Original Research Article

Assessment of thyroid profile among type 2 diabetic patients attending to rural teaching hospital, Sangareddy

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Abstract

Background: The present study was undertaken to assess the interdependent relationship between thyroid disease and diabetes among type 2 DM patients attending to rural teaching hospital.
Materials and methods: In the present study, 100 type 2 diabetic subjects and 100 healthy non diabetic subjects were investigated for total triidothyronine (T3), total thyroxin (T4), thyroid stimulating hormone (TSH), plasma glucose fasting(FPG), and glycosylated hemoglobin (HbA1c),
Results: The level of T3 and T4 were significantly lower while the level of TSH was significantly higher in type 2 diabetics as compared to non-diabetics.
Conclusion: The present study concluded that type 2 DM patients are at high risk with thyroid dysfunction. Therefore continuous screening for thyroid hormones is suggested in type 2 DM patients to reduce the vascular complications and management of diabetes and also reduce the risk of thyroid hormone dysfunction.

Key words

Diabetes Mellitus, Hyperthyroidism, Hypothyroidism, Thyroid stimulating hormone (TSH), Triidothyronine (T3), Tetraidothyronine (T4), Glycosylated Haemoglobin (HbA1c).

Introduction

Diabetes mellitus (DM) is a metabolic disorder characterized by hyperglycemia with disturbances of carbohydrates, protein and fat metabolism as a result of a defect in the insulin action or synthesis of insulin or both [1, 2, 3]. Worldwide India is having high incidence of DM and declared as a diabetes capital of world [4, 5, 6]. Among DM the incidence of type 2 DM is increasing day by day due to lack of physical activity and obesity [7, 8, 9]. By origin diabetes is a autoimmune disorder and it can associated with other autoimmune disorders such as vitiligo and thyroiditis. It may also associate with metabolic syndromes like obesity, hypothyroidism and hyperthyroidism. Among endocrine disorders thyroid disorders is the second most common disorder, approximately 43 million people were suffering from thyroid disease with a incidence of 5%. Thyroid disease and diabetes are the two most common endocrine disorders encountered in clinical practice and also influenced mutually. Pancreatic function and carbohydrate metabolism are regulated and influenced by thyroid hormones [10, 11, 12].

A number of studies are reported the prevalence of thyroid dysfunction among diabetic patients to be varying from 2.2% to 17%. However few other studies have been reported higher prevalence of thyroid dysfunction in DM patients varying from 31% to 46.5% [13, 14, 15]. According to above reports, diabetic patients are having high prevalence of thyroid disorders when compared with general population. So the present study was aimed to assess the interdependent relationship between thyroid disease and diabetes among type 2 DM patients attending to rural teaching hospital.

Materials and methods

The present study was carried out at MNR Medical College and Hospital (700 beds teaching hospital catering to rural population) situated in Sangareddy, Telangana state. A total of 100 study subjects of both gender groups were selected from the medicine ward, MNR hospital during the period from March 2019 to August 2019. This study was approved by institutional ethical committee and investigations were carried out in the biochemistry laboratory, MNR Medical College and Hospital, Sangareddy.

Collection of blood sample

Blood samples were collected, after 12 hours fast from the above study subjects. 5 ml of blood from the cubital vein was collected in tubes containing sodium fluoride, EDTA and plain bottle, after explaining the procedure to the study subjects. Serum was separated from the blood samples by a centrifuged machine at 3000 rpm for 10 minutes in the biochemistry department. Following estimations are carried out on the serum samples by standard kit methods were as follows.

- Triidothyronine (T3)
- Tetraidothyronine (T4)
- Thyroid stimulating hormone (TSH)
- FBS
- HbA1c

Plasma glucose estimated by using GOD-POD method (ERBA-semi auto-analyzer) and HbA1c was estimated by using direct enzymatic assay method by using Ion exchange chromatography (Crest a Coral clinical system, USA) [1, 3], T3, T4 and TSH-estimated by using (CLIA -method) chemiluminescence immune assay method [8, 9].

Reference range

The normal reference ranges according to the kits are:

- TSH (0.7-6.4 μIU/ml),
- T3 (0.52-1.85 ng/ml),
- T4 (4.0-11.0 μg/dl),
- FPG (normal range 70-110mg/dl)

- HbA1c (normal range 4.2-5.7%).

Reference range

The normal reference ranges according to the kits are: TSH (0.7- 6.4 μIU/ml), T3 (0.52-1.85 ng/ml), T4 (4.0-11.0 μg/dl. FPG (normal range 70-110 mg/dl), and HbA1c (normal range 4.2-6.2%).

Inclusion criteria

- Known case of type 2 Diabetes mellitus
- Recently diagnosed case of type 2 Diabetes mellitus

Exclusion criteria

All the patients with past history of thyroid disease, drugs, malignancy, radiotherapy to chest and neck areas, pregnant, patients with chronic illness, were excluded from the study.

Statistical analysis

The collected data were analyzed by SPSS software version 16.0. All results were presented as mean ± standard deviation (SD). A p-value of less than 0.0001 (p< 0.0001) was considered significant.

Results

In the present study, total 200 subjects were divided into two groups, 100 controls (non-diabetic) and 100 cases (diabetic) with the age range of 30 – 70 years. Out of 100 non-diabetic controls 62 were females and 38 males and in 100 diabetic cases, 78 were females and 22 males as shown in the **Table - 1**.

Table - 1: Age and Gender wise distribution of controls and cases.

Age (Years)	Controls (Non-Diabetic) (n=100)		Cases (Diabetic) (n=100)	
	Males	**Females**	**Males**	**Females**
30- 40	08	06	04	13
41-50	08	37	07	33
51-60	13	14	08	17
61-70	09	05	03	15
Total	38	62	22	78

Table - 2: Various parameters for cases and control.

Parameters	Controls (Non-Diabetic) Mean ± SD	Cases (Diabetic) Mean ± SD	Student 't' test	P-Value
FPG (mg/dl)	93.21 ± 9.95	174.9 ± 9.33	59.94	<0.0001 s**
HbA1c (%)	4.80 ± 0.19	7.66 ± 1.52	18.67	<0.0001 s**
T3 (ng/ml)	1.25 ± 0.30	0.778 ± 0.33	10.52	<0.0001 s**
T4 (μg/dl)	8.97 ± 1.50	6.94 ± 1.51	09.52	<0.0001 s**
TSH (μIU/ml)	2.04 ± 1.05	10.61 ± 3.15	25.76	<0.0001 s**
S** = extremely statistically significant				

The mean ± SDs of FPG, HbA1c, TSH, T3 and T4, in controls were in the range of 93.21 ± 9.95, 4.80 ± 0.19, 2.04 ± 1.05, 1.25 ± 0.30, and 8.97 ± 1.50, respectively. It is observed that the mean ± SDs of FPG, HbA1c, TSH, T3 and T4, in cases were in the range of 174.9 ± 9.33, 7.66 ± 1.52, 10.61 ± 3.15, 0.778 ± 0.33, and 6.94 ± 1.51, respectively. It was evident that FPG, HbA1c, TSH levels were increased in cases as compared to controls .The mean ± SD level of T3 and T4 was statistically significantly decreased in diabetic cases compared to non- diabetic controls (P<0.0001) as shown in **Table - 2**.

Discussion

The present study evaluated the relationship between thyroid disease and diabetes mellitus.

The present study reveals the mean ± SD of the TSH, FPG and HbA1c were significantly higher in diabetic patients compared to healthy non-diabetic subjects. In the present study high number of cases was seen in 40 to 60 years age groups. Among the total cases female predominance is more than the male. Similar findings were reported by Bhandopadhyay, et al. (2006) [16], Desai JP, et al. (2015) [17], Luboshitzky, et al. (2002) [18] and Kiran Kumar Akka, et al. (2017) [1]. In the present study the prevalence of thyroid dysfunction is more females than men. Similar findings were reported by Aminorroaya A, et al. (2009) [19].

In the present study, the mean ± SD levels of fasting plasma glucose were significantly higher in diabetic patients than that of healthy non-diabetic subjects. The TSH level was significantly higher in diabetic subjects as compared to healthy control subjects. The T3 and T4 levels were significantly decreased in diabetic subjects as compared to healthy control subjects. In the present study the levels of TSH which changes in response to thyroid hormones was found significantly higher in diabetic cases than non-diabetic control. According to Suziki, et al. (1994) [20], the levels of thyroid hormones are significantly related to HbA1c and fasting plasma glucose. Glucose absorption was reduced from GIT tract due to the prolonged accumulation of peripheral glucose by gluconeogenesis; diminished hepatic glucose output and reduced disposal of glucose are best reasons for thyroid dysfunction [20]. In diabetes the TRH levels are decreased. According to Smith, et al. (1998) [21], this could be the reason for the occurrence of low thyroid hormone levels in diabetics. Even some medications used for diabetics may influence the levels of thyroid hormones for example insulin is anabolic hormone which enhances the level of free T4 while it suppresses the levels of T3 by inhibiting the hepatic conversation of T4 to T3. According to Whitley, et al. (1984) [22], some hypoglycemic agents such as the phenyl thioureas will suppress the levels of FT4 to T4, while causing the levels of TSH.

Conclusion

The present study concluded that type 2 DM patients are at high risk with thyroid dysfunction. Therefore continuous screening for thyroid hormones is suggested in type 2 DM patients to reduce the vascular complications and management of diabetes and also reduce the risk of thyroid hormone dysfunction.

Acknowledgements

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