

A Study On The Association Of Diabetes Mellitus Type-2 And Hypothyroidism.

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Abstract: Hypothyroidism Is Common In Diabetes Mellitus Patients And Can Produce Significant Metabolic Disturbances Such As Dyslipidemia, Which Commonly Found In Type 2 Diabetes. This Will Further Leads To Increase The Risk Of Cardiovascular Diseases. Based On This We Studied The Thyroid Profile And Serum Cholesterol Level In Diabetes Patients. The Study Comprised Of 50 Patients With Evidence Of Diabetes And 50 Normal Individuals As Control Group. In All The Individuals Fasting Blood Sugar, Hba1c, T3, T4, TSH And Serum Cholesterol Were Estimated. There Is A Significant Increase Of Mean Fasting Blood Sugar And Hba1c In Cases Of Diabetes When Compared With Control. The Thyroid Profile Parameters Such As T3 And T4 Are Significant Decreased And There Is A Significantly Increase Of TSH In Cases When Compared With Control. Finally, The Serum Cholesterol Is Also Significantly Increased In Cases. All Data Suggest That There Is Altered Thyroid Profile And Increased Serum Cholesterol Which Further Aggravates Atheroma Risk. Therefore, Regular Screening For Thyroid Profile In Diabetes Mellitus May Be Helpful For Early Treatment Of Hypothyroidism And Reducing The Risk Of Atherosclerosis. The Throxine Replacement Will Reverse The Dyslipidemia And Further Decreases The Risk Of Cardiovascular Diseases.

Key words: Hypothyroidism, Thyroid Profile, Diabetes Mellitus, Cardiovascular Diseases

I. Introduction

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycaemia resulting from defects in insulin secretion, insulin action or both. Diabetes mellitus is an important health problem that is prevalent all over the world. Incidence of silent cardiac events are more common in diabetics than in general population. Patients with diabetes have an increased incidence of atherosclerotic, cardiovascular, peripheral vascular and cerebrovascular disease. Major cause of morbidity and mortality among diabetic patients is cardiovascular complications. Therefore, it is important to recognize various cardiovascular risk factors and modify them if possible by primary or secondary intervention. Age, obesity, hypertension, smoking, male sex and hyperlipidaemia are the various risk factors for the development of cardiovascular disease. Metabolic Syndrome has recently emerged as another potent risk factor that is thyroid dysfunction. [1]

Diabetic patients have a higher prevalence of thyroid disorders compared with the normal population. The prevalence of thyroid dysfunction in DM has been estimated as 10.8% with majority of hypothyroidism (around 30%) and subclinical hypothyroidism (around 50%). [2] A number of reports have also indicated a higher than normal prevalence of thyroid disorders in type 2 diabetic patients, with hypothyroidism being the most common disorder.

The relation between diabetic mellitus and thyroid dysfunction is less explained area which may also answers the various facts of diabetes mellitus including atherosclerosis, hypertension and related cardiovascular disease. Therefore, the aim of our study is evaluation of thyroid profile including T3, T4 and TSH in addition, serum cholesterol was estimated in Diabetes mellitus.

II. Material Methods

The study comprised of 95 patients between age group 50 to 65 years of both sexes of diabetes mellitus. The criteria for the diagnosis of DM were the same as the one which was given by the National Diabetes Data Group 1999. In all those cases fasting blood sugar and HbA1c confirmed the diagnosis of diabetes mellitus. In this group serum TSH level was estimated those who had high TSH level were included for assessment of T3, T4 and serum cholesterol. The control group comprised of 50 numbers, whose age and sex matched healthy subjects who are free of features of diabetes mellitus, having a normal fasting blood glucose and HbA1c. Individuals suffering from thyroid diseases were excluded.

Blood was drawn in the fasting state for Fasting Blood Sugar (FBS) in the fluoridated vial. For HbA1c estimation, the sample was collected in heparinized vial. The samples were collected in plain vials for the estimation of serum T3, T4, TSH and cholesterol. Sera were separated from samples and analysis was done.

FBS was estimated by GOD-POD method [3]. HbA1c was estimated by the method of Trivelli et al 1979 [4]. Thyroid profile like T3, T4 and TSH was estimated by using CLIA kits. Serum cholesterol was estimated by the method of CHOD-POD [5].

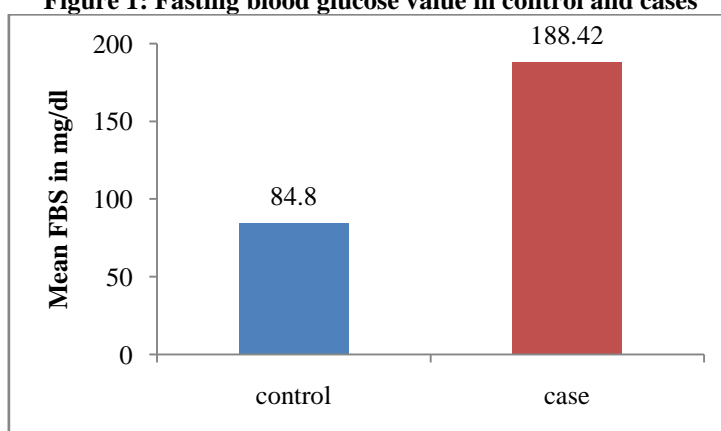
III. Results And Discussion

In the present study the diagnosis criteria of Diabetes Mellitus was based on National Diabetes Data Group (NDDG) 1979 and World Health Organisation (WHO) 1980, Diabetes was diagnosed on the basis of the fasting plasma glucose ≥ 126 mg/dl. The symptoms of DM include polyuria, polydipsia, polyphagia and weight loss. The complications associated with DM includes, neuropathy, nephropathy, retinopathy, angiopathy, susceptibility to infection. 95 patients previously diagnosed as DM were included in the study for assessment of thyroid status out of this 50 cases demonstrated are high serum TSH and low T3 and T4 level. In this 50 cases serum cholesterol level was estimated do detect any abnormality.

Changed FBS concentration in control and cases:

In the present study the mean fasting plasma glucose level was significantly increased in cases when compared with control this rise is statistically significant ($p < 0.001$; figure 1).

Figure 1: Fasting blood glucose value in control and cases



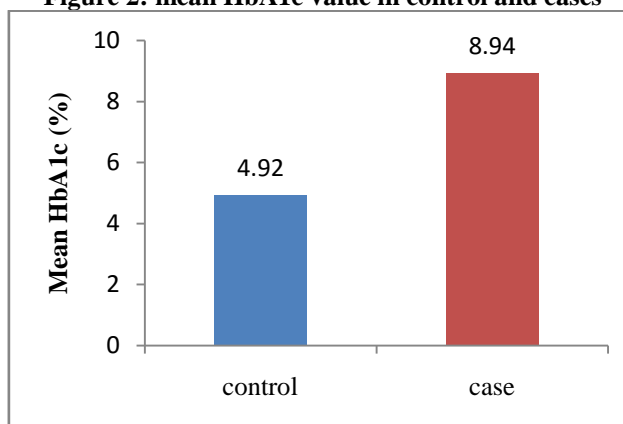
	Control (n=50)	Cases (n= 50)	p value
FBS (mg/dl)	84.80±5.01	188.42 ± 33.28	< 0.001

The raise of blood glucose is due to impaired insulin secretion, insulin resistance, and increased glucose production resulting from environmental and genetic factors in diabetes mellitus.

Changed HbA1c concentration in both groups

In the present study the mean HbA1c level was significantly increased in cases when compared with control this rise is statistically significant ($p < 0.001$; figure 2).

Figure 2: mean HbA1c value in control and cases



	Control (n=50)	Cases (n= 50)	p value
HbA1c (%)	4.92±0.52	8.94±0.36	< 0.001

Glycated haemoglobin decide the long term control of DM. Free amino groups of haemoglobin reacts with glucose by non-enzymatically reaction and form covalent glyctaed haemoglobin. There are different glycated derivates are existed and these are collectively called as HbA1. The important constituent of HbA1 is HbA1c, formed with glucose. It contains about 5% of circulating haemoglobin [6]. HbA1c reflects the average value of blood glucose over the past one to two months. In DM the blood glucose level is high, which leads to increased of HbA1c.

Altered thyroid profile in control and cases:

In the present study the mean serum T3 and T4 levels are significantly decreased in cases when compared with control this decrease is statistically significant ($p < 0.001$; Table 1). But the mean serum TSH level was significantly increased in cases when compared with control ($p < 0.001$; Table 1).

Table 1: Comparison of Thyroid profile in control and cases:

	Control (n=50)	Cases (n= 50)	p value
T3 (ng/dl)	105.64 ± 11.33	74.80 ± 15.25	< 0.001
T4 (µg/dl)	8.21± 1.29	5.28± 2.41	< 0.001
TSH (µIU/ml)	2.48± 0.60	9.63 ± 1.14	< 0.001

Diabetic group patients have a higher prevalence of thyroid dysfunction compared with the normal healthy individuals. A number of studies have also indicated a higher than normal prevalence of thyroid dysfunction in type 2 diabetic patients, with hypothyroidism being the most common disorder. Udiog, A et al., (2007) studies shown that 46.5% of diabetics mellitus have altered thyroid hormone levels 26% of the diabetics have low levels of thyroid hormone and 19.9%.had raised levels. Guang-Ran Yang et al., (2010) studies shown that 22.4% of diabetes mellitus with type 2 have subclinical hypothyroidism. The possible mechanism of hypothyroidism in diabetic patients is

- a) The presence of anti thyroid peroxidase antibodies or thyroid autoantibodies increases the risk of the thyroid disease.
- b) Low Serum T₃ is due to reduced peripheral conversion of T₄ to T₃ via 5' monodeiodination reaction.
- c) Poorly controlled diabetes may also result in impaired TSH response to TRH or loss of normal nocturnal TSH peak.

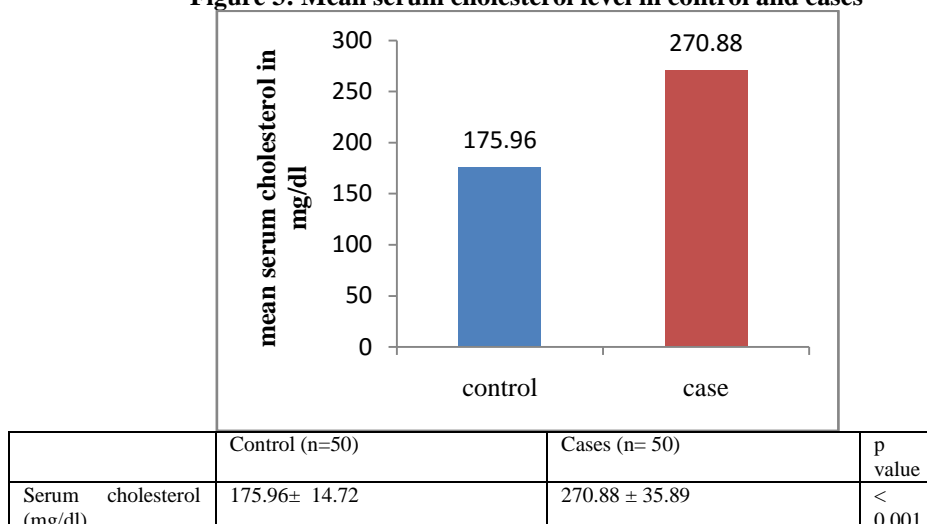
The abnormal thyroid hormone levels found in diabetes is due to the presence of thyroid hormone binding inhibitor (THBI), an inhibitor of extra thyroidal conversion enzyme(5'-deiodinase) of T₄ to T₃, and dysfunction of the hypothalamo-pituitary-thyroid axis. The major alterations in thyroid hormone system are a reduction in the TSH stimulation of the thyroid gland, probably caused by central hypothyroidism, and in the peripheral generation of T₃ from T₄. The presence of TPO antibodies is associated with an increased risk of Hypothyroidism [9,10].

Patients who are TPO positive are more likely to develop hypothyroidism as compared with patients who are TPO negative. The prevalence of hypothyroidism is significantly associated with positive TPO antibodies. Despite the association between positive thyroid TPO antibodies and the subsequent development of hypothyroidism, annual measurement of serum TSH constitutes the preferred screening test to detect asymptomatic thyroid dysfunction.

Changed Cholesterol concentration in both groups:

In the present study the mean serum cholesterol level was significantly increased in cases when compared with control this rise is statistically significant ($p < 0.001$; figure 3).

Figure 3: Mean serum cholesterol level in control and cases



Increased serum cholesterol and triglycerides reflect decreased utilization. The composition and the transport of lipoproteins are seriously disturbed in thyroid diseases. hypothyroidism is characterized by hypercholesterolaemia & hyper triglyceridemia and marked increase in low-density lipoproteins (LDL) & apo lipoprotein B because of a decreased fractional clearance of LDL by a reduced number of LDL receptors in the liver. The HDL levels are normal or even elevated in severe hypothyroidism because of decreased activity of cholesteryl – ester transfer protein (CETP) and hepatic lipase (HL), which are enzymes regulated by thyroid hormones. Moreover, hypothyroidism increases the oxidation of plasma cholesterol mainly because of an altered pattern of binding and to the increased levels of cholesterol, which presents a substrate for the oxidative stress. Cardiac oxygen consumption is reduced in hypothyroidism. This reduction is associated with increased peripheral resistance and reduced contractility [11, 12].

IV. Conclusion

Diabetic patients risk for cardiovascular diseases because diabetes itself causes hypercholesterolemia. Diabetic associated with hypothyroidism will causes significant increase in cholesterol level, which will cause development of atheromatous plaque. Therefore hypercholesterolemia in diabetic associated with hypothyroidism should be tackled and the normal level should be restored to prevent complication of ischemic heart diseases.

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