasma sugar (70 to 110 mg/dl) , Random plasma sugar (< 200 mg/dl). Subclinical hypothyroidism was defined as an elevated TSH level with normal serum thyroid hormone levels. Hypothyroidism was defined as an elevated TSH together with a decreased serum thyroid hormone levels. Subclinical hyperthyroidism was defined as a decreased TSH with

normal thyroid hormone levels and hyperthyroidism was defined as a decreased TSH with elevated thyroid hormone levels.

Exclusion Criteria :

We exclude patients with cardiac disorders, pancreatic disorders, Diabetes Mellitus Type 1, Hypertension (HT), Bone and muscle disease, Blood coagulopathies, Cerebrospinal abnormalities, Malignancy , Traumatic injuries, Drug abusers.

Data Analysis:

The Master chart was prepared using Excel 2007 software. Data were expressed as mean ± standard deviation. P values ≤ 0.05 was considered as statistically significant. The graphpad in stat software was used to perform statistics.

Result :

100 patients of type 2 diabetes mellitus and 100 healthy controls with matching age and sex were included in study. On analysis of all patients with type 2 diabetes mellitus, we found the mean ages in patients with type 2 diabetes mellitus were comparable to those in group control. The mean ages of patients with type 2 diabetes mellitus and control were 36.86 ± 7.21 and 32.54 ± 6.68 years, respectively (P<0.005). Sexes were comparable between the two study groups. Male/female ratio was 56/44 in patients with type 2 diabetes mellitus compared with 51/49 in healthy controls.

Table: 1 Levels of different parameters in cases and controls

Parameters	Case	Control	P Value
	Mean±SD	Mean±SD	
Serum FPG	132 ± 8	97 ± 9	<0.05
Serum TSH	6.2 ± 3.1	3.1 ± 2.1	<0.001
Serum Total T3	0.4 ± 0.2	0.9 ± 0.3	<0.05
Serum Total T4	2.4 ± 1.2	6.2 ± 1.1	<0.05

Table: 2 Thyroid disorders in cases and controls

Thyroid Disorders	Case	Control
	n=100	n=100
Present	24	5
Absent	76	95

Table: 3 Classification of thyroid disorders in cases and controls

Thyroid Disorders	**Case**	**Control**	**P Value**
	n=100	**n=100**	
Hypothyroidism	9	1	<0.02
Subclinical Hypothyroidism	12	3	<0.01
Hyperthyroidism	1	0	>0.05
Subclinical Hyperthyroidism	2	1	>0.05
Total	24	5	<0.05

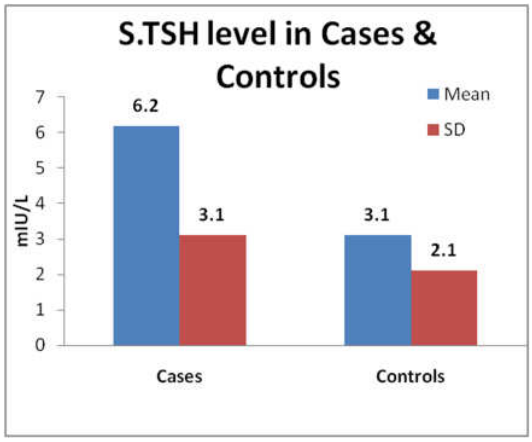
Serum fasting plasma glucose (FPG), Serum thyroid stimulating hormone (TSH), Serum Total T3 (TT3), Serum Total T4 (TT4) concentrations in both type 2 diabetes mellitus and control are shown in table 1.The results clearly shows that in present study there is significant increase (p<0.05) of S.FPG concentration (132 ± 8mg/dl) in comparison to control healthy subjects (97 ± 9mg/dl). In Figure 1, Serum TSH concentration was increased significantly (p < 0.001) in patients (6.2 ± 3.1 mIU/L) when compared to control group (3.1 ±

2.1 mIU/L). On the other hand, Serum Total T3 (TT3) was decreased significantly ($p < 0.05$) in type 2 diabetes mellitus patients (0.4 ± 0.2 ng/ml) in comparison to healthy subjects (0.9 ± 0.3 ng/ml). Serum Total T4 was decreased significantly ($p < 0.05$) in type 2 diabetes mellitus patients (2.4 ±1.2 µg/dl) in comparison to healthy subjects (6.2 ± 1.1 µg/dl). The levels of serum T3 and T4 were significantly low while serum TSH levels were significantly high in diabetic group compared to control group (Table 1).

In table 2, Thyroid dysfunctions were more in diabetic group compared to control group (24% versus 5%). This was statistically significant with P value <0.05.

In table 3, Subclinical hypothyroidism was more in diabetic group compared to control group (12% versus 3%, P value <0.01). Hypothyroidism was again more in diabetic group compared to control group (9% versus 1%, P value < 0.02). Hyperthyroidism and subclinical hyperthyroidism were insignificantly more in diabetic group. Most common thyroid disorder in diabetic patients was subclinical hypothyroidism (12%) while least common was hyperthyroidism (1%)(Table 3).

Image 1. Serum TSH level in Cases and Controls



Discussion:

Day by day diabetes is a leading cause of morbidity and mortality worldwide. Its incidence is increasing all over the world, posing a major threat to the public health. Thyroid disorders are also very common endocrine disorders in the general population. Hence it is common for an individual to be affected by both thyroid diseases and diabetes. Prevalence of thyroid dysfunction in type 2 diabetes mellitus patients become an attention in epidemiological studies in the field of endocrinology in the last decade. Several studies with various design and aim were held to find out prevalence and determinants of thyroid dysfunction in type-2 diabetes patients. The focus of these studies were prevalence of hypothyroidism which has connection with pathophysiology, pathogenesis, co morbidities, and complications of type-2 diabetes mellitus.[1]

Type-2 DM results from insulin resistance, which may be combined with relatively reduced insulin secretion and is due primarily to life style factors and genetics, and previous studies report, insulin resistance, which led to less response of peripheral muscles to thyroid hormones causes hypothyroidism. On the other hand, abnormality of thyroid hormones level

attributed to insulin resistance, which decrease conversion of T4 to active T3, also reduced hypothalamus thyrotropin releasing hormone (TRH) in DM patients.[11]

In present study thyroid dysfunctions were found in 24% of diabetic patients. Similar results were reported by Ghazali et al, Gurjeet et al, and Laloo et al, who reported 29.7%, 30% and 31.2% respectively.[8,9,10]

Most prevalent thyroid disorder in diabetic patients was subclinical hypothyroidism occurring in 12%, followed by hypothyroidism in 9%, subclinical hyperthyroidism in 2%, and hyperthyroidism in 1%. Our results are in concordance with the results of Perros et al, Celani et al, Nobre et al, Babu et al and Radaiedeh et al.3

Limitations of our study is sample size, large sample size is require to find out metabolic derangement in diabetes mellitus type 2 patients.

Conclusion:

Our study reveals significant change thyroid dysfunctions in diabetes mellitus type 2 patients. This study showed high prevalence of thyroid dysfunctions in patients of type 2 diabetes mellitus. Hence, we conclude that screening for thyroid dysfunction among patients with diabetes mellitus should be routinely performed, so as to recognize these dysfunctions early. The coexistence of hypothyroidism or hyperthyroidism with diabetes mellitus leads to increase complications. The ability to early diagnose and treat unsuspected thyroid dysfunctions and those patients whose conditions are difficult to manage in diabetics may result in reduced morbidity and mortality and improve quality of life. In addition, further large-scale studies are recommended.

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