ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

The impact of T2DM on Thyroid Profile and Outcomes in a Female Population.

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ABSTRACT

Altered autoimmunity leads to thyroid and diabetes along with genetic inheritance. In our study the prevalence and pattern of thyroid dysfunction in an Indian female population with type 2 Diabetes mellitus was assessed. Females aged 30-60 years were included for the estimation of GHbA1C , Microalbuminuria as well thyroid profile FreeT3, Free T4 and TSH. It was a hospital based cross-sectional study .The patients were coming to diabetic clinic of hospital. General biochemistry parameters were estimated on fully automated biochemistry analyzer and hormones by ELISA method. 50 patients and 50 age & sex matched controls were assessed. The correlation of thyroid profile with diabetic profile was done by SPSS software. Pearson Correlation among the various parameters was done. Free T3, Free T4, TSH, HbA1C and Microalbumin are significantly inter correlated. Correlation (2 tail) was more than 0.05 level for each correlation.Diabetes and thyroid disorders both influence each other's prognosis. Effect of Free T3, Free T4, TSH is significant on HbA1c and microalbumin and the vice versa also. The trend can be elicited in the inter relationship between thyroid profile and diabetic profile. This implicates the study in a larger population over a greater span of time.

Keywords: Diabetes, fT3, fT4,TSH, Microalbuminuraia, HbA1c.

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ISSN: 0975-8585

INTRODUCTION

Type 2 diabetes accounts for most individuals with non-autoimmune forms of diabetes. The spectacular increase in the prevalence of Type 2 Diabetes worldwide is well documented [1]. Early identification is an important tool for the management of diabetes, as insulin resistance or relative insulin deficiency may lead to diverse complications of diabetes.

Thyroid hormones play an indispensable role in various metabolic processes in the human body. Hypothyroidism and hyperthyroidism are the main clinical conditions that affect the basal metabolic rate [2]. Thyroid immunity is known to be more common in the female population. The higher incidence among females may be attributed to inhibition of disease activity by androgens and exacerbation by estrogens [3].

The influence of endocrine and non-endocrine organs other than the pancreas on diabetes mellitus is documented. Occasionally, other endocrine disorders such as abnormal thyroid hormone levels are found in diabetes [4].

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 . In chemically induced diabetic animals, the alterations in the hypothalamo-pituitary-thyroid axis in diabetic rats are numerous [5,6].

Hypothalamic and plasma TRH, pituitary and plasma TSH, as well as TSH secretion rate are all 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 also important structural changes in the thyroid gland and pituitary that are accompanied by marked alterations in their secretory activity [6].

In addition, T4 deiodination to T3 in peripheral tissues is decreased. 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 [7,8].

Iodothyronines indicate that are insulin antagonists with high levels being diabetogenic, while absence of iodothyronines inhibits the development of diabetes [9].

Thus Diabetes mellitus and thyroid diseases are the two most common endocrinopathies seen in the adult population. Excess or deficiency of either insulin or thyroid hormones can result in functional abnormalities of one another, as both of them are closely involved in cellular metabolism [10].

Possibly, thence diabetes and thyroid disorders have a propensity to appear together in patients. Patients with Type 2 Diabetes commonly display the symptoms of hypothyroidism, and symptoms of hyperthyroidism have been documented in patients with type 1 diabetes. Since there may be a link between diabetes and thyroid diseases, the

American Diabetes Association (ADA) has proposed that people with diabetes be checked for thyroid disorder [14].

Therefore, in the light of the above facts, our objectives were to find out the prevalence of thyroid dysfunction in a Type 2 Diabetes female population. An effort was made to compare and correlate these two metabolic disorders by taking into consideration various biochemical parameters.

Review of Literature

Patricia Wu stated that prevalence of thyroid disorders is high in diabetics compared with the normal population [13]. 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.

Worldwide the prevalence of diabetes for all age groups was 2.8% in 2000 and is supposed to be 4.4% in 2030. The total number of people with DM is projected to rise from 171 million in 2000 and 360 million in 2030 [1]. Thyroid disease is also common in general population. The thyroid function affected 6.6% of adults as per the Whickham surve[12].

Thyroid dysfunction is common in diabetic patients and can produce significant metabolic disturbance[6]. Therefore, regular screening for thyroid abnormalities in all diabetic patients will allow early treatment of thyroid dysfunction.

Objectives

Altered auto immunity leads to thyroid and diabetes along with genetic inheritance. So, In our study the correlation of thyroid dysfunction in a female population with Type 2 Diabetes was assessed.

MATERIALS AND METHODS

This was a Hospital record based cross sectional study conducted on diabetes patient (outpatients) of the Hospital . Entire diabetic patients are taken into the study . Type II Diabetes Mellitus patients were included and previously diagnosed Thyroid Disorders were excluded.

Data Collection

The study design and methods of thyroid disorders have been previously described, and a brief outline is presented here. The study was a population-based survey of the prevalence of thyroid dysfunction in the Type 2 Diabetes population.

Participants in the study were eligible females aged between 30-to-70 years. The biochemical parameters were body mass index (BMI), glycemic control (fasting and post prandial blood glucose levels, glycated haemoglobin A1c), and a thyroid profile (TSH, free T3, and free T4).

These parameters were measured and compared with the normal population. Outpatients with previously diagnosed type 2 diabetes (treated or untreated) will be consecutively screened at each participating centre. Previously diagnosed diabetes were historically defined as mentioned in the patients' medical records and verified during monitoring visits. Patients with known (previously diagnosed) thyroid disorders were excluded.

Patient data included demographic information, past medical history, dates of onset of hypertension and diabetes, current diabetes status (complications such as retinopathy, peripheral neuropathy, as well as CV disease, glycemic control, current therapy) were obtained. Informed consent was obtained from the subjects.

Baseline Characteristics

Baseline characteristics of all the subjects were composed by asking them to fill out the questionnaire pertaining to age, sex, and years since disease condition(s) diagnosed, family history, and complications associated with the disease and food habits. Family history and complications were graded as per the stages of the disease(s) development.

Sample collection

Fasting and postprandial blood was collected in plain blood containers under strict aseptic conditions.

Technique

ELISA is for the quantitative determination of TSH,freeT3 and freeT4(using respective ELISA KITS) in human serum. The assay is useful in the diagnosis of thyroid or pituitary disorders.

Principle

TSH- imunoenzymometric Assay

The essential reagents required for an immunoezymometric assay include high affinity and specificity antibodies (enzyme conjugated and immobilized), with different and distinct epitope recognition in excess and native antigen. In this procedure, the immobilization takes place during the assay at the surface of a micro plate well through the interaction of streptavidin coated on the well and exogenously added biotinylated monoclonal anti-TSH antibody.

Upon mixing monoclonal biotinylated antibody, the enzyme-labelled antibody and a serum containing the native antigen, reaction results between the native antigen and the antibodies, without competition or stearic hindrance, to form a soluble sandwich complex.

ISSN: 0975-8585

T4 AND T3 Analog method

The essential reagents required for a solid phase enzyme immunoassay include immobilized antibody, enzyme-antigen conjugate and native antigen. Upon mixing immobilized antibody, enzyme-antigen conjugate and a serum containing the native free antigen, a competition reaction results between the native free antigen and the enzyme-antigen conjugate for a limited number of insolubulized binding sites.

GLUCOSE : **GOD-POD method**

MICRO ALBUMIN

Latex particle coated with anti-human albumin are agglutinated when missed with samples containing micro albumin.

HbA1C

Particle enhanced immunoturbidimetric test, in which HbA1C is determined directly without measurement of total Hb.

General biochemical parameters were estimated on fully automated biochemistry analyzer and hormones by ELISA method.

OBSERVATIONS AND RESULTS

All data were expressed as mean ± SD of the number of experiments. The statistical significance was evaluated by using SPSS version 17.

Pearson correlation among the various parameters was done. TSH,HbA1c and Microalbumin are significantly inter correlated. Correlation (2 tail) was more than 0.05 level for each correlation

Table 1: Descriptive Statistical Analysis

PARAMETER	MEAN	SD
T3	3.0057	2.38521
T4	3.0104	0.44579
TSH	1.3504	0.30362
HbA1c	8.682	2.10523
URINE MIROALBUMIN	24.6652	10.14859

ISSN: 0975-8585

Fig 1 Correlation between HbA1c and TSH

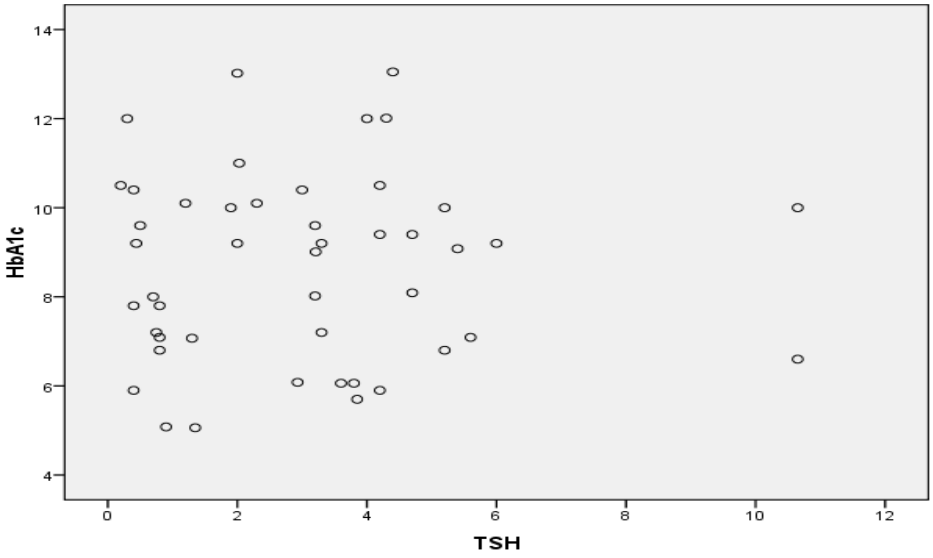


Fig 2 Correlation among Microalbumin and TSH

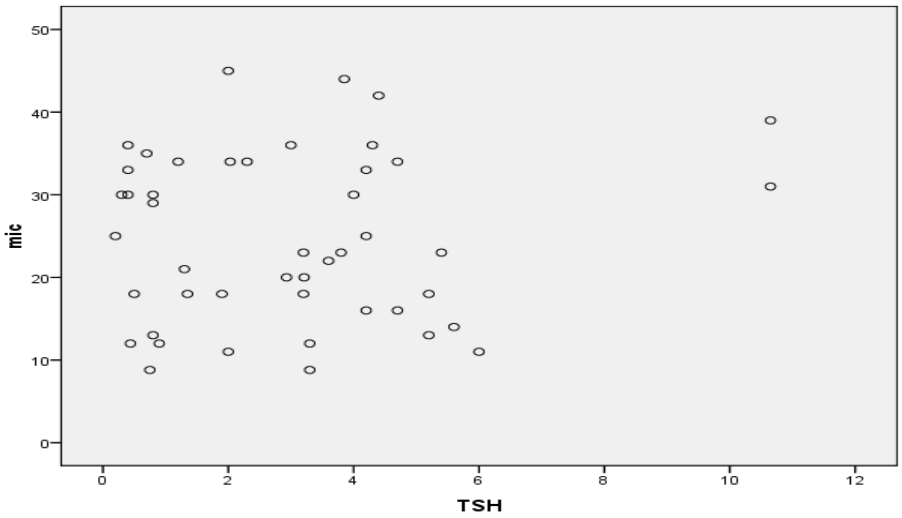
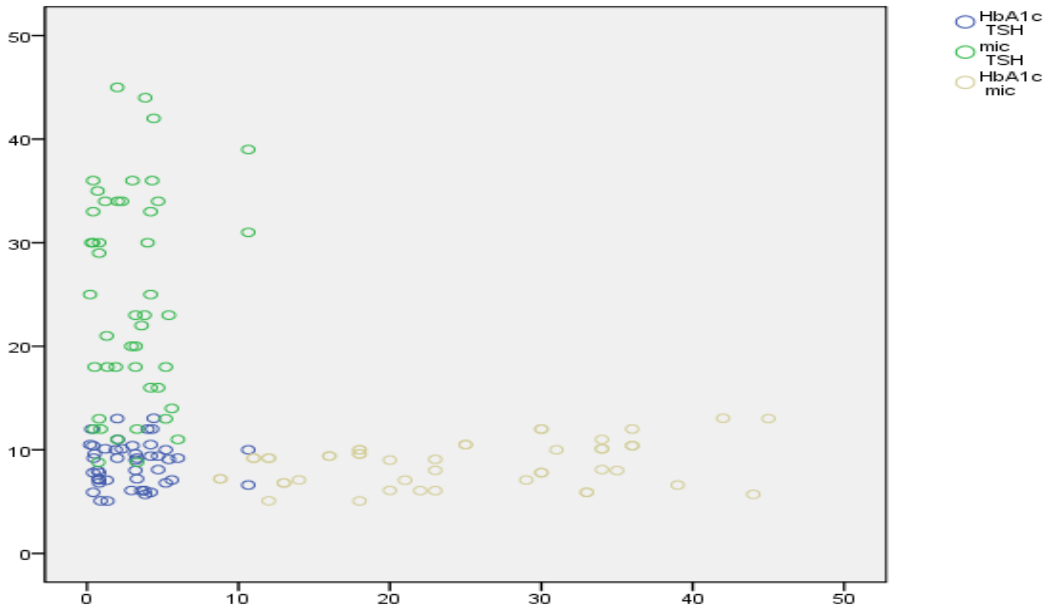


Fig 3 Correlation among HbA1c , TSH and Microalbumin



ISSN: 0975-8585

DISCUSSION

Thyroid plays prominent role in the normal functioning of the body. Its vital effects on glucose metabolism along with lipids and proteins and conversely can be affected by abnormal glucose metabolism.

Diabetes mellitus and thyroid disorders either hypothyroidism are quite common endocrinopathies seen in general population. The Prevalence of sub clinical hypothyroidism is 5.4% & clinical hypothyroidism is 4.1%, while the prevalence of sub clinical hyperthyroidism is 5.8% and the clinical hyperthyroidism is 5.1% in general population[4].

Whickham survey found that thyroid function affected 6.6% of adult[14]. A higher prevalence of abnormal TSH concentration in Type 2 diabetic patients (31%)[16]. We have to evaluate diabetics about hypothyroidism whether clinical or sub-clinical. Both the diseases compound and complement each other. Being such they lead to early and serious complications. This needs screening for thyroid disorder in diabetics.

CONCLUSION

Diabetes and thyroid disorders both influence each other's prognosis as both are due to the immunological and genetic causes. FreeT3, T4, TSH effect on HbA1c as well microalbumin and the vice versa also. Henceforth, along with early diagnosis of Diabetes mellitus, regular screening for thyroid abnormalities will allow early treatment of thyroid dysfunction. The trend can be elicited in the inter relationship between thyroid profile and diabetic profile. This implicates the study in the larger population over a greater span of time.

ACKNOWLEDGEMENTS

We acknowledge Mr.SasiGanesh, Statistician, SVMC RC for results analysis.

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