

ORIGINAL RESEARCH

The Relation Between type 2 Diabetes Mellitus and Thyroid Function Parameter Compare as A Healthy Person

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ABSTRACT

Introduction: Diabetes and thyroid diseases are two familiar endocrinopathies seen in the general population. Abnormal thyroid hormone levels can also be found in individuals with diabetes. Main issue with the co-existence of both diabetes and thyroid disorders has been associated with increased long-term morbidity and mortality. Hypothyroidism have been associated with insulin resistance which has been reported to be the major cause of impaired glucose metabolism in T2DM. The state-of-art evidence suggests a pivotal role of insulin resistance in underlining the relation between T2DM and thyroid dysfunction. Diabetes Mellitus Type 2 plays an important role in thyroid dysfunction development. **Aim:** The aim of this study was to of thyroid function test in T2DM. and compare them with results obtained from a sample of the control Non-Diabetes and the relation between diabetes and thyroid dysfunction.

Materials and Method: Total of 50 Diabetic cases (Group 1) and 50 healthy non-Diabetics control subject (Group 2) this study between January 2017 to June. Which included both male and female. Plasma and serum sample of both the groups were analyzed to assess the thyroid profile, FBS and HbA_{1c}. Both groups were compared using student t-test by calculating r- value of the parameters, P-value and the Pearson coefficient correlation was calculated with significant p value at < 0.05.

Results: The mean values of FBS, HbA_{1c} were significantly increased (P<0.0001) in type -2 Diabetes mellitus cases as compared to normal healthy individuals. Other mean values, TSH significantly increased (P<0.0001) in thyroid function in type -2 Diabetes mellitus patient as compared to controls. Whereas the mean value of T3 and T4 was significantly decreased in Thyroid level in type -2 Diabetes mellitus patient as compared to controls.

Conclusion: The results of the present study showed that the levels of serum T3, T4 were significantly lower in diabetics while serum TSH was significantly higher in diabetics when compared to that of controls. Finally, it was concluded from the above observation that type 2 Diabetes Mellitus patients suffer from thyroid dysfunction.

Keywords: FBS, Glycated Haemoglobin, Body mass Index, Thyroid Profile (T3, T4, TSH)

INTRODUCTION

Diabetes mellitus (DM), a leading cause of death worldwide, is one of the most challenging health problems in the 21st century.^[1] Thyroid dysfunction is increasingly found in the diabetes mellitus patients, the prevalence of which is around 13.4%^[2]

Diabetes mellitus can be autoimmune in origin and is associated with many other autoimmune disorders such as autoimmune thyroiditis, celiac disease, and vitiligo. It may also associate with such as metabolic syndromes, hypo/hyperthyroidism and obesity.^[3]

Diabetes and thyroid diseases are two familiar endocrinopathies seen in the general population. Abnormal thyroid hormone levels can also be found in individuals with diabetes.^[4]

The co-existence of both diabetes and thyroid disorders has been associated with increased long-term morbidity and mortality. Thus, the present study was conducted to find out the relationship between type 2 DM & thyroid dysfunction in patients with type 2 diabetes, as the benefits of identifying at an early stage, and even in asymptomatic patients is considerable.^[5]

Insulin and thyroid hormones are intimately involved in cellular metabolism and thus excess or deficit of either of these hormones result in the functional derangement of the other. The physiological and biochemical interrelationship between insulin and the influence of both insulin and iodothyronines on the metabolism of carbohydrates, proteins and lipids are recorded. Such records indicate that iodothyronines are insulin antagonist with high levels being diabetogenic while absence of the hormone inhibits the development of diabetes.^[6]

5'-adenosine monophosphate activated protein kinase (AMPK) is a central target for modulation of insulin sensitivity and feedback of thyroid hormones associated with appetite and energy expenditure.^[7]

The relation between T2DM and thyroid dysfunction has been a less explored arena which may behold answers to various facts of metabolic syndrome including atherosclerosis, hypertension, and related cardiovascular disorders. T2DM owes its pathological origin to inappropriate secretion of insulin, due to defective islet cell function or beta cell mass. Continuous consumption of calories-rich meals, junk food and sedentary lifestyle have culminated into an epidemic of diabetes projected to afflict around 300 million people across the globe by 2020.^[8]

These considerations were anticipated as obesity and familiar in inducing IR as a result of lessened insulin sensitive receptors with the increase in weight.^[9]

Unmanaged pro diabetes, both type 1 and type 2, may induce a "low T3 state" characterized by low serum total and free T3 levels, increase in reverse T3 (rT3) but near normal serum T4 and TSH concentrations.^[10]

Since body weight is associated with BMI and a strong correlation existed between an elevated BMI and the progression of type-2 DM.^[11]

If Increase of BMI there is increase in IR, which indirectly elevates the blood glucose level and eventually leads to T2DM.^[12]

MATERIAL AND METHOD

This Hospital based, case-control observation study was conducted in Department of Biochemistry, Integral Institute of Medical Sciences & Research Hospital, Integral University Lucknow, Uttar Pradesh, India

Samples collected from all clinically diagnosed cases of thyroid profile in type 2 diabetes mellitus Fifty diabetic patients and 50 healthy non-diabetic control participated in this study between the age group 30 years to 75 years.

Inclusion Criteria

All the cases were diagnosed based Thyroid dysfunction with Type 2 diabetes mellitus, all diabetics irrespective of glucose control, and all diabetics irrespective of treatment (OHA/insulin).referred by General Medicine OPD and controls recruited were non-teaching staff and health workers from the medical college and hospital.

Exclusion criteria: Patients who received previous thyroid disorder on treatment medications and those with abnormal having Pancreatitis, having Steroid induced diabetes and Type 1 DM were excluded from the study.Particulars were compiled by a pre-tested proforma confronting the purpose of the study.

A 5 mL of fasting venous blood was collected after overnight fasting from anticubital vein by appropriate vials under aseptic conditions, sample will be analyzed for FBS, HbA1/C, T3, T4, and TSH. serum has been separated by the use of centrifugation

Estimation of glucose by GOD/POD method,estimation of Glycated Hemoglobin by Nephelometry Method and estimation of Tri-iodothyronine (T3 T4 and TSH) quantitative measurement by using ELFA technique (Enzyme Linked Fluorescent Assay)

Statistical Analysis

Value of the concerned parameter were Statistical analysed by Processing in SPSS software (22 version) & p-values will be calculated by student unpaired t-test. The value of the parameter has been calculating along with the Pearson correlation at the level of $p < 0.05$ will be considered statistically significant

RESULT

Table 1: Comparison between Thyroid Profile Level in Diabetes Patient (Case) and Non-Diabetes (Control).

T3 (nmol/L)				
CASE	50	1.00	0.56	P = 0.19* (not statistically significant) T value -1.31
CONTROL	50	1.12	0.32	

T4 (nmol/L)				
CASE	50	97.96	28.82	P – 0.889* (not statistically significant) T value -0.13
CONTROL	50	97.34	12.72	
TSH (nmol/L)				
CASE	50	7.23	3.45	P ≤ 0.004* (Very statistically significant) T value – 2.92
CONTROL	50	5.68	1.45	

Table 2: Karl Pearson's Correlation Coefficient among the biochemical parameter in cases.

Correlations		FBS (mg/dl)	HbA1c (%)	T3 (nmol/L)	T4 (nmol/L)	TSH (nmol/L)	BMI (kg/m2)
FBS (mg/dl)	Pearson Correlation	1	.638**	-.310*	-.345*	.579**	-.158
	Sig. (2-tailed)		.000	.028	.014	.000	.274
	N	50	50	50	50	50	50
HbA1c (%)	Pearson Correlation	.638**	1	-.412**	-.480**	.644**	-.117
	Sig. (2-tailed)	.000		.003	.000	.000	.417
	N	50	50	50	50	50	50
T3 (nmol/L)	Pearson Correlation	-.310*	-.412**	1	.493**	-.498**	-.046
	Sig. (2-tailed)	.028	.003		.000	.000	.751
	N	50	50	50	50	50	50
T4 (nmol/L)	Pearson Correlation	-.345*	-.480**	.493**	1	-.401**	-.039
	Sig. (2-tailed)	.014	.000	.000		.004	.786
	N	50	50	50	50	50	50
TSH (nmol/L)	Pearson Correlation	.579**	.644**	-.498**	-.401**	1	-.128
	Sig. (2-tailed)	.000	.000	.000	.004		.375
	N	50	50	50	50	50	50
BMI (kg/m2)	Pearson Correlation	-.158	-.117	-.046	-.039	-.128	1
	Sig. (2-tailed)	.274	.417	.751	.786	.375	
	N	50	50	50	50	50	50
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Shows the correlation matrix among various variable study. HbA1C and TSH is 0.644 in case which positively significant (P < 0.01).

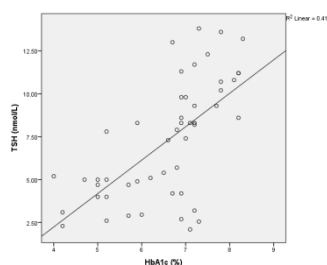


Fig.1 Scatter diagram showing the correlation between TSH and HbA1C among cases

DISCUSSION

The thyroid hormones, T3 and T4 are insulin antagonists that also potentiate the action of insulin indirectly TRH synthesis decreases in Type 2 diabetes mellitus. These facts could be responsible for the occurrences of decreased thyroid hormone levels in diabetics patients. The level of TSH in our study was clinically significant in diabetics than in non-diabetics. Result obtained from present study has shown that in type-2 diabetes mellitus, hypothyroidism, which is a better index to monitor type-2 diabetes mellitus, is frequently observed

The study showed that the serum T3 and serum T4 levels were decreased, and serum TSH levels were increased in type 2 diabetics when compared to controls. We have observed that there is no substantial change.^[13]

A study by Jusufovics S, et al. showed that patients with type 2 diabetes had abnormal thyroid hormone levels. The level of T3, T4 and TSH were significantly lower while the levels of TSH were significantly higher in type 2 diabetics as compared to non-diabetics. Significantly higher levels glycoatedhaemoglobin was observed in diabetics as compared to non-diabetics subjects who agree with the findings of our study.^[14]

There are alterations in the hypothalamus pituitary-thyroid axis. Hypothalamic and plasma TRH, pituitary, and plasma TSH, as well as TSH secretion rates are reduced, and the TSH response to TRH is decreased. Despite normal peripheral TSH metabolism. T3 and T4 production and iodide uptake by the thyroid are diminished. There are important structural changes in the thyroid gland and pituitary that are accompanied by marked alterations in their secretory activities. T4 deiodination to T3 in peripheral tissues is decreased.^[15]

In the present study FBS & HbA1c was found significantly increased in patients with diabetes, and it was directly proportional to the fasting blood glucose levels. Similarly, Venkatachalam R et al., 2015, Kim et al (2010) shown that HbA1c were significantly increased in T2DM patients and it has positive correlation with FBS in T2DM.^[16, 17]

Focus has been raised to look for the influence of thyroid hormone action on insulin levels. Conflicting data are available for the impact of thyroid dysfunction on insulin levels. Furthermore, the development of IR leads to many metabolic abnormalities. The main pathophysiological basis underlying glucose intolerance, dyslipidemia, abdominal obesity, and hypertension has been attributed to IR.^[18, 19]

In our study, mean value of BMI of diabetic patients was found significantly higher than healthy controls. BMI is the marker for the diagnosis of general obesity. Rezzonico Jet al., (2008); VelijaA et al. (2007) reported that the prevalence of obesity is 72% in Asian Indian population. Papazafirpoulou et al. (2010) reported that prevalence of T2DM increases with increasing BMI. High prevalence of obesity may be responsible for the high prevalence the diabetes or presence of hypothyroidism in our population.^[20, 21]

Limitation

The present study had limitation for being case-control study. The accuracy of newly diagnosed cases of T2DM and their duration of the DM was understanding. However the data suggested that thyroid profile could predict the unfavorable fasting blood glucose, HbA1C in type 2 DM.

CONCLUSION

The results of the present study showed that the levels of serum T3, T4 were significantly lower in diabetics while serum TSH was significantly higher in diabetics when compared to that of controls. Finally, it was concluded from the above observation that type 2 Diabetes Mellitus patients suffer from thyroid dysfunction. Hence there is a need early diagnosis can prevent timely onset of atherosclerotic disease like coronary artery disease, hypertension and stroke arising from an diagnose and treatment of thyroid dysfunction in type Diabetes mellitus. This helps reduce the morbidity rate and improve the quality of life in diabetic patients.

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