

## A Study of Prevalence and Spectrum of Thyroid Dysfunction in Type II Diabetes Mellitus

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### ABSTRACT:

#### INTRODUCTION

Among all the endocrine-metabolic diseases, Diabetes is the most common disorder seen. The impact of this disease on the quality of life, morbidity and mortality through the complications that affect the large and small vessels resulting in retinopathy, nephropathy, neuropathy, coronary artery disease, cerebrovascular disease and large vessel obstruction has been emphasized by the findings of the National Commission (USA) on diabetes and DCCT trial.

#### AIMS AND OBJECTIVES OF THE STUDY

1. To study the thyroid functions in diabetes mellitus.
2. To know the spectrum of thyroid dysfunction in diabetes mellitus.

#### METHODOLOGY

The study includes type 2 diabetics from OPD's and IPD's of all the departments of KIMS Hospital, Hubli in the period between January 2015 and December 2015. 100 patients of type 2 are selected from OPD and IPD in a random fashion.

#### RESULTS

1. The present study included 100 patients with type 2 diabetes mellitus. Out of 100 subjects, 53 were females and 47 were males. Age group of study participants was divided into 31-50, 51-70, 71-90 years.

Mean age (SD) = 56.13 (11.95)

Mean age (SD) among male = 56.06 (9.63)

Mean age (SD) among female = 56.2 (13.77)

The p-value for the difference in mean age between males and females was 0.959 which was statistically not significant.

#### DISCUSSION

Among the endocrine-metabolic diseases, diabetes occupies the major share. India has the dubious distinction of being home to the largest number of people suffering from diabetes than any country in the world. The disease is responsible for significant mortality and morbidity due to the complications. This study was conducted at KIMS, Hubli between 2014 and 2015. Thyroid functions were studied in type 2 Diabetes Mellitus patients attending the OPD and IPD of KIMS hospital. A total of 100 type 2 diabetic patients were studied. All were confirmed diabetics who previously had fasting plasma glucose levels of >126 mg/dl or RBS of  $\geq 200$  on more than one occasion and were receiving treatment such as Insulin, OHA's or physical exercise therapy. All these patients were from the rural area. Prevalence and spectrum of thyroid disorders in type 2 diabetics. In this study of 100 patients with type 2 diabetes, 53 were males and 47 were females. We have found 26 patients with thyroid disorders i.e., 26% and a number of reports have also indicated higher than normal prevalence of thyroid disorders.

#### CONCLUSION

Thyroid dysfunction is seen in 26% of the patients with type 2 diabetes mellitus. Subclinical hypothyroidism was the most common abnormality noted. Thyroid dysfunction was more common in females than in males. A serum TSH within euthyroid range almost always eliminates the diagnosis of hypo or hyperthyroidism. This shows that TSH is preferred screening test for thyroid dysfunction in diabetics.

**KEYWORDS:** PREVALENCE, SPECTRUM OF THYROID DYSFUNCTION, TYPE II DIABETES MELLITUS

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## I. Introduction

Among all the endocrine-metabolic diseases, Diabetes is the most common disorder seen. The impact of this disease on the quality of life, morbidity and mortality through the complications that affect the large and small vessels resulting in retinopathy, nephropathy, neuropathy, coronary artery disease, cerebrovascular disease and large vessel obstruction has been emphasized by the findings of the National Commission (USA) on diabetes and DCCT trial. The prevalence of diabetes is rapidly rising all over the world. The prevalence of diabetes mellitus in West is between 6-7.6%. Current estimates suggest that there are at least 150 million people living with diabetes worldwide of which two-third are in the developing countries. India has already become the "diabetes capital" of the world with over 3 crore affected patients. The prevalence has already reached approximately 20% in urban and 10% of the rural population. Between 1995 and 2025, there is predicted to be a 35% increase in the worldwide prevalence of diabetes.<sup>1</sup>

The rising number of people with diabetes will occur mainly in populations of developing countries, leading to more than 300 million people with diabetes globally by 2025. The World Health Organization (WHO) has projected that the global prevalence of diabetes will rise to 300 million (7.8%) by 2030. Factors such as sedentary lifestyle, dietary indiscretions, ethnicity, hypertension and obesity are thought to be major contributions to this epidemic.

Thyroid disorders are also very common in the general population and it is second only to diabetes as the most common condition to affect the endocrine system. As a result, it is common for an individual to be affected by both thyroid diseases and diabetes.<sup>2</sup>

The association between these two disorders has long been recognized although the prevalence of thyroid dysfunction in the diabetic population varies widely between the studies. Insulin and thyroid hormones are intimately involved in cellular metabolism and thus excess or deficit of either of these hormones could result in the functional derangement of the other. The term "thyroid diabetes" was coined in the early literature to depict the influence of thyroid hormone alterations in the deterioration of glucose control.<sup>3</sup>

There is abundant evidence to suggest that Type 1 Diabetes Mellitus is an autoimmune disorder. These include the presence of insulinitis, presence of antibodies and of auto-reactive T-cells against islet cell antigens, an association with some other known organ-specific autoimmune dysfunction (thyroid disorder and pernicious anemia) and strong association between HLA genes and lastly remission of the disease with immunomodulator therapy. Thus association between thyroid and type 1 diabetes may be an autoimmune process.

## II. Aims And Objectives Of The Study

1. To study the thyroid functions in diabetes mellitus.
2. To know the spectrum of thyroid dysfunction in diabetes mellitus.

## III. Methodology

### STUDY GROUP

The study includes type 2 diabetics from OPD's and IPD's of all the departments of KIMS Hospital, Hubli in the period between January 2015 and December 2015. 100 patients of type 2 are selected from OPD and IPD in a random fashion.

### Inclusion Criteria:

1. All patients with type 2 diabetes aged more than 30 years.
2. All diabetics irrespective of glucose control.
3. All diabetics irrespective of treatment (OHA/insulin).

### Exclusions Criteria:

1. Type 1 DM.
2. Patients with :
  - a) Gestational diabetes mellitus.
  - b) Fibrocalculous pancreatitis.
  - c) Pancreatitis.
  - d) Steroid induced diabetes would be excluded.
- 3) All those who had proven thyroid disorder and on treatment.

## IV. Results

1. The present study included 100 patients with type 2 diabetes mellitus. Out of 100 subjects, 53 were females and 47 were males. Age group of study participants was divided into 31-50, 51-70, 71-90 years.

Mean age (SD) = 56.13 (11.95)

Mean age (SD) among male = 56.06 (9.63)

Mean age (SD) among female = 56.2 (13.77)

The p-value for the difference in mean age between males and females was 0.959 which was statistically not significant.

2. In this study, 100 established cases of diabetes mellitus were screened for thyroid disorders by thyroid function tests. Abnormal thyroid function was found in 26 cases of T2DM and remaining diabetics had normal thyroid function. Among 26 cases low thyroid function was noted in 17 patients and 9 subjects had hyperfunctioning thyroid gland.

Out of the 17 hypothyroid subjects, 8 patients had overt hypothyroidism and 9 patients had subclinical hypothyroidism. Hyperthyroidism was noted in 9 subjects among which overt hyperthyroidism was noted in 8 patients and 1 patient had subclinical hyperthyroidism.

3. In the present study of 100 patients with type 2 diabetes, 53 were males and 47 were females. We have found that prevalence of thyroid dysfunction was more among females than in males. 10 out of 53 male patients had thyroid dysfunction whereas 16 of the 47 females were suffering from thyroid disorders.

4. 100 subjects of type 2 diabetes mellitus were classified into 3 age groups that are 31-50 years, 51-70 years and 71-90 years. It was noted that thyroid dysfunction was noted during the 2 groups between 31-70 years. None of the patients had thyroid dysfunction in the age group 71-90 years. Hypothyroidism was noted in 6 out of 37 patients in the age group of 31-50 years and 11 out of 53 patients in the age group 51-70 years. Hyperthyroidism was noted 7 out of 37 patients in the age group of 31-50 years and 2 out of 53 patients in the age group 51-70 years.

5. 100 diabetics in this study were divided into three groups according to the duration of diabetes. 51 people were in the duration of  $\leq 5$  years and 34 were 6-10 years and the remaining 15 had more than 10 years duration of diabetes.

6. In this study, out of 100 patients with type 2 diabetes, 22 patients had retinopathy confirmed by ophthalmoscopic fundus examination. 7 out of 22 patients had thyroid dysfunction and the remaining patients were euthyroid. Hypothyroidism was the most common abnormality noted. 5 out of 22 cases had hypothyroidism while remaining 2 cases were found to have hyperthyroidism.

7. In this study, out of 100 patients with type 2 diabetes 12 patients had neuropathy. 6 out of 12 patients had thyroid dysfunction and remaining patients were euthyroid. Hypothyroidism was the most common abnormality noted contributing to 5 out of 6 cases and 1 case was hyperthyroid.

8. In this study, out of 100 patients with type 2 diabetes 12 patients had nephropathy. 6 out of 12 patients had thyroid dysfunction and remaining patients were euthyroid. Hypothyroidism was the most common abnormality noted contributing to 5 out of 6 cases and 1 case was hyperthyroid.

9. HbA1c was done for all the subjects among the study group. The levels of HbA1c were divided into 3 intervals:  $\leq 8\%$ , 8.1-12.0%, and  $>12\%$ . Most cases of thyroid dysfunction (20 out of 26 cases) had HbA1c levels less than 8%.

10. In this study of 100 patients with type 2 diabetes 75 patients were treated with only OHA's for control of diabetic state whereas 23 were on Insulin and the remaining 2 on both Insulin and OHA's. 18 patients had thyroid dysfunction among 75 patients who were on OHA's and subclinical hypothyroidism was the most common abnormality noted. 8 patients had thyroid dysfunction among 23 patients who were on insulin therapy and hypothyroidism was the most common abnormality noted. Both the patients who were on dual therapy for diabetes had a euthyroid state.

11. FBS and PPBS were done for all the patients included in the study group. FBS and PPBS values were divided into intervals as shown below in table 20 and 21. 11 out of 26 patients who had thyroid dysfunction had poor control of FBS levels. 15 out of 26 patients who had thyroid dysfunction had poor control of PPBS levels.

12. Biochemical values of lipid profile, FBS, PPBS, T3, T4, and TSH were compared between type 2 diabetics with euthyroid and dysfunctional thyroid state and are depicted below.

T3 and TSH values were found to be statistically significant ( $p < 0.05$ ). The remainder of the biochemical values had no statistical significance between the two groups.

## V. Discussion

Among the endocrine-metabolic diseases, diabetes occupies the major share. India has the dubious distinction of being home to the largest number of people suffering from diabetes than any country in the world. The disease is responsible for significant mortality and morbidity due to the complications. This study was conducted at KIMS, Hubli between 2014 and 2015. Thyroid functions were studied in type 2 Diabetes Mellitus patients attending the OPD and IPD of KIMS hospital. A total of 100 type 2 diabetic patients were studied. All were confirmed diabetics who previously had fasting plasma glucose levels of  $>126$  mg/dl or RBS of  $\geq 200$  on more than one occasion and were receiving treatment such as Insulin, OHA's or physical exercise therapy. All these patients were from the rural area. Prevalence and spectrum of thyroid disorders in type 2 diabetics. In this study of 100 patients with type 2 diabetes, 53 were males and 47 were females. We have found 26 patients with thyroid disorders i.e., 26% and a number of reports have also indicated higher than normal prevalence of thyroid disorders.

Pasupathi et al in their study found that prevalence of thyroid disorder was 45% among type 2 diabetics. Hypothyroidism was present in 28% and 17% had hyperthyroidism. Udiong et al in their study from Nigeria found that prevalence of thyroid disorder was 46.5%. Hypothyroidism was present in 26.6% and 19.9% had hyperthyroidism. A prevalence of 12.3% was reported among Greek diabetic patients and 16% of Saudi patients with type 2 diabetes were found to have thyroid dysfunction.<sup>4</sup>

In Jordan, a study reported that thyroid dysfunction was present in 12.5% of type 2 diabetic patients. Perros et al demonstrated an overall prevalence of 13.4% of thyroid diseases in diabetics with the highest prevalence in type 1 female diabetics (31.4%) and lowest prevalence in type 2 male diabetics (6.9%).<sup>5</sup>

In this study out of the 26 patients with thyroid dysfunction, 8 had overt hypothyroidism, 9 had subclinical hypothyroidism, 8 had overt hyperthyroidism and 1 had subclinical hyperthyroidism.

In this study, subclinical hypothyroidism was almost equal in either sex (7.5% in males compared to 8.5% in females). Sub-clinical hypothyroidism was more common among elderly females. Hyperthyroidism was significantly more in females (13.2%) compared to males (2.1%). Subclinical hyperthyroidism was present in one male patient in our study.

Udiong et al in their study of 161 diabetic subjects, the incidence of low levels was higher in women (16.8%) than in men (9.9%), while the number with raised level was higher in males (11%) than in females (8%).<sup>41</sup> Raghuwanshi et al<sup>77</sup> in their study found that the prevalence of both clinical and subclinical hypothyroidism was more among females than in males. Many studies have shown increased incidence of sub-clinical hypothyroidism in elderly females compared to males. Hyperthyroidism was more common in males than in females.<sup>6</sup>

Laloo Demitrost et al in their study of 202 diabetics found that 139 (68.8%) are euthyroid, 33 (16.3%) have subclinical hypothyroidism, 23 (11.4%) have clinical hypothyroidism, 4 (2%) have subclinical hyperthyroidism and 3 (1.5%) are hyperthyroidism cases. Maximum patients with thyroid dysfunction were found to be hypothyroid (subclinical and clinical), 10 male patients in the subclinical, 6 in the clinical category and 23 female patients in the subclinical and 17 in the clinical category.<sup>7</sup>

The presence of both high and low levels of thyroid hormones in diabetics in this study may be due to modified TRH synthesis and release and may depend on the glycemic status of the diabetics studied. Glycemic status is influenced by insulin, which is known to modulate TRH and TSH levels. Thyroid dysfunction in diabetics in relation to age. In this study, we have found 13 (50%) each patient with thyroid disorders between the age groups of 31-50 years and 51-70 years. Laloo Demitrost et al in their study of 202 Diabetic subjects found out that most of the patients with detected thyroid dysfunction were seen in the age group of 45-64 years.

Flatau et al., have reported 38% with sub-clinical hypothyroidism after the age of 60 years. Diabetes mellitus and thyroid disorders are common in the elderly. The prevalence of hypothyroidism was 14% (9.7% in males and 18.2% in females) and that of DM was 11.5% (12.1% in males and 11.1% in females). In 74% of the diabetics, the diagnosis was made after the age of 60 years. Subclinical hypothyroidism was detected in 38% of all the hypothyroid subjects. Flatau et al., have concluded that diabetes mellitus and primary hypothyroidism are common disorders in elderly subjects. DM in the elderly can usually be handled with diet and oral hypoglycemic drugs. Since the clinical features of hypothyroidism in the elderly are often atypical, we suggest that elderly subjects should be screened for hypothyroidism.<sup>8</sup>

In this study, we have found that there is variation in the TSH levels and T3, T4 levels found in diabetics and diabetics with thyroid disorders. Patients with thyroid disorders had higher levels of TSH and T3 compared to those without thyroid disorders whereas there was no significant difference in T4 levels. Findings in our study are similar to that of Pasupathi et al and Gupta et al. Haque et al in their study found that the serum T3 and T4 concentrations were low and TSH concentrations were high in T2DM subjects. The p-value shows significant difference.<sup>9</sup>

Singh et al in their study found that level of FT3 and FT4 were significantly lower while the level of TSH was higher in T2DM as compared to non-diabetics.<sup>81</sup> The guidelines of American thyroid association<sup>82</sup> and American association of clinical endocrinology recommend serum TSH measurement as the single most relevant test to diagnose hypo and hyperthyroidism.<sup>10</sup>

## **VI. Conclusion**

Thyroid dysfunction is seen in 26% of the patients with type 2 diabetes mellitus. Subclinical hypothyroidism was the most common abnormality noted. Thyroid dysfunction was more common in females than in males. A serum TSH within euthyroid range almost always eliminates the diagnosis of hypo or hyperthyroidism. This shows that TSH is preferred screening test for thyroid dysfunction in diabetics.

One must have a strong suspicion of thyroid dysfunction in patients with uncontrolled glycemic levels and must be evaluated for the same especially in young and middle-aged diabetics with poor glycemic control.

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