Original Research Article

Evaluation of thyroid profile among type 2 diabetic patients attending to Basaveswara Teaching and General Hospital, Kalaburagi, Karnataka

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Abstract

Background: The present study was undertaken to assess the interdependent relationship between DM and thyroid disease among Type 2 diabetic patients attending to teaching hospital.
Materials and methods: In the present study, 400 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 was we identified that the patients are at high risk with thyroid dysfunction in type 2 diabetic patients attending to teaching hospital. 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, Hypothyroidism, Hyperthyroidism, Triidothyronine (T3), Tetraidothyronine (T4), Thyroid stimulating hormone (TSH), HbA1c.

Introduction

Diabetes mellitus (DM) defined as a metabolic disorder characterized by elevated levels of blood glucose with disturbances of carbohydrate, fat and protein metabolism as a result of a defect in the synthesis of insulin (endogenous) or insulin action or both. DM can cause long-term complication includes damage and dysfunction to various organs like heart, kidneys, eyes, nerves and blood vessels and are responsible for the majority of morbidity and mortality with the disease. The prevalence of DM is increasing day by day in both developing and developed countries. According to World Health Organization (WHO), India is having the high prevalence of DM and declared as a diabetes capital of the world. Type 2 DM is increasing day by day due to increased obesity and reduced physical activity. According to International Diabetes Federation (IDF), by 2020, 70 million people are going to live with DM in India and have reached approximately 10% of rural population and 20% of urban population [1, 2, 3]. DM can be autoimmune in origin and is associated with other autoimmune disorders such as autoimmune celiac disease, thyroiditis, and vitiligo. It may also associate with such as metabolic syndromes, hyper/hypothyroidism and obesity [4]. Worldwide, thyroid diseases are the second commonest endocrine disorder, approximately 42 million people were suffering from thyroid disease with a prevalence of 4-5% [5].

DM and thyroid diseases are the two most common endocrinopathies encountered in clinical practice. According to J Feely et al. 1979, both DM and thyroid diseases are associated with each other and also mutually influenced [6]. Thyroid hormones show their influence in the regulation of carbohydrate metabolism and pancreatic function, on the other hand, DM will affects thyroid function tests to variable extent. 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% [7]. According to above reports, diabetic patients are having high prevalence of thyroid disorders when compared with general population [8]. So the present study was undertaken to assess the interdependent relationship between DM and thyroid disease among Type 2 diabetic patients attending to teaching hospital.

Materials and methods

The present study was carried out at Basaveshwara teaching & general hospital (820 beds teaching hospital catering to Gulbarga population) situated in Gulbarga, Karnataka state. A total of 500 study subjects of both gender groups were selected from the medicine ward Basaveshwara hospital during the period from March 2015 to March 2017. This study was approved by institutional ethical committee and investigations were carried out in the biochemistry laboratory, Basaveshwara teaching and general hospital, Gulbarga.

Collection of blood sample

Blood samples were collected, after 12 hours fast from the above study subjects. 5ml 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-analyser) and HbA1c was estimated by using direct enzymatic assay method by using Ion exchange chromatography (Crest A Coral clinical system, USA) [1, 2], T3, T4 and TSH-estimated by using (CLIA -method) chemi luminescence immune assay method [5, 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 4.2-6.2%).

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), 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

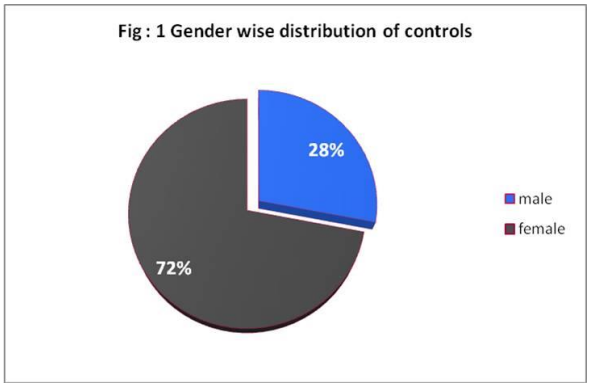
All the patients with past history of thyroid disease, drugs, malignancy, radiotherapy to chest and neck areas, pregnant, patients with chronic illness, were excluded from the study.

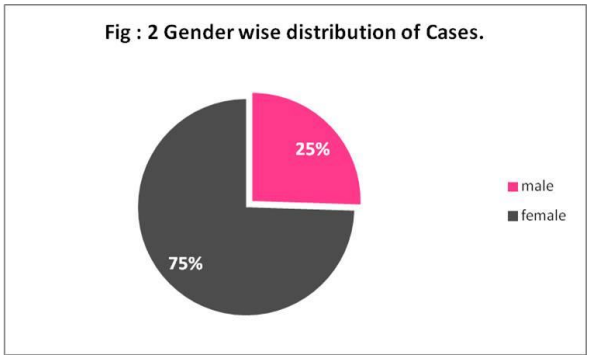
Statistical analysis

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 500 subjects were divided into two groups, 100 controls (non-diabetic) and 400 cases (diabetic) with the age range of 30 – 70 years. Out of 100 non-diabetic controls 72 were females and 28 males and in 400 diabetic cases, 298 were females and 102 males as shown in the **Table – 1**, **Figure - 1** and **Figure – 2**.





The mean ± SDs of FPG, HbA1c, TSH, T3 and T4, in controls were in the range of 93.41 ± 9.97, 4.80 ± 0.191, 2.17 ± 1.05, 1.32 ± 0.30, and 9.26 ± 1.79, respectively. It is observed that the mean ± SDs of FPG, HbA1c, TSH, T3 and T4, in cases were in the range of 174.94 ± 9.29, 7.66 ± 1.51,

10.61 ± 3.14, 0.778 ± 0.33, and 6.94 ± 1.50, 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**.

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

Age (Years)	Controls (Non-Diabetic) (n=100)		Cases (Diabetic) (n=400)	
	Males	**Females**	**Males**	**Females**
30- 40	04	40	16	84
41-50	08	24	24	125
51-60	10	08	64	81
61-70	06	00	08	08
Total	28	72	102	298

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)	93.41 ± 9.97	174.94 ± 9.29	77.92	<0.0001 s**
HbA1c (%)	4.80 ± 0.191	7.66 ± 1.51	18.84	<0.0001 s**
T3 (ng/ml)	1.32 ± 0.30	0.778 ± 0.33	14.87	<0.0001 s**
T4 (μg/dl)	9.26 ± 1.79	6.94 ± 1.50	13.27	<0.0001 s**
TSH (μIU/ml)	2.17 ± 1.05	10.61 ± 3.14	26.49	<0.0001 s**
S** = extremely statistically significant				

Discussion

In the present study, we evaluated the interdependent relationship between DM and thyroid disease. The present study reveals that 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 numbers of cases were seen in 40-60 years age group. Similar studies were reported by Luboshitzky, et al. and Desai JP, et al. [10, 11]. In the present study female predominance is more than the male of total cases. Similar findings were reported by Desai JP et al. and Bhandopadhyay, et al. [11, 13]. The incidence and prevalence of thyroid disease are more prevalent in women than men and the percentage of thyroid dysfunction among women was 13% among men was 5% [13].

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. Similar findings were reported by Samatha P, et al. [14], Reeta T, et al. [15], and Priti S, et al. [16]. The TSH level was significantly higher in diabetic subjects as compared to healthy control subjects. Similar findings were reported by Singh G, et al [17]. The T3 and T4 levels were significantly decreased in diabetic subjects as compared to healthy control subjects. Similar findings were reported by Haque S S, et al. [18].

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 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 gluconeogenisis, diminished hepatic glucose output and reduced disposal of glucose are best reasons for thyroid dysfunction [19]. In diabetes the TRH levels are decreased. According to Smith, et al., [20] 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 a anabolic hormone which enhances the level of FT4 while it suppresses the levels of T3 by inhibiting the hepatic conversation of T4 to T3. According to Whitley, et al. [21], some hypoglycaemic agents such as the phenylthioureas will suppress the levels of FT4 to T4, while causing the levels of TSH.

Conclusion

The present study was we identified that the patients are at high risk with thyroid dysfunction in type 2 diabetic patients attending to teaching hospital. 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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