



PREVALENCE OF THYROID DYSFUNCTION IN TYPE 2 DIABETIC PATIENTS

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ABSTRACT

Abnormal thyroid hormone levels occur in diabetes mellitus AIM: To find out the prevalence of thyroid dysfunction in type 2 diabetic patients. MATERIALS AND 100 diabetic and 100 nondiabetic age and sex matched subjects were selected and thyroid function test was performed. Out of 100 diabetics subjects studied, 18% had low plasma thyroid hormone levels ,16% had raised plasma thyroid hormone levels and 66 % were euthyroid . This study has shown a high incidence of abnormal thyroid hormone levels among the diabetics(34%). DISCUSSION: Iodothyronines are insulin antagonist with high levels being diabetogenic while the absence of the hormone inhibits the development of diabetes. A higher frequency of retinopathy and nephropathy was observed in diabetic patients with subclinical hypothyroidism. Routine assessment of thyroid hormone levels is necessary in diabetics. The ability to diagnose and treat unsuspected hypothyroidism in these patients may greatly enhance the quality of life.

KEY WORDS: diabetes mellitus, hypothyroidism, hyperthyroidism



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INTRODUCTION

Diabetes Mellitus is the most common endocrinal disorder seen in clinical practice. The prevalence of diabetes mellitus in West is between 6-7.6 %. India has already become the "diabetes capital" of the world with over 3 crore affected patients. Around 2025 worldwide prevalence of diabetes is going to increase by 35%. The increase in number of patients with diabetes will occur in developing countries, leading to more than 300 million people with diabetes globally by 2025¹ Thyroid disorders are the most common condition which affect the endocrine system second to diabetes mellitus. As a result, it is common for an individual to be affected by thyroid diseases and diabetes. The first report showing the association between diabetes and thyroid dysfunction was published in 1979^{2,3}. Since then a number of studies have estimated the prevalence of thyroid dysfunction among diabetes patients to be varying from 2.2 to 17 %, the most common disorder being subclinical hypothyroidism^{4,5}. However, few studies have estimated a higher prevalence of thyroid dysfunction in diabetes i.e. 31 % and 46.5% respectively^{6,7} Thyroid function tests are recommended in patients with clinical suspicion and / or unexplained changes in diabetic metabolic control or increased serum cholesterol and weight gain. The treatment of hypothyroidism helps better control of other associated conditions. The diagnosis and treatment of unsuspected hypothyroidism in diabetic patients may enhance the quality of life. Hence there is a need to detect hypothyroidism, which contributes to morbidity¹.

AIM

- 1) To find out the prevalence of hypothyroidism in type 2 diabetic patients
- 2) To compare this prevalence with non diabetic population matched by age and sex.

MATERIALS AND METHODS

This study was conducted at a tertiary care hospital in Chennai from January 2014 to February 2015. 100 outpatients attending the outpatient department and inpatients admitted in the wards who were either previously or newly diagnosed diabetic were included in the study. 100 non-diabetic volunteers without history of diabetes mellitus whose FPG was less than 110 mg /dl on two occasions were the control subjects. These volunteers included non-diabetic subjects who come to the hospital for routine check-ups as advised by their attending physicians. Randomly selected diabetic patients were subjected to evaluation of thyroid function biochemically. Venous blood samples were withdrawn and assayed for thyroid function (T3, T4, FT3, FT4, and TSH) and for the glycaemic status (FPG, HbA1c). The following guidelines for detection of thyroid dysfunction were considered – 1) Normal – when FT3, FT4, T3, T4 and TSH were within the normal range. 2) Primary hypothyroidism – when TSH is more than 5.2 μ IU/L and FT3, FT4, T3, T4 is less than the normal value. 3) Primary hyperthyroidism - when TSH is less than 0.2 μ IU/L and FT4, FT3, T3, T4 is more than the normal values. 4) Subclinical hypothyroidism – when TSH is more than 5.2 μ IU/L and FT3, FT4, T3, T4 is within the normal range. 5) Subclinical hyperthyroidism – when TSH is less than 0.2 μ IU/L and FT3, FT4, T3, T4 are within the normal range.

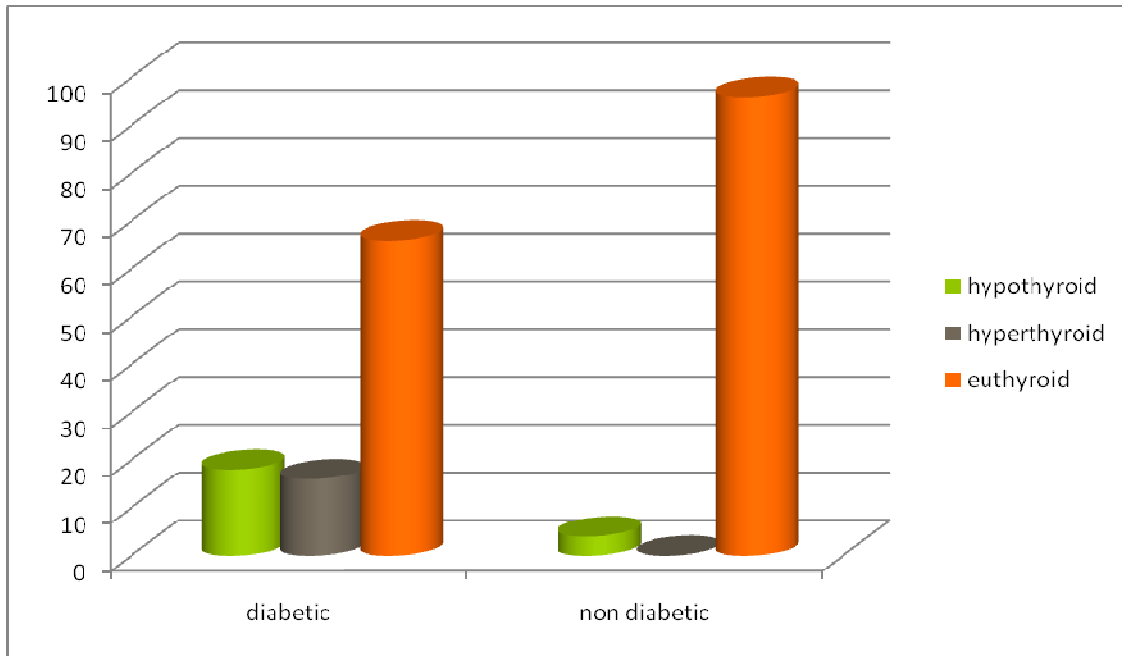
RESULTS

TSH levels in diabetics were significantly lower than the level in non-diabetic controls. Male diabetics had lower levels of TSH than diabetic females. Out of 100 diabetics subjects studied, 18% had low plasma thyroid hormone levels, 16% had raised plasma thyroid hormone levels and 66 % were euthyroid. Of the patients with hypothyroidism 14 were females and 4 were males. Among cases with hyperthyroidism 5 were females and 11 were males. Of the 100

nondiabetic patients taken as control 4% had hypothyroidism, none had hyperthyroidism and 96% were euthyroid. 4 controls had

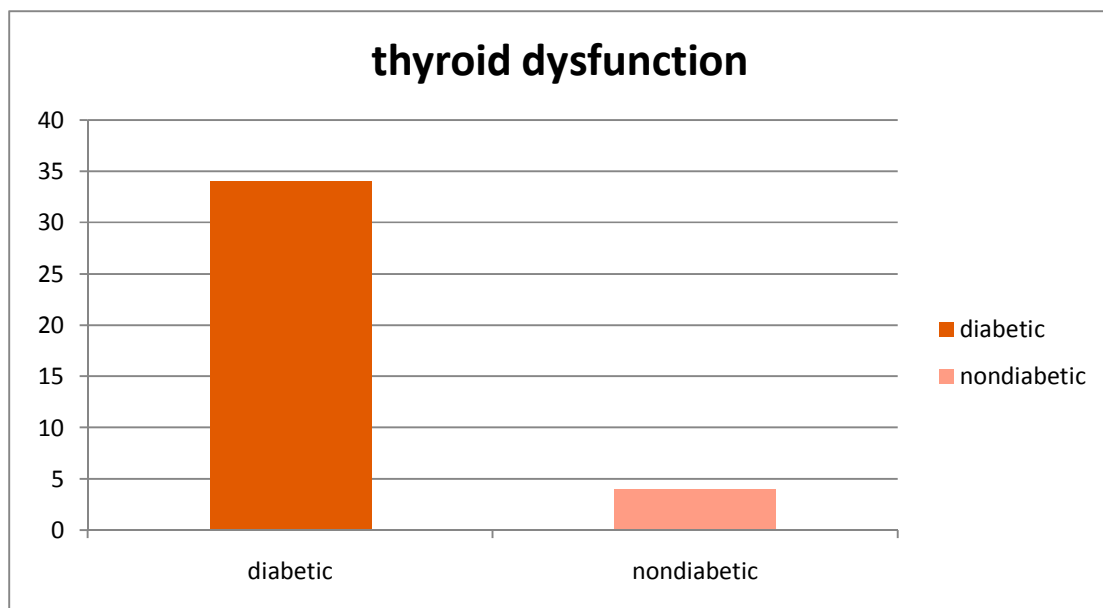
hypothyroidism and among them 3 were females and one was a male.

Figure 1
Prevalence of thyroid dysfunction in cases and controls



This study has shown a high incidence of abnormal thyroid hormone levels among the diabetics(34%).

Figure 2
Thyroid dysfunction in cases and controls



The prevalence of hypothyroidism was higher in women than in men . The prevalence of hyperthyroidism was higher in males than in females .

Figure 3
Thyroid dysfunction in males and females among cases

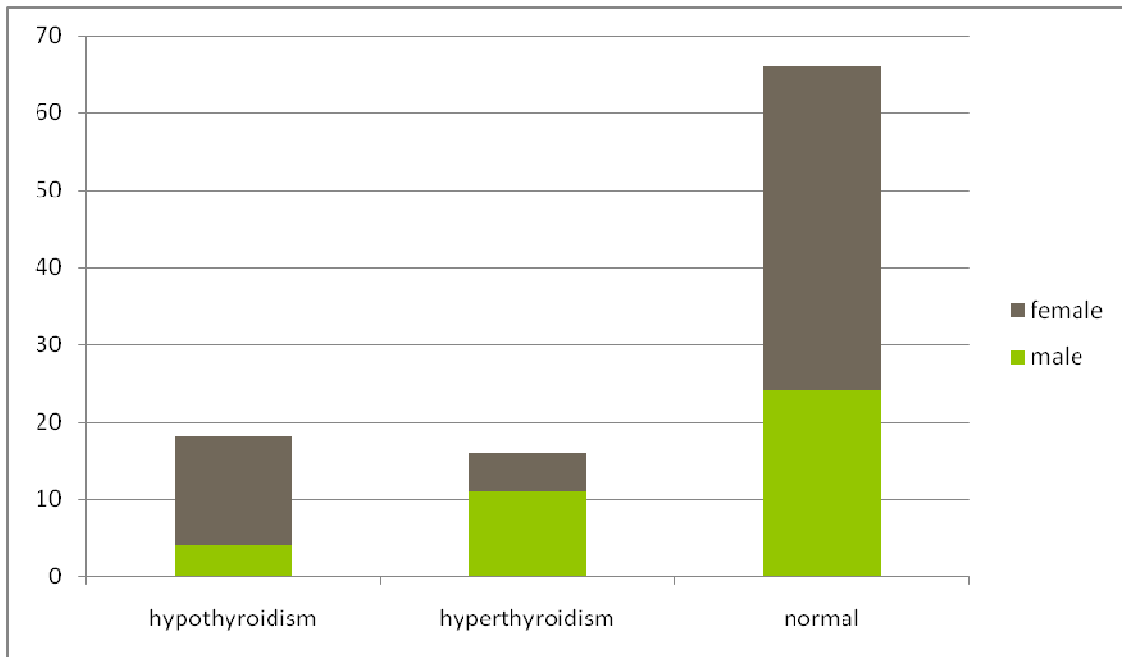


Table 1

subjects	hypothyroid	normal
diabetics	18	82
nondiabetics	4	96

On comparing data with controls, the study shows that the relative risk of developing hypothyroidism in diabetic patients is 4.5. Hence diabetics are 4.5 times more likely to develop hypothyroidism. The Odds ratio is 5.2672 which is statistically significant.

DISCUSSION

Thyroid disorders are the most common condition which affects the endocrine system second to diabetes mellitus. As a result, it is common for an individual to be affected by thyroid diseases and diabetes. The first report showing the association between diabetes and thyroid dysfunction was published in 1979^{2,3}. A number of studies have estimated the prevalence of thyroid dysfunction among diabetes patients to be varying from 2.2 to 17 %, the most common disorder being subclinical hypothyroidism^{4,5}. However, few studies have estimated a higher prevalence of thyroid dysfunction in diabetes i.e. 31 % and 46.5% respectively^{6,7}. Thyroid function tests are recommended in patients with clinical suspicion

and / or unexplained changes in diabetic metabolic control or increased serum cholesterol and weight gain. Thyroid hormones affect glucose metabolism via several mechanisms. Hyperthyroidism has been recognized to promote hyperglycaemia.⁸ In hyperthyroidism, the half-life of insulin is reduced secondary to an increased rate of degradation and an increased release of biologically inactive insulin precursors^{9,10}. In hyperthyroidism endogenous production of glucose is enhanced by several mechanisms^{11,12}. It is well known that diabetic patients with hyperthyroidism experience worsening of their glycaemic control. Thyrotoxicosis has been

shown to precipitate diabetic ketoacidosis in subjects with diabetes^{13,14}. In hypothyroidism, glucose metabolism is affected as well via several mechanisms. A reduced rate of liver glucose production is observed in hypothyroidism and accounts for the decrease in insulin requirement in hypothyroid diabetic patients¹⁵. A recent study involving subjects from a Chinese population found a higher TSH level in patients with metabolic syndrome compared to that in the non-metabolic syndrome group suggesting that subclinical hypothyroidism may be a risk factor for metabolic syndrome¹⁶. Uncontrolled hyperthyroidism in diabetic patients may trigger hyperglycaemic emergencies while recurrent hypoglycaemic episodes have been reported in diabetic patients with hypothyroidism. Furthermore, thyroid dysfunction may amplify cardiovascular disease risk in diabetic patients through interrelationships with dyslipidaemia, insulin resistance and vascular endothelial dysfunction.

Effects of Diabetes Mellitus on Thyroid Hormones and Thyroid Diseases

Altered thyroid hormones have been described in patients with poor glycaemic control. In diabetic patients, the nocturnal TSH peak is blunted or abolished, and the TSH response to TRH is impaired¹⁷. Reduced T3 levels have

been observed in uncontrolled diabetic patients. This "low T3 state" is explained by impairment in peripheral conversion of T4 to T3. This abnormality normalizes with improvement in glycaemic control. The abnormal thyroid hormone level may also be due to various medications that the diabetic patients receive. For example, it is known that insulin¹⁷, an anabolic hormone enhances the level of FT4. Insulin also suppresses the level of T3 by inhibiting hepatic conversion of T4 to T3. Oral hypoglycaemic agents such as the sulphonylureas are known to suppress the level of FT4 and T4, while causing raised levels of TSH^{18,19}.

CONCLUSION

The relationship between diabetes mellitus and thyroid disorders is characterized by a complex interdependent interaction. Unidentified thyroid dysfunction could negatively impact diabetes and its complications. An increased prevalence of retinopathy and nephropathy was observed in diabetic patients with subclinical hypothyroidism^{20,21,22}. Therefore, management of subclinical hypothyroidism in patients with diabetes is beneficial. The ability to diagnose and treat unsuspected hypothyroidism would enhance the quality of life in diabetic patients.

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