

## Thyroid Dysfunction in Diabetes Mellitus

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### ABSTRACT

**Objective:** To determine the prevalence of thyroid disease in diabetics and its relationship to diabetic complications.

**Study design:** Descriptive study.

**Material and method:** 100 patients of either gender or ages more than 12 years suffering from diabetes mellitus (DM) were enrolled for the study. All diabetics were subjected to tests for thyroid functions including T3, T4 and TSH. A careful history and examination was done to find out symptoms and signs suggesting complications of DM and thyroid dysfunction. Further investigations done were complete blood picture, blood sugar level (fasting and 2 hours postprandial), HbA1C, urine analysis, chest x-ray, ECG, serum creatinine, blood urea, liver function tests and fasting lipid profile. Echocardiography, Doppler studies for peripheral vascular disease, urinary ketones, arterial blood gas analysis and serum electrolytes were performed where indicated. Data was analyzed using SPSS 17 and the results were described in terms of descriptive statistics. Frequency and percentage were calculated and standard deviation was estimated. Significance was kept at p value <0.05.

**Results:** This study included 100 diabetic patients. 51% were males and 49% females. Age ranged between 15 to 71 years (mean 56 years). 13% were suffering from Type1 DM and 87% from Type 2 DM. 14% suffered from thyroid dysfunction. Out of these, 5 were having subclinical hypothyroidism, 4 hypothyroidism, 3 hyperthyroidism and 2 subclinical hyperthyroidism. The prevalence of thyroid dysfunction in patients with diabetic complications was: 14.3% of all with Ischemic heart disease, 13% with peripheral vascular disease, 12.8% with neuropathy, 12.7% with nephropathy, 16% with retinopathy, 9% with hypoglycemia, 33.3% with diabetic ketoacidosis and 33.3% with diabetic foot.

**Key words:** Diabetes mellitus, hyperthyroidism, hypothyroidism

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### INTRODUCTION

Thyroid diseases and diabetes mellitus (DM) are endocrine disorders most commonly seen in clinical practice. Both mutually influence each other and associations between both conditions have long been reported<sup>1,2</sup>. On one hand, thyroid hormones effects carbohydrate metabolism, and on the other hand, diabetes influences thyroid function. This clinical relationship cannot be explained merely on basis of excess or shortage of either hormone. Many trials have shown immunological and genetic correlation between the two types of disorders<sup>3</sup>. It is a fact that DM is often accompanied by other autoimmune diseases; amongst these thyroid diseases are most common. The aim of this study is to determine the prevalence of thyroid disease in diabetics, which in turn will help guide clinicians on the optimal screening and management of these conditions.

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### MATERIAL AND METHOD

The study was conducted in the Departments of Medicine, King Edward Medical University, and Services Institute of Medical Sciences, Lahore. 100 patients of either gender or ages more than 12 years suffering from diabetes mellitus (DM) were enrolled for the study. Diagnosis of DM was established and patients were subclassified into Type 1 and Type 2 according to WHO criteria<sup>4</sup>.

All diabetics were subjected to tests for thyroid functions including T3, T4 and TSH. Levels of T3 and T4 were measured in automatic analyzer with RIA method. TSH was measured with IRMA method. A careful history and examination was done to find out symptoms and signs suggesting complications of DM and thyroid dysfunction. Further investigations done were complete blood picture, blood sugar level (fasting and 2 hours postprandial), HbA1C, urine analysis, chest x-ray, ECG, serum creatinine, blood urea, liver function tests and fasting lipid profile. Echocardiography, Doppler studies for peripheral vascular disease, urinary ketones, arterial blood gas analysis and serum electrolytes were performed where indicated.

Data was analyzed using SPSS 17 and the results were described in terms of descriptive statistics. Frequency and percentage were calculated and standard deviation was estimated. Significance was kept at p value <0.05.

## RESULTS

This study included 100 diabetic patients presenting in the Medical department. 51% were males and 49% females. Age ranged between 15 to 71 years (mean: 56 years). 13% were suffering from Type1 DM and 87% from Type 2 DM. 14% suffered from thyroid

dysfunction. Out of these, 5 were having subclinical hypothyroidism, 4 hypothyroidism, 3 hyperthyroidism and 2 subclinical hyperthyroidism (Table 1). The diabetic complications in patients with thyroid dysfunction are shown in Table 2. The prevalence of thyroid dysfunction in patients with diabetic complications was: 14.3% of all with Ischemic heart disease, 13% with peripheral vascular disease, 12.8% with neuropathy, 12.7% with nephropathy, 16% with retinopathy, 9% with hypoglycemia, 33.3% with diabetic ketoacidosis and 33.3% with diabetic foot.

Table 1: Correlation of various thyroid disorders to the subtypes of DM

Type of thyroid disease	Type 1 CM	Type 2 DM	Total
Hypothyroidism	1	3	4
Subclinical hypothyroidism	0	5	5
Hyperthyroidism	2	1	3
Subclinical hyperthyroidism	1	1	2
Total	4	10	14

Table 2: Prevalence of diabetic complications in various types of thyroid dysfunctions

Diabetic Complication	Hypothyroidism	Subclinical hypothyroidism	Hyperthyroidism	Subclinical hyperthyroidism
<b>IHD</b>				
Stable angina	1	2	1	1
Unstable angina	1	2	0	0
MI	2	1	0	0
PVD	3	3	0	0
Neuropathy	3	5	2	1
<b>Retinopathy</b>				
Background	2	1	0	1
Preproliferated	1	0	1	0
Proliferated	0	1	0	0
Vitreous he	0	1	0	0
Nephropathy	2	1	0	0
CRF	0	2	1	0
Hypoglycemia	0	2	0	0
Diabetic foot	1	1	0	0
DKA	0	0	2	0

## DISCUSSION

Several reports document a higher than normal prevalence of thyroid dysfunction in the diabetic population.<sup>5,6,7</sup> Our research showed 14% of diabetics suffering from thyroid disease which is a finding similar to other studies.

In our study group we found Type 1 DM in 13% patients, age ranging from 15 to 40 years. The rest belonged to Type 2 DM group. Thyroid disorders were found to be more common in subjects with type 1 diabetes compared to those with type 2 diabetes. Out of those with Type1 DM, 30.7% had thyroid dysfunction, while amongst those with type 2 DM, 11.5% had thyroid disease. Thyroid disorders have been demonstrated in other studies to be the most

frequent autoimmune disorders associated with type 1 diabetes, commonest being autoimmune thyroiditis<sup>8,9,10</sup>.

In our group of 13 patients with type1 DM, 1(7.6%) showed manifest hypothyroidism, while 3(23%) suffered from manifest/subclinical hyperthyroidism. While out of 87 patients with type 2 DM, 8(9.2%) had manifest/subclinical hypothyroidism, while 2 had manifest/subclinical hyperthyroidism. We concluded that hypofunctioning thyroid, both subclinical and manifest was the most prevalent type of disorder. It was also observed that both clinical and subclinically hypothyroid manifested the maximum macrovascular and microvascular complications including coronary artery disease, peripheral vascular disease, nephropathy,

neuropathy, retinopathy as well as recurrent episodes of hypoglycemia. On the other hand diabetic ketoacidosis was the presenting feature for type 2 DM patients who also had underlying hyperthyroidism. Similar observations have been made by Morillas and Battacharrya in patients with hyperthyroidism presenting with worsening of their glycemic control<sup>11,12</sup>. Furthermore, on the other end of the spectrum, a recent study involving subjects from a Chinese population suggested that subclinical hypothyroidism may be a risk factor for metabolic syndrome<sup>13</sup>. Increased risk of nephropathy and retinopathy has similarly been shown in diabetic patients with subclinical hypothyroidism as compared to euthyroid patients with diabetes by Singer, Hollander and Yang et al, respectively<sup>14-17</sup>.

## CONCLUSION

Thyroid dysfunction is common in diabetic patients and can produce significant metabolic disturbances. Therefore, regular screening for thyroid abnormalities in all diabetic patients will allow early treatment of subclinical thyroid dysfunction.

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