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Prevalence and Pattern of Thyroid Disorders in Diabetic Patients.

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ABSTRACT

Background: Diabetes mellitus and thyroid disorders, both involve dysfunction of the endocrine system. Studies have shown that these two diseases tend to coexist in patients. Thyroid disorders can have a major impact on glucose control and undiagnosed and untreated thyroid disorders can adversely affect the metabolic control and can further increase the risk of cardiovascular diseases. This study was done with the aim of finding the prevalence and pattern of thyroid disorders in diabetic patients. **Methods:** In this observational cross sectional study 436 diabetic patients participated, who regularly attended the outpatient clinic of the diabetes unit, Puri Hospital Sujanpur , Pathankot. All the patients first evaluated clinically but the diagnosis of thyroid disorders in diabetic patients based solely on clinical manifestations can be difficult. Poor glycemic control can produce features similar to Hyperthyroidism and sometimes can be mistaken for Hypothyroidism also. So all the patients were evaluated for thyroid function tests which included estimation of FT3, FT4, & TSH. Estimation of serum TSH is most sensitive for the diagnosis of thyroid disorders. It is most reliable and sensitive screening test for thyroid dysfunction. Presence of anti-thyroid peroxidase (TPO) antibodies were used as an indicator of autoimmune thyroid disorders. Depending on the results all the patients with thyroid disorders were classified in these four categories. 1.Clinical Hypothyroidism (C-Hypo) TSH>4.20 muI/ml, FT4<0.93ng/dl. 2.Subclinical Hypothyroidism (SC-Hypo) TSH>4.20 muI/ml , FT4 0.93-1.7ng/dl. 3.Subclinical Hyperthyroidism (SC-Hyper) TSH<0.27 muI/ml , FT4 0.93-1.7ng/dl. 4.Clinical Hyperthyroidism (C-Hyper) TSH<0.27 muI/ml, FT4>1.7ng/dl **Results:** Diabetic patients (27%) have a higher prevalence of thyroid disorders compared with the normal population (6.6%) . Out of all the thyroid disorders, Subclinical Hypothyroidism was most common (14.23%) in diabetic patients both in type 1DM & type 2 DM. Prevalence of anti TPO antibodies was 25.8% and it was more common in young women with type 1 DM compared to type 2 DM. 15.4% new cases of thyroid disease were diagnosed during laboratory evaluation. **Conclusion:** We conclude that screening for thyroid disease among patients with diabetes mellitus should be routinely performed as undiagnosed and untreated thyroid disorders can produce significant metabolic disturbances, and can further aggrevate the risk of cardiovascular diseases. A sensitive serum TSH assay is the screening test of choice. In type 1 diabetic patients, it is helpful to determine whether anti-TPO antibodies are present, if present then annual TSH screening should be done. A properly tuned thyroid can keep the body's metabolism under proper control and can greatly help people with diabetes stay healthy.

Keywords: Thyroid disorders, prevalence, anti thyroid peroxidase antibodies (anti TPO) diabetes Mellitus.

INTRODUCTION

Diabetes Mellitus and thyroid disorders both involve dysfunction of the endocrine system and both are very common in clinical practice.

International diabetes federation (IDF) has estimated that around 387 million people are living with diabetes worldwide.

The association between diabetes and thyroid disease is well known. The first studies were published in year 1997.[1]

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Therefore, several studies in different countries were conducted to estimate the prevalence of thyroid disease in diabetic patients. Some studies estimated the prevalence to be 10-24%.[2]

The thyroid is the largest gland in the endocrine system, a network that regulates important biological processes like growth, development and metabolism. The gland can produce hormones telling the body to burn energy quickly, boosting metabolism or withhold these hormones, showing the body's activity down. Like diabetes, thyroid disease is caused by the hormone imbalance, although the hormone involved are different. Thyroid disorders are typically related to either an overproduction of thyroid hormone (Hyperthyroidism) or more commonly an underproduction (Hypothyroidism).

About 7% of the population has some type of thyroid disease; it is more common in women than in men.

Function of the thyroid

Thyroid gland is a butterfly shaped gland located in the neck, just below the adam's apple and above the collarbone. It produces two hormones thyroxime (T4) and trlioclothyronine (T3) which enter the bloodstream and effect the metabolism of the heart, liver, muscles and other organs. The thyroid gland operates as part of a feedback mechanism involving the hypothalamus, an area of the brain, and the pituitary gland, which is located within the brain.

First, the hypothalamus sends a signal to the pituitary through a hormone called TRH (Thyropropin releasing hormone). The pituitary gland "monitor" the level of the thyroid hormone in the blood and increases or decreases the amount of TsH released which in their regulates the amount of thyroid hormone produced. Thyroid hormone regulates the way the body uses energy. It works by attaching to the specific proteins called receptors that are present in cell throughout the human body. Therefore thyroid hormone abstract wide-ranging effects in regulating the function of virtually every organ. So any changes in the blood cells of the thyroid hormone can effect many body systems and cause a wide range of symptoms.

The extent to which each organ is affected varies widely between individuals, which is why thyroid dysfunction causes very different symptoms in different people.

In general, the severity not produces symptoms of abnormal thyroid function depends on the severity of the actual condition, the length of time it has been present, and the person persons age. As a result, it is difficult to correctly diagnose thyroid disorder based only on symptoms. Fortunately, precise measurement of thyroid function is now possible with the TsH blood test, a test that directly measures the amount of TsH produced by the pituitary gland.

Classification of thyroid disorders

There are two basic disorders of the thyroid gland.

1) Hypothyroidism (an underactive thyroid gland)
2) Hyperthyroidism (an overactive thyroid gland.)

Hypothyroidism

This is the most common disorder of the thyroid gland. In this disorder production of thyroid hormones by thyroid gland is decreased and patients have to receive thyroxine replacement therapy. It can occur at any age and in either sex but it is most older women.

Most common cause hypothyroidism is directly iodine deficiency. It can also be caused by an inherited autoimmune condition called Hashimoto thyroidism. Hashimoto thyroiditis produces antibodies that damage the thyroid tissue, resulting in the thyroid failure. Other causes of Hypothyroidism include the surgical remove of the thyroid gland, exposure to the radiation such as radioactive iodine therapy or external radiation used to treat some forms of cancer.

Certain drugs as lithium carbonate and amiodarone can also cause hypothyroidism. The symptoms and effects of hypothyroidism can vary greatly depending on the age of the effects individual. E.g.

1. Unexplained fatigue
2. Weight gain
3. Mood swings
4. Deprevision
5. Dry skin
6. Fluid retention
7. Muscle weakness
8. Constipation
9. Infertility and miscarriage in women of reproductive age.
10. Severe growth delay and mental retardation if present in an infant, condition is known as cretinism Sleep disturbance and poor memory in elderly.

Hyperthyroidism

It is a less common than hypothyroidism. It can occur at any age but is more common in female as compared to males. (female to male ratio is 9:1)

The most common cause of hyperthyroidism in people under age 40 is graves diseases a type of autoimmune thyroid disease. In this disease, the antibodies stimulate thyroid to enlarge and overproduce thyroid hormones.

Other causes of hyperthyroidism include thyroid nodules and thyroidism.

1. Hyperthyroidism can produce symptoms like
2. Accelerated growth.
3. Hyperactivity.
4. Poor handwriting.
5. Loss of concentration.
6. Short term memory loss.
7. Irregular period in young women.
8. Hot flushes.
9. Mood swings.
10. Sweating
11. Irritability.
12. Heart rate.
13. Weight loss despite increased appetite.
14. Frequent power movements.
15. Insomnia.

Thyroid disorder and diabetes

People with diabetes, both type 1 & 2 are more prone to thyroid disease than the general population and that is of particular concern because thyroid disease can make blood glucose control more difficult in part because of its effects on meditation in the body. A pumped up metabolism from hyperthyroidism can cause diabetes and other medications to be eliminated from the body too quickly, reducing their effectiveness. So people with diabetes and Hyperthyroidism may need higher doses of insulin or oral medications with Hyperthyroidism, the opposite is medication tend to

linger n the system and there is a risk of overmedication. In diabetes that could cause low blood glucose (Hypoglycemia).
A person with one autoimmune disease is more likely to get another and this is the reason the patients with type 1 diabetes Mellitus are commonly associated with some autoimmune thyroid disorders.

Effects of thyroid disorders on diabetes control
Abnormal thyroid function may have profound effects on blood glucose control in diabetes. Both hyperthyroidism and hypothyroidism can effect the causes of diabetes but their effect are somewhat different.

Hyperthyroidism
The excessive thyroid hormone causes increased glucose production in the liver, rapid absorption of the glucose through the intestines and increased insulin resistance (a condition in which the body does not use insulin efficiently). It may be important to consider underlying thyroid disorder if a person has e=unexplained weight loss, deterioration in blood glucose control, or increased insulin requirements. Sometimes hypothyroidism may even unmask latent diabetes.
Having diabetes increase a persons risk for heart disease, and many people with diabetes have a heart condition such as cornart heart disease or heart failure. Since hypothyroidism causes rapid heart rate and increases the risk of abnormal heart rhythm, it may aisc bring on angina (chest pain), worsen heart failure or interfere with the treatment of heart failure, as well as further increase the risk of other heart problems.

Hypothyroidism
Hypothyroidism rarely causes significant in blood glucose control, although it can reduce the clearance of insulin from the bloodstreams ,so the dose of insulin may be reduced. More important, hypothyroidism is accompanied by a variety of abnormalities in blood lipid levels. the includes increased total cholesterol and LDL (low density lipoprotein or "bad") cholesterol levels, and increased trigiyceside levels .the abnormal lipid pattern typical of type2 diabetes (low HDL ,or "good cholesterol, high trigiycerides, and a high proportion of small ,dense LDL particles) is usually by hypothyroidism .these changes further raise the already high risk of cardiovascular diseases such as heart disease and strokeamong people with diabetes.

Pregnancy, diabetes and thyroid disorder
Pregnancy-relatrd thyroid dysfunction is three times more common in women within disbetesb and should be anticipated in every pregnant woman with type 1 diabetes. Postparturm thyroiditis may cause fluctuating thyroid hormone levels in the months following delivery. In addition to symptoms such as fatigue, depression (the "baby blues"), irritability, and heart palpitations, blood glucose control and insulin requirements may be affected during this period of thyroid dysfunction and profound reproductive hormonal changes. Continued monitoring of thyroid function is necessary in all women who experience postpartum thyroiditis, since roughly one-third will develop permanent hyporthyroidism within three to four years and will require thyroxine replacement.
Women who have diagnosed hypothyroidism and already take thyroxine before pregnancy often need to increase the dose of thyroxine during pregnancy. Adequate thyroxine replacement is vital for the baby's neurological development. Women with active Graves disease may enter a period of remission during pregnancy, when the disease becomes less active, but they can expect a recurrence following delivery.
If hyperthyroidism is poorly controlled during pregnancy, the risk of maternal material complications such as preeclampsia and fetal problems such as prematurity increases. The maintenance of normal thyroid function and tight blood glucose control is therefore of utmost importance during pregnancy to ensure a successful outcome.

Importance of screening
Abnormal thyroid function can have a major impact on diabetes control and increases a person's risk of developing diabetic complications because of the complications that can result from untreated thyroid disorder, regular screening is recommended to allow early detection and treatment.
This study was done with the aim of finding the prevalence and pattern of thyroid disorders in diabetic patients.

MATERIALS AND METHODS

This observational cross sectional study was conducted over a period of two and a half year in the diabetic unit of Puri Hospital, Sujanpur, Pathankot.
The inclusion criteria included were all the patients of both sexes who were diagnosed to have diabetes for more than one year.
The exclusion criteria included newly diagnosed diabetics (duration <1year) & patients with gestational diabetes.
Total 436 patients were included in the study.
The confidentiality of patients was maintained during the research. Patient's identifiers including names and hospital identification numbers were substituted by serial numbers.
Patients were diagnosed to have type 2DM when it is diagnosed with an age >30years, without insulin use in the first year after diagnosis and without history of Ketosis or Ketonuria. In type 1DM patients the diagnosis was based on typical clinical presentation,

a variable degree of weight loss, polyuria, polydypsia and polyphagia and the need to use insulin continuously since the diagnosis with discontinuation and medical follow-up for at least 1year.

Written informed consent for the study was obtained from all the patients aged. 18years or older or from the parents or guardians of the patients younger than 18years.

Measurements

- All patients were first evaluated. Clinically & following data was taken.
- Patients details including name, age, sex.
- Duration of DM (years).
- BMI
- Blood pressure (systolic and diastolic).
- Comorbidities such as hypertension, dyslipidemia.
- Presenting features of Hypothyroidism as (unexplained fatigue, weight gain, mood swings, depression, constipation, fluid retention etc).
- Presenting features of Hyperthyroidism as. Irritability, hot flushes, swelling ,weight loss despite increased appetite etc. increased Heart rate.

Diagnosis of thyroid dysfunction in diabetic patients based solely on clinical manifestations can be difficult. Poor glycemic control can produce features similar to Hyperthyroidism and sometimes can be mistaken for Hypothyroidism also. So laboratory evaluation of all the patients were done for the following parameters.

- Fasting and post prandial blood sugar level.
- Hb A1C
- Free thyroxin
- TSH
- Anti-thyroperoxidase antibody (anti-TPO)

Sample collection

Blood samples were obtained in plain vials. After a 12 hour overnight fasting and sent to laboratory for processing as per standard procedures.

TSH estimation was done on semi automatic hormone analyser (LUMAX) using chemi-luminiscence assay method.

Glucose estimation was done on semi automatic biochemistry analyser (CHEM-7) using glucose oxidase method.

Analytical method

Thyroid dysfunction was classified as

- Clinical Hypothyroidism (c-Hypo), TSH>4.2mUI/mL, FT4<0.93ng/dL
- Subclinical Hypothyroidism (sc-Hypo), TSH>4.2mUI/mL, FT4 0.93-1.7ng/dL
- Subclinical Hyperthyroidism (sc-Hyper), TSH<0.27mUI/mL, FT4-0.93-1.7ng/dL
- Clinical Hyperthyroidism (c-Hyper), TSH<0.27mUI/mL, FT4>1.7ng/dL

Statistical Analysis

Statistical analysis was done using statistical package for social sciences. Mean ± SD was determined for quantitative data and frequency for categorical variables. Independent test was performed in all continuous variables. Normal distribution of the data was checked before any t-test.

RESULTS

In this study, overall 436 patient, 47(10%) with type 1DM and 389(89.3%) with type 2DM were included. Baseline characteristics of study subjects with or without thyroid dysfunction are presented in [Table 1].

Table 1: Baseline characteristics of study subjects.

Characteristics	T1DM	T2DM
N	47	389
Gender (female)	23(48.9%)	207 (53.2%)
Age (years)	31.5±15.8	60.7±10.6
Diabetes Duration (years)	13.2±10.8	15.6±11.2
Hypertension (yes)	10(21.2%)	324 (83.2%)
Dyslipidemia (yes)	12(25.3%)	279(71.7%)
Previous thyroid disease Yes NO Unknown	 9 (19.1%) 34 (72.3%) 4 (8.5%)	 59 (15.1%) 233 (59.8%) 97 (24.9)
SBP (mmHq)	112±14	132±20
DBP (mmHq)	80±10	86± 12
FBG (mq/dl)	144±65.5	132±72.4
2hrs. PPG (mq/dl)	216±72.0	210±81.0
Hb A/C	11.6±3.1	9.2±1.8

Data are presented as mean ± SD, n (%) SBP (systolic blood pressure), DBP (diastolic blood pressure), FBG (fasting blood glucose), 2hrs PPG (2hrs postprandial glucose)

- In the present study 436 established diabetics were screened for thyroid disorders by thyroid function tests. Abnormal thyroid function was found in 10 type 1DM cases (21.2%) and 108 type 2DM cases (27.7%) and remaining diabetics had normal thyroid function. The prevalence of thyroid disorders in all diabetic patients was 27%.
- Out of 436 diabetic patients, 206 were males and 230 were females. It was found that prevalence of thyroid dysfunction was more among females than in males. 42 out of 206 male petients had thyroid dysfunction(20.3%) where 76 out of 230 females were suffering from thyroid disorders (33.0%).

Table 2: Prevalence of thyroid dysfunction in diabetic patients (n=436)

Thyroid	No. of cases	%
Normal	318	72.93
Clinical Hypothyroidism	5	1.15
Sub-clinical Hypothyroidism	62	14.23
Hyperthyroidism	51	11.69

Among 118 cases of thyroid dysfunction low thyroid function was noted in 67 patients and hyperthyroidism was noted in 51 patients. Out of 67 hypothyroid patients 5 had overt hypothyroidism and 62 had sub-clinical hypothyroidism.

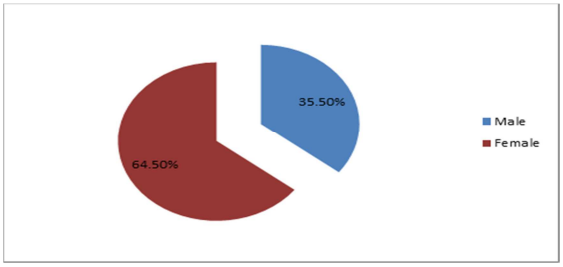

Figure 1: Sex wise distribution of thyroid dysfunction in diabetic patients [(n=118), male=42(35.5%), female =76(64.5%)]

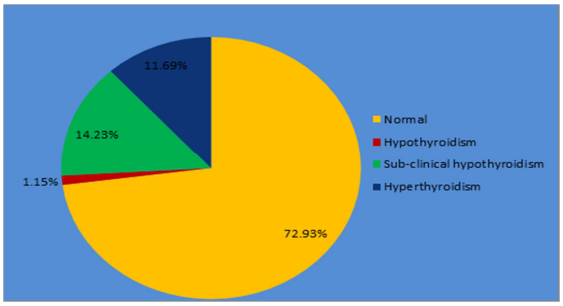

Figure 2: Prevalence of thyroid dysfunction in diabetic patients.

The spectrum of thyroid disorders varied among males and females. C hypothyroidism was present in 4 male patients where as only 1 female patients had hypothyroidism. Sun-clinical hypothyroidism was present in 14 out of male patients and 48 out of 230 females. Hypothyroidism was more among females compared to males but no statistical difference was noted.

Table 3: Sex distribution of thyroid dysfunction in diabetics.

Sex	Hypothyroidism	Sub-clinical Hypothyroidism	Hyperthyroidism	N	Total
Male	4(1.9%)	14(6.7%)	24(11.6%)	164(79.6%)	206
Fema; e	1(0.4%)	48(20.8%)	27(11.7%)	154(66.9%)	230

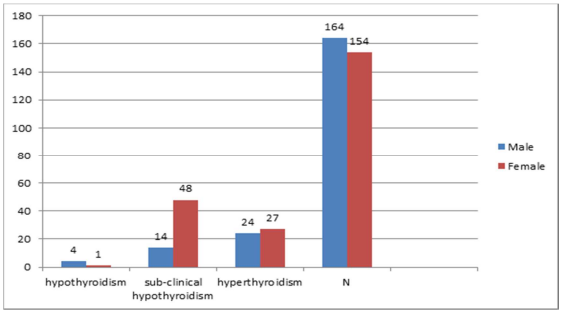

Figure 3: Sex distribution of thyroid dysfunction in diabetics.

- In the present study 126with diabetic were below the age of <60 years (adult and middle age) and 92 people were over the age of 60 years (elderly) the spectrum of thyroid disorders among this group was as follows:
  Out of 126 patients below the age of 60years. 26 had SC hypothyroidism, 5 clinical hypothyroidism and 45 of them were hyperthyroidism and out of 92 elderly people. 36 had SC hypothyroidism and 6 had hyperthyroidism. No hypothyroid cases were noted in elderly people.

Table 4: Age & Sex distribution of thyroid dysfunction in diabetics.

Male (206)					Females(230)			
Age	Hypo	Hyper	SC Hypo	N	Hypo	Hyper	Sc Hypo	N
<60	4	22	1	124	1	23	23	102
>60	0	2	13	40	0	4	25	52
Total	4	24	14	164	1	27	48	154

- It was found that sub-clinical hypothyroidism is more in elderly people with diabetes whereas hyperthyroidism was more among the adult and middle age group.
- Another fact was that sub-clinical hypothyroidism is more among females (20.8%) than males (6.7%) while hyperthyroidism showed not much difference in females (11.7%) and males (11.6%).
- We also examined the association between thyroid dysfunction and diabetic control (defined by the mean Hb A1C) in which we found that overt hypothyroidism was observed at a mean Hb A1C of 7.6± (0.5), overt hyperthyroidism at a mean Hb A1C of 7.4 (±0.5) and sub-clinical hypothyroidism at a mean Hb A1C of 7.8 (±0.7).

DISCUSSION

Diabetes is a major endocrinal metabolic disorder in india. This disease is responsible for significant mortality and morbidity due to the complications. This study was done in diabetic unit of Puri Hospital, Sujanpur, Pathankot, Punjab. A total of 436 diabetic patients were studied. All were confirmed diabetics who previously had plasma glucose levels of >126 mg/dl or RBS of >199 on more than one occasion and were receiving treatment.

This study demonstrate a 27% prevalence of thyroid dysfunction (TD) in the diabetic patients studied, which is three to four times higher than the general population. The prevalence in females was higher than the males in the study group while it is equal for both sexes in the general population.

Subclinical hypothyroidism was the most frequent dysfunction found corresponding to 14.23% of the patients which was similar to studies already

described in the literature but higher than that reported in studies with non- diabetics.[3-5]

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.

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%).

It is noted that there is a lower incidence of thyroid dysfunction in diabetics among Europeans as compared to that of Indians as per the Indian studies.

In this study sub-clinical hypothyroidism was more among females 20.8 % compared to males 6.7 %. Sub-clinical hypothyroidism was more common among elderly females, hyperthyroidism was almost equal in either sex with 11.6 % in males and 11.7 % in females. Overt hypothyroidism was present in four male patients and in one female patient in our study.

In this study we have found 32.3% patients with thyroid dysfunction over the age of 60 years compared to that of 24.6% below the age of 60 years. Sub -clinical hypothyroidism was more common in patients above 60 years.

Flatau and Trougoubof have also observed similar findings. They have reported 38% with sub-clinical hypothyroidism after the age of 60 years. Diabetes mellitus and thyroid dysfunctions are common in the elderly.

Flatau and Trougouboff 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.

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 compared to those without thyroid disorders whereas there was no much difference in T4 and T3 levels. Findings in our study are similar to that of Pasupathi et al. and Shalini Gupta et al.

The guidelines of American thyroid association and American association of clinical endocrinology recommend serum TSH measurement as single most relevant test to diagnose all forms of hypo and hyperthyroidism.

Effect of thyroid dysfunction on diabetes

It is reported that DM appears to influence thyroid function in at least two sites, one at the level of hypothalamic control of thyroid stimulating hormone (TSH) release and the other at the conversion of thyroxine (T4) to 3,5,3'- triiodothyronine (T3) in the peripheral tissues[6]. Perros et al. reported that the thyroid hormones, triiodothyronine (T3) and tetraiodothyronine (T4) are insulin antagonists that also potentiate the action of insulin indirectly. TRH synthesis decreases in diabetes, and this could be responsible for the occurrence of low thyroid hormone levels in diabetics.[7]

In the literature, it is well known that thyroid hormones directly control insulin secretion, thus affecting the control of diabetes. In hypothyroidism, there is a reduction in glucose induced insulin secretion by beta cells, and the response of beta cells to glucose or catecholamine is increased in hyperthyroidism due to increased beta cells mass. Moreover, insulin clearance is increased in thyrotoxicosis.[8,9]

The prevalence of TD in T2DM is almost comparable to that in T1DM, although the genetic links are less clear.[10,11] Therefore according to our findings we think that a routine screening for TD seems justified at least in high risk groups like patients above 50years of age particularly with suggestive symptoms, raised antibody titer, or dyslipidemia. Our finding is similar to a lot of studies done for the screening of TD in patients with DM and most of them recommended screening routinely.

Hyperthyroidism impairs glycemic control in diabetic subjects, while hypothyroidism may increase susceptibility to hypoglycaemia thus complicating diabetes management. Furthermore, it seems that unidentified thyroid dysfunction could negatively impact diabetes and its complications.

TPO antibodies and thyroid disorders

TPO antibodies was positive in 25.8% of patients and the others where negative. According to various studies , the prevalence of autoimmunity in T1 DM patients may vary between 3 and 50%.[12,13] One factor that may account for this variability could be the different laboratory methods used for the evaluation of autoimmunity.

The epidemiological study of Whickam,[14] showed that 55% of patients with elevated TSH and positive anti-thyroid antibodies progressed to clinical hypothyroidism in contrast with 33% of those who had elevated TSH and negative antibodies.

Other studies have reported higher prevalence of TPO-AB both in general population and diabetics and opined that they have a 90% negative predictive value. The association of positive TPO-Ab and future development of hypothyroidism is known. Hence this cannot be used as the diagnostic tool because of the high negative predictive value.

Dyslipidemias in diabetics and thyroid disorders

In this study we have also seen for disturbances in lipid profile in patients with thyroid dysfunction. We have noticed increased levels of triglycerides in patients with thyroid dysfunction. HDL, VLDL and Cholesterol where in normal ranges.

Pasupathi et al. in their study found that there were increased levels of HbA/C, triglycerides and VLDL-

C and reduced level of HDL-C in diabetics. In our study we have found a similar pattern of biochemical disturbances.

Diabetes has been shown to be associated with numerous thrombotic, atherosclerotic, and cardiovascular diseases. Cholesterol has been singled out as the cause of atherosclerosis. However, other lipids, such as triglycerides and phospholipids, also show similar correlations. Pasupathi et al. in his study, found levels of serum lipids to be elevated in diabetic patients. The abnormally high concentration of serum lipids in diabetes is mainly a result of the increase in mobilization of free fatty acids from peripheral depots. This happens because reduced insulin levels increase the activity of the hormone sensitive lipase. On the other hand, glucagons, catecholamines, and other hormones enhance lipolysis. The marked hyperlipedemia that characterizes the diabetic state may therefore be regarded as a consequence of the uninhibited actions of lipolytic hormones on fat depots.

In regard to the other factors examined, female gender was the only risk factor for developing thyroid dysfunction in our study, similar to the results in many other studies.[15,16]

Limitations

Some limitations of our study must be discussed. Some types of selection bias may have occurred because these patients are already under medical care. Some patients whom already had prior knowledge of their thyroid function could have some nonspecific symptoms of TD but not yet with laboratorial confirmation. They might be more interested on research. However, all patients were submitted to the same study protocol.

Other limitations of the study is that only one sample of TSH and FT4 was collected, which may have contributed to a high frequency of TD, since the phenomenon of regression to the mean was not minimized by a second sample. However, the dosage of FT4 is not always included in other prevalence studies like NHANES. The level of FT4 add a greater specificity in the detection of TD.

The strength of this study is the great number of patients (n=436)), more than described in other studies with diabetic patients mentioned previously and dosage of TSH, FT4 and anti-TPO using ultra-sensitive laboratory tests performed in all patients.

CONCLUSION

In conclusion this study showed a high prevalence of thyroid dysfunction (27%) in the diabetic population which indicates that screening for thyroid dysfunction among patients with diabetes should be routinely performed.

Sub-clinical hypothyroidism was more common than other conditions which constituted 14.23% of the thyroid dysfunction in the diabetics.

Elderly patients had higher incidence 32.3% of thyroid dysfunction.

Thyroid disorders are more in females (33%) than males (20.3%).

Patients with hyperthyroidism presented with clinical features of thyroid disorders where as hypothyroid patients did not have any signs and symptoms.

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 strong suspicion of thyroid dysfunction in patients with uncontrolled glycemic levels and must be evaluated for hyperthyroidism especially in young and middle aged diabetics with poor glycemic control.

We conclude that screening for thyroid disease among patients with diabetes mellitus should be routinely performed as undiagnosed and untreated thyroid disorders can produce significant metabolic disturbances, and can further aggrevate the risk of cardiovascular diseases.

Abbreviations

C-Hypo: Clinical hypothyroidism; C-Hyper: Clinical hyperthyroidism; DM: Diabetes mellitus; SC-Hypo: Subclinical hypothyroidism; SC-Hyper: Subclinical hyperthyroidism; TD: Thyroid disfunction; T1DM: Type 1 diabetes mellitus; T2DM: Type 2 diabetes mellitus.

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