

STUDY OF THYROID PROFILE IN TYPE 2 DIABETES MELLITUS IN COMPARISON TO NON-DIABETICSBasavaraj G. Mangshetty¹, Niraj Saraf², M. Sidharth³**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: INTRODUCTION: In diabetes mellitus there are alterations in the hypothalamus-pituitary-thyroid axis. Hypothalamic and plasma TRH (Thyrotropin releasing hormone), pituitary and plasma TSH (Thyroid stimulating hormone), as well as TSH secretion rates are reduced, and the TSH response to TRH is decreased despite normal peripheral TSH metabolism. T₃ (Tri-iodothyronine) and T₄ (Tetra-iodothyronine) production and iodide uptake by the thyroid are also diminished. Unrecognized thyroid dysfunction can impair metabolic control in diabetes and may even exaggerate cardiovascular risk. **AIMS OF THE STUDY:** 1. To study the prevalence of thyroid disorders in patients with type 2 diabetes mellitus. 2. To study the distribution of thyroid disorders in patients with type 2 diabetes mellitus regarding age, sex, duration of diabetes, type of treatment, family history of diabetes mellitus, comorbid conditions, BMI and serum lipid profile. 3. To evaluate the relationship between glycemic control with reference to Hb1AC levels, Blood sugar levels and occurrence of altered thyroid function in type 2 diabetes mellitus. 4. To Compare prevalence of thyroid dysfunction in type 2 diabetes mellitus with thyroid function in non-diabetics. **METHODOLOGY:** 50 patients diagnosed with type 2 diabetes mellitus or newly detected Type 2 diabetes mellitus without thyroid disorders attending outpatient departments and admitted to General medicine wards of Basaveshwara teaching and general hospital. Gulbarga Karnataka and age and sex matched 50 controls. A thorough clinical examination was done and Thyroid profile was studied. **RESULTS:** Of the patients with Diabetes 30 patients (60%) were female and 20 patients (40%) were males. The mean age in diabetic group was 54.28±/ 12.74 compared to mean in non-Diabetic group was 49.52±/ 12.58. 27 patients (54%) in Diabetic group had hypertension and 6 patients (12%) diabetic group had coronary artery disease compared to 15 patients (30%) with hypertension and 3 patients (6%) with coronary artery disease in non-diabetic group. 7 patients (14%) had abnormal thyroid profile in diabetic group of which 6 patients (12%) had subclinical hypothyroidism and 1 patient (1%) had overt hyperthyroidism. In non-Diabetic 4 patients had abnormal thyroid profile of which 3 patients (6%) had subclinical hypothyroidism and 1 patient (2%) had over hypothyroidism. The mean HBA1C levels in diabetic group was 8.14, Fasting blood sugar levels was 113.4 and postprandial blood glucose levels was 162.4 compared to 81.76, 113.4 and 5.038 respectively in diabetic group. **INTERPRETATION AND CONCLUSION:** In our study the prevalence of thyroid dysfunction was common in type 2 diabetes mellitus patients than in general population and prevalence was more in females than males. Our study shows significant co relation between abnormal thyroid profile and family history of Diabetes, BMI and serum lipid profile. However no correlation between abnormal thyroid profile and glycaemic levels was seen.

KEYWORDS: Thyroid diabetes mellitus.

INTRODUCTION: Diabetes mellitus is a common endocrine disorder which involves multiple organ systems and leads to significant morbidity and mortality due to accompanying complications.

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Diabetes mellitus is defined as a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both.⁽¹⁾ The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels.⁽²⁾

Of the many organs affected by diabetes, one such organ affected is the Thyroid gland. In diabetes mellitus 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.⁽²⁾

There are also important structural changes in the thyroid gland and pituitary that are accompanied by marked alterations in their secretory activities.⁽³⁾

Unrecognized thyroid dysfunction can impair metabolic control in diabetes and may even exaggerate cardiovascular risk. Prompt detection and treatment may reduce risk derangement of cellular metabolism in diabetes mellitus and help achieving metabolic control in diabetes.⁽⁴⁾

This study is a small attempt to study the thyroid disorders in patients with type 2 Diabetes mellitus in comparison to non-diabetics.

MATERIALS AND METHODS: The present study was carried out in the Department of Medicine, Basaveshwara Teaching and General hospital (Gulbarga).

Study Design: Case control Study.

Period of Study: November 2011 to April 2013.

MATERIALS:

- Questionnaire,
- BMI calculation,
- Blood pressure (sitting and Lying),
- Blood sugar: FBS, PPBS,
- HBA1c,
- Renal function tests: Blood Urea, Serum creatinine,
- urine routine (urinalysis),
- Fasting lipid profile,
- Thyroid profile (FT3, FT4 and TSH),
- Fundus examination,
- Chest X-ray,
- ECG.

Study Group: The study group included 50 patients with known type 2 diabetes mellitus or newly detected Type 2 diabetes mellitus without known thyroid disorders either admitted in wards or attending the outpatient departments who met the inclusion criteria and 50 patients with age and sex matched controls.

Inclusion Criteria: Known type 2 diabetes mellitus and newly detected type 2 diabetes mellitus

Exclusion Criteria:

- Patients with known thyroid disease.
- Patients with chronic renal failure and Diabetic nephropathy.
- Patients with acute illness (sepsis, acute MI, severe heart failure, recent admission in intensive care unit).
- Patients with hepatic dysfunction.
- Patients with psychiatric illness.
- Pregnancy.
- Patients on treatment with drugs interfering with thyroid function (amiodarone, Propranolol, corticosteroids and oral contraceptives).

All patients in the study group were selected without any bias for sex, duration, severity or control of diabetes. A thorough history was recorded with particular emphasis on symptoms of hypothyroidism and hyperthyroidism. The presence of associated illness like coronary artery disease, hypertension and cerebrovascular accident were noted.

Family history regarding diabetes mellitus and treatment history of oral hypoglycaemic or insulin along with duration was also included.

A thorough general and systemic examination was carried. The fundus examination for diagnosis of diabetic retinopathy and neurological examination for diabetic neuropathy were also done.

BMI calculation (Quetelet Index): Body mass index (BMI) is calculated with height and weight of the subject using the following formula.

$$\text{BMI} = \text{weight (kg)} / \text{height (m)}^2.$$

RESULTS AND DISCUSSION:

AGE DISTRIBUTION: In the present study of 50 type 2 diabetic patients, 7 patients (14%) were up to 40 years, 36 patients (72%) were between 41-60 years and 7 patients (14%) were 61 years or more. This shows that the disease was more prevalent between 41-60 years of age. This observation was similar to WHO report which predicts that while the main increase in diabetes would be in the > 65 year age group in the developed countries, In India and developing countries the highest increase would occur in the age group of 45-65 year of age group.⁽⁵⁾ This observation is also similar to Kapur et al, who reported that maximum number of cases were diagnosed between 40 and 59 year of age with no significant difference between the genders.⁽⁶⁾

GENDER DISTRIBUTION: In the present study 40% (20 in number) of the diabetic population were males and 60% (30 in numbers) were females. Female to male ratio was 1.5:1. This observation was similar to Arthur M. Michalek et al who reported that prevalence of diabetes among women was higher than in men.⁽⁷⁾ Athanasia Papazafiropoulou et al (2010) (97) in a study of 1092 Greek patients with diabetes mellitus found that the prevalence rate of thyroid dysfunction in type 2 diabetes mellitus at 12.3%. They also found that Diabetic women were more frequently affected than men. This study is supports our findings. This is in contrast to Jali et al⁽⁸⁾ and Flatau E et al⁽⁹⁾ who reported that diabetes was more prevalent in men than in women.

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DURATION OF DIABETES MELLITUS: In the present study, majority of cases with diabetes that is 70% (35 in number) had duration of diabetes up to 5 years, 18% (9 in number) of patients had duration between 6-10 years and 12% (6 in number) of patients had duration of illness more than 10 years. Majority of people are in the age group between 41 to 60 yrs and have duration of disease less than 5 years.

CO-MORBID DISEASES: In the present study, 54% of diabetics (27 in number) of the studied had hypertension compared to 30% (15 in numbers) non- diabetic control group. In the present study, 12% (6 in number) of diabetic patients had Coronary Artery Disease whereas 6% (3 in number) in control group which is almost twice that of in general population.

DYSLIPIDEMIA: In the present study, 50% (25 in number) of the study group had raised total cholesterol level; 84% (42 in numbers) had raised triglycerides level; 44% (22 in numbers) had decreased HDL-C level and 50% (25 in numbers) had raised LDL-C levels. In control group 40% (20 in number) had elevated triglycerides, 30% (15 in numbers) had elevated LDL-C, 20% (10 in numbers) had reduced HDL-C levels.

HBA1C LEVEL: In the present study, 52% of diabetic (26 in number) had HbA1C level more than 8% and compared to 46% (23 in numbers) had level HbA1C less than 8%. More than half of the diabetic had poor glycaemic control only 2% or (1 nos) had HbA1C <6.

ABNORMAL THYROID PROFILE: In the present study, 14% (7 in number) of the total 50 patients with diabetes mellitus had abnormal thyroid profile L Tanow et al observed that 78% of IDDM patients and 50% of NIDDM had hypertension.⁽¹⁰⁾ Fuller H et al observed that the frequency of WHO defined hypertension was highest in NIDDM patients older than 53 years, being 43% of male and 52% of females.⁽¹¹⁾ Both these studies support the findings in this study.

Prevalence of CAD in general population in urban areas in India is 6.4%⁽¹²⁾ In the present study, 12% (6 in number) of diabetic patients had Coronary Artery Disease whereas 6% (3 in number) in control group which is almost twice that of in general population. This is supported by two studies which concluded that Type 2 diabetes increases relative risk of cardiovascular disease two- to fourfold compared with the risk in the general population.^(13,14)

DISTRIBUTION OF THYROID ABNORMALITIES: In the present study, 12% (6 in number) of the patients had report suggestive of sub clinical hypothyroidism and 2% (1 in number) of the patients had report suggestive of sub clinical hyperthyroidism. Whereas in control group 6% (3 in number) had sub clinical hypothyroidism and 2% (1 in number) had overt hypothyroidism.

ANALYSIS OF ESR IN DIABETICS AND NON DIABETICS: In this study, on comparing the two groups the ESR was statistically highly significant (P=0.000541).

ANALYSIS OF THYROID PROFILE IN DIABETICS AND NON DIABETICS: In the present study thyroid profile of Diabetics compared to non-diabetics When Compared between non-diabetics was statistically significant levels (FT3: p=0.0005; FT4: p=0.0201; TSH: p= 0.0236) indicating prevalence of abnormal thyroid profile more common in diabetics.

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ANALYSIS OF ASSOCIATED SYSTEMIC HYPERTENSION AND CAD IN DIABETICS AND NON DIABETICS: In our study, on comparing both groups with respect to associated hypertension difference was statistically significant between the two group ($p=0.000021$) Also in our study on between the two groups associated CAD was significant ($p=0.0076$).

ANALYSIS OF BMI IN DIABETICS AND NON DIABETICS: In our study, on comparing BMI, the difference was statistically significant ($p=0.0052$) between the two groups.

ANALYSIS OF BLOOD SUGAR LEVEL IN DIABETICS AND NON DIABETICS: On comparing the two groups the differences were statistically significant (FBS: $p=0.000136$; PPBS: $p=0.000112$; HBA1C: $p=0.0000132$).

ANALYSIS OF SERUM LIPID PROFILE IN DIABETICS VS NON DIABETICS: On comparing the two groups the differences were statistically significant. (TC: $p=0.0021$; TGS: $p=0.0023$; HDL: $p=0.028$; LDL: $p=0.00038$).

SIGNIFICANCE OF AGE IN PATIENTS WITH ABNORMAL THYROID PROFILE: Among the patients in Diabetic group with abnormal thyroid profile, each 14% (1/7) of patients were found to be of age 61 and more and 40 or less. 71.4% (10/12) were found to be of age between 41-60 years. Though there is difference, when Compared between patients with normal and abnormal thyroid profile it has no significance ($p=0.998$). Similarly, no significance was seen in non-diabetic group also ($p=0.834$).

SIGNIFICANCE OF SEX DISTRIBUTION IN CASES WITH ABNORMAL THYROID PROFILE: In the present study 85.7% (1/7) patients were found to be female compared to 14.3% (6/7) male in the group with abnormal thyroid profile. Compared between patients with normal and abnormal thyroid profile among diabetic group this is statistically not significant ($p=0.5674$) and similarly results been in non-diabetic group ($p=0.512$).

SIGNIFICANCE OF TYPE OF TREATMENT IN PATIENTS WITH ABNORMAL THYROID PROFILE: Out of 7 patients with thyroid abnormality, 57.1% (4/7) were on OHA, 14.3% (1/7) were on Insulin and 28.5% (2/7) were on both OHA/Insulin. Compared with normal thyroid profile group it has no statistical significance ($p=0.4891$).

SIGNIFICANCE OF ASSOCIATED HYPERTENSION AND CAD IN PATIENTS WITH ABNORMAL THYROID PROFILE: In the present study, in Diabetic group 57.1% (4/7) of patients had hypertension in the group of 7 patients with abnormal thyroid profile whereas 42.8% (3 /7) of patients had no hypertension. This finding has no statistical significance ($p=0.6385$). And 14.2% (1/7) were found to have CAD compared to 85.7% (6/7) without CAD in patients with abnormal thyroid profile. Compared between patients with normal and abnormal thyroid profile in diabetic group this finding was found to be insignificant ($p=0.840$). similar result was seen in non-diabetic group.

ANALYSIS OF BMI IN CASES WITH NORMAL AND ABNORMAL THYROID PROFILE: Out of 7 patients with abnormal thyroid profile in diabetic group, 42.9% (6/7) were overweight and 28.6% (1/7) were obese. There was significant correlation between BMI and abnormal thyroid profile ($p=0.00000003$) in diabetic group was seen.

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ANALYSIS OF BLOOD SUGAR LEVEL IN CASES WITH NORMAL AND ABNORMAL THYROID PROFILE: Out of 7 patients in diabetic group with abnormal thyroid profile, 57.1% (4/7) had HbA1C value above 8% and the remaining 42.9% (3/7) had HbA1C 8 or less. This difference is not statistically significant ($p=0.9376$). Similarly no co relation was found between FBS and PPBS.

SIGNIFICANCE OF SERUM LIPID PROFILE IN PATIENTS WITH ABNORMAL THYROID PROFILE: In diabetic group significant co relation was found between triglyceride level, total cholesterol level with respect to abnormal thyroid profile but no association was found in non-diabetic group.

CONCLUSION:

- Prevalence of thyroid dysfunction is more common among type 2 diabetes mellitus patients than in general population.
- Prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus is higher in females than in males
- There is significant correlation between abnormal thyroid profile and family history of diabetes, BMI and serum lipid profile. However no co relation was seen between abnormal thyroid profile and glycaemic levels were seen. This study shows that CAD, hypertension is more common in diabetics than in general population.
- Routine screening for thyroid dysfunction in type 2 diabetes mellitus patients may be justified especially in females because the progression to overt thyroid dysfunction is associated with significant morbidity including the adverse effects on glycemetic control, lipid profile.

SUMMARY: This study is aimed at comparing thyroid profile in diabetics to non-diabetics showed following observations:

In the present study, 14% (7nos) of patients with type 2 diabetes mellitus had abnormal thyroid profile compared to 8% (4nos) in non-diabetic group In Diabetic patients with abnormal thyroid profile (7nos), most common abnormality was sub clinical hypothyroidism (85.7%) followed by overt hyperthyroidism (14.3%) whereas in non-diabetic most common was subclinical at 6% (3 nos.) followed by overt hypothyroidism 2% (1 nos.)

In the present study, patients ranged from 36 to 70 years of age. Maximum number of patients was in the age group between 41 to 60yrs (72.2%). Majority (70.4%) of patients was on OHA and 14.8% each were on insulin and both OHA/Insulin. Majority (75.9%) of patients were on regular treatment and 18.5% were irregular. 30.9% patients were having family history of diabetes mellitus and 61.1% had no family history.

The prevalence of HT (54%) and CAD (11.1%) were higher among diabetic population than non-diabetics significant number of patients (24.1%) had diabetic retinopathy.

Majority (59.2%) of the diabetic patients were overweight and obese. 51.9% had HbA1C level more than 8% and 48.1% had HbA1C level less than 8% showing that more than half of the patients had poor glycaemic control. 50% of the patients had raised total cholesterol level, 84.24% had raised LDL cholesterol level, 43.25% had decreased HDL cholesterol level and 50% had raised Triglyceride level showing that majority of diabetics have dyslipidemia.

In our study, Diabetic patients when compared to non-diabetics had significant elevations in ESR, CAD, Hypertension, Blood sugar levels and dyslipidemia.

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Our study showed no significant association between abnormal thyroid profile, duration of diabetes, type of treatment, female gender, hypertension, HBA1C and blood sugar levels. however significant association between abnormal thyroid profile and BMI, family history of diabetes FLP was seen especially with total cholesterol and triglycerides.

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