

To Determine If Thyroid Function Testing Should Be Included In the Investigation Process for Type 2 Diabetes

Dr. Shivani Bansal^{1*}, Dr. Ashok Kumar², Dr. Ranjum Chaudhary³

^{1*}Professor, Department of General Medicine, Santosh Medical College & Hospital, Santosh Deemed to be University, Ghaziabad.

²Professor, Department of General Medicine, Santosh Medical College & Hospital, Santosh Deemed to be University, Ghaziabad.

³Assistant Professor, Department of General Medicine, Santosh Medical College & Hospital, Santosh Deemed to be University, Ghaziabad.

Corresponding Author: ^{1*}Dr. Shivani Bansal

ABSTRACT

Background: Abnormal thyroid hormones levels are found in diabetes mellitus. Metabolism of carbohydrates, proteins and lipids are influenced by insulin and iodo-thyronines, absence of hormones inhibits diabetes development while higher levels are diabetogenic. Excess or deficiency of Insulin and thyroid hormones results in derangement of function.

Aims & Objectives: To study if thyroid function testing should be included in the investigation process for type 2 diabetes

Methods & Materials: The Department of Medicine, Santosh Medical College and hospital, Ghaziabad on patients who will be attending the Medicine OPD of Santosh Hospital Ghaziabad. This hospital caters to all sections of society and thus the sample drawn from this hospital is a true representation of Indian population from 1st June 2019 to 31st May 2020. The study will include 500 patients with type-2 diabetes mellitus irrespective of age and both gender randomly presenting to the Santosh hospital.

Results: The age distribution of Type 2 diabetic patients is shown between 40 and 49 years, there were 97 patients, between 50 and 59 years, there were 173 patients, between 60 and 69 years, there were 146 patients, between 70 and 79 years, there were 55 patients, and between 80 and 89 years, there were 29 patients

Conclusion: The prevalence of thyroid dysfunction was studied in 500 type 2 diabetic patients at the Santosh hospital during a two-year period; sex preponderance in 170 diabetic patients with thyroid dysfunction was also identified. The significantly greater prevalence of thyroid dysfunction in patients with type 2 diabetes at 1.34 percent. There was a noticeable female preponderance in the study group, as 64% of the total number of diabetic patients were female. The greatest number of people with diabetes are between 50 and 59 years old.

Keywords: diabetes, thyroid, dysfunctions, insulin, iodo-thyronines

1. INTRODUCTION

Diabetes mellitus is defined as fasting blood sugar \geq 126 mg/dl after an eight-hour fast or (not eating anything) or by having a non-fasting glucose levels \geq 200mg/dl along with

symptoms of diabetes, or a glucose level of ≥ 200 mg/dl on a two-hour glucose tolerance test, or HbA1c $\geq 6.5\%$ (1).

Prevalence of Diabetes in India

Diabetes mellitus has an increased susceptibility in Indian population. Multiple surveys shows propensity of Diabetes mellitus among migrant Indians. Local population residing their shows a decrease rate of diabetes then migrants from India. (2).

Indian diabetes mellitus prevalence studies results were reviewed systematically using WHO standard criteria for diagnosis of diabetes. 23.28% prevalence of disease was found in urban population and 2.5% in rural dwellers. Impaired glucose tolerance higher value, in different studies, ranging from 3.6 - 9.1%, shows higher prevalence of diabetes mellitus in the coming decade (3). According to WHO, India had 69.2 million people living with diabetes in 2015. The projected figure for 2025 is 80 million and for 2035 is 108 million respectively (4).

Abnormal thyroid hormones levels are found in diabetes mellitus (17). Metabolism of carbohydrates, proteins and lipids are influenced by insulin and iodo-thyronines, absence of hormones inhibits diabetes development while higher levels are diabetogenic. Excess or deficiency of Insulin and thyroid hormones results in derangement of function (18).

Although, hypothyroidism shows wide range of changes in carbohydrate metabolism. Dyslipidemia found in type 2 diabetes is exacerbated by Sub clinical hypothyroidism and reversed by adequate thyroxin replacement, thus lowering the cardiovascular disease risk. (19). Published data on the thyroid disease in diabetes have come from inpatients, out patients or general practice, samples and there are limited longitudinal data. However, Indian studies on thyroid disorders are inadequate in type 2 diabetic patient, further such studies among diabetic population are not there in this part of country, hence, we did this study.

Diabetes mellitus is known to mankind from the prehistoric times. For much of the time, little was known about this fatal disease that caused wasting away of the body, extreme thirst and frequent urination. The knowledge of diabetes mellitus, as revealed by history, existed with the Indians since prehistoric age. The disease was known as Asrava during Vedic era (600)BC and a detailed description of it is available in Charak Samhita, Sushruta Samhita and Vagbhata. Asthanga Hridaya (600) AD is the first medical treatise in which one gets clear definition of madhumeha (diabetes mellitus) by mentioning glycosuria.

Beside genetic factors, environmental factors are of utmost importance in diabetes mellitus. These include inappropriate dietary habits, dyslipidemia, Obesity, hypertension, cigarette smoking, immune reaction, viral infections and all states that increase insulin requirement or decrease the possibility of insulin formation in the Beta- cells.

Cause

The underlying cause of diabetes mellitus is insulin deficiency which is absolute in type I diabetes mellitus and relative in type II diabetes mellitus. This may be due to variety of causes.

Near 3 to 4 weeks of gestation, the thyroid gland emerges in the foetus as an epithelial proliferation in the floor of the pharynx at the base of the tongue, between the tuberculum impar and the copula linguae, at a point later identified as the foramen cecum. Through the thyroglossal duct, the thyroid then descends in front of the pharyngeal gut as a bilobed diverticulum. In the subsequent weeks, it migrates to the neck's base. Through the thyroglossal duct, the thyroid remains attached to the tongue throughout migration.

At 18-20 weeks of gestation, the foetal hypothalamus and pituitary begin secreting thyrotropin-releasing hormones (TRH) and thyroid-stimulating hormones (TSH), while foetal production of thyroxin (T4) reaches a clinically meaningful level at 18-20 weeks (13). Until 30 weeks of gestation, foetal T3 remains low (less than 15 ng/dl), increasing to 50 ng/dl at term. The ability of the foetus to produce its own thyroid hormones protects the foetus from, for example, brain development defects caused by maternal hypothyroidism. However, premature babies can experience neurodevelopmental issues due to a deficiency in maternal thyroid hormones since their own thyroid is not properly formed to meet their postnatal needs (14).

It has been shown that sub-clinical hypothyroidism affects almost one in 20 women with type 2 diabetes mellitus. A study conducted by Ridgway et al showed the higher prevalence of undiagnosed thyroid disease among Americans especially with females being more prevalent than men. Their study showed a prevalence of 11.7% thyroid dysfunction in diabetics with 9.5% hypothyroidism and 2.2% hyperthyroidism (23). Few Indian studies are conducted to know the association of autoimmunity of thyroid with type II diabetes mellitus. Gautam et al showed two groups of population. In the first group five folds among the hypothyroid patients increased the incidence of diabetes and hypothyroidism was also five times more common in diabetic patients compared to general population.

The clinical and biochemical profiles of diabetes mellitus seen in Indian population differ considerably from those seen in western countries. They studied the prevalence of thyroid microsomal antibody and thyroglobulin antibody among insulin dependent diabetes mellitus, non- insulin dependent diabetes mellitus and controls. It showed higher prevalence of thyroid antibodies in insulin dependent diabetes mellitus patients with thyroid microsomal antibody titre being higher than thyroglobulin antibody. This study concluded that insulin dependent diabetes mellitus patients are more prone to loss of self tolerance of thyroid antigens (14).

2. MATERIALS AND METHODS

The Department of Medicine, Santosh Medical College and hospital, Ghaziabad on patients who will be attending the Medicine OPD of Santosh Hospital Ghaziabad. This hospital caters to all sections of society and thus the sample drawn from this hospital is a true representation of Indian population from 1st June 2019 to 31st May 2020. The Sample size n was calculated using this formula from open Epi: (open source Epidemiologic statistics for public health) v3.2 software.

The study will include 500 patients with type-2 diabetes mellitus irrespective of age and both gender randomly presenting to the Santosh hospital.[14-16] The diagnosis of type-2 diabetes mellitus was based on following criteria. All subjects were on diabetic diet, oral anti-diabetic agents, insulin or combined were included.

All the data thus obtained was analyzed statistically to bring out results clearly. The data was tabulated, all Tables numbered and appropriate titles given. Some of the relevant data was represented by bar charts. The arithmetic mean was calculated to get the central value of the data. Where the mean was influenced by extreme value, standard deviation was taken out and percentage was calculated.

The blood sugar will be done by glucose uptake oxidase peroxidase method. Glucose oxidase is an enzyme extracted from the growth medium of *Aspergillus Niger*. Glucose oxidase catalyse the oxidation of beta D-glucose present in the plasma to D glucono-1, 5-

lactone with the formation of hydrogen peroxide; the lactone is then slowly hydrolysed to D-gluconic acid.[17-19] The hydrogen peroxide produced is then broken down to oxygen and water by a peroxidase enzyme. Oxygen then react with an oxygen acceptor such as ortho toluidine which itself converted to a coloured compound, the amount of which can be measured by colorimetry.

The analysis was done using Statistical Package of Social Science (SPSS Version 19;

Age in years	Type 2 diabetes patients	% of Total patients
40-49	97	19.4
50-59	173	34.6
60-69	146	29.2
70-79	55	11
80-89	29	5.8
Total	500	100

Chicago Inc., USA). Statistical significance of the comparisons were done by the applying specific tests. Quantitative variables were differentiated using mean values and qualitative variables using proportions. Significance level was calculated at $P < 0.05$.

3. RESULTS

Santosh hospital Ghaziabad, we conducted the study among type2 diabetic patients to find out thyroid disorder prevalence.

Table-1: Gender distribution of type2 diabetic patients

The study was conducted on 500 randomly selected patients on type-2 diabetes mellitus of age= \geq 40 yrs. and both sex attending to the Santosh hospital as out patients. Out of 500 patients 180 were males and 320 females.

Table-2: AgeWise Distribution of Type 2 Diabetic patient

GENDER	NUMBER	% OF TOTAL PATIENT
Male	180	36
Female	320	64
TOTAL	500	100%

Following table shows the Age wise distribution of Type 2 diabetic patients between 40-49 years there were 97 patients, between 50-59 years there were 173 patients, between 60-69 years there were 146 patients, between 70-79 years there were 55 patients and between 80-89 years there were 29 patients.

4. DISCUSSION

As we know diabetes mellitus is the most common endocrinal disorder encountered by the physician in the general practice. In this study randomly we Selected 500 patients who

attended to our hospital as an out-patient and are type 2 diabetic. They represented different background of the Indian Population. Among the selected patients altered thyroid disorder are 170, having an incidence of 33.8%. [21.-22] In the study done by Smithson among United Kingdom diabetic population, the prevalence of undiagnosed thyroid disease was 5.8% and prevalence of 10.8% was seen among all the diabetic patients.

34% prevalence of thyroid dysfunction is seen in present study, with hypothyroidism being highest 19.2%, followed by subclinical hypothyroidism 11.6% and least are hyperthyroidism 3.2%. Smithson study showed 5% incidence of thyroid disorder in diabetics with 2.5% hypothyroid, 1.8% subclinical hypothyroid and 0.45% hyperthyroid. Maazozair study showed 28% incidence of thyroid disorder in diabetics with 18.8% subclinical hypothyroidism as the commonest thyroid disorder. [23-25] Surendra Kumar study showed 35.8% prevalence of thyroid disorder in diabetics with 61.9% hypothyroidism followed by sub-clinical hypothyroidism 27.3%. Thus we conclude that screening of thyroid profile among type2 diabetes mellitus patients is cost effective. Our study results were higher compared to the Smithson and Ridgway studies but equivalent to MaazOzair and surendra Kumar study. The most common thyroid dysfunction in type2 diabetes mellitus in our study was hypothyroidism.

5. CONCLUSION

The study was done in 500 patients who were type2 diabetics, at Santosh hospital for a period of 2 years showing prevalence of thyroid dysfunction, sex preponderance in 170 diabetic patients with thyroid dysfunction was also determined.

The conclusion of our study is summarized below.

1. 34% prevalence is seen in our study which is substantially higher prevalence of thyroid dysfunction in patients with type2 diabetes.
2. There was a clear cut female preponderance in the study group, the Prevalence was 64% among total number of diabetic patients.
3. Between 50-59 years of age maximum number of patients with diabetes come under this age.
4. 19.2% of the total study group patients were hypothyroidism which is maximum followed by 11.6% subclinical hypothyroidism.
5. There is female preponderance (22.8% of total study group) among diabetic patients having thyroid disorders.
6. Among the gender distribution of different types of thyroid disorders in type2 diabetes mellitus patients 72 female patients (14.4% of the total study group) had hypothyroid and 35 female patients (7% of total study group) had subclinical hypothyroid. Among males 24 (4.8% of total study group) had hypothyroidism and 23 (4.6% of study group) had subclinical hypothyroid.

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