Thyroid Profile in Diabetic Patients in a Tertiary Care Centre at Alappuzha, Kerala, India

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ABSTRACT

BACKGROUND

Diabetes mellitus is the most common endocrine metabolic disease. Thyroid disorders are the second most common endocrine disorders, there is a high chance for an individual to have both diseases. Drugs for diabetes modify thyroid gland function, so these drug interactions have to be taken into account for treatment of diabetics with thyroid disorder. We wanted to study the profile of thyroid gland dysfunction in patients with type 2 diabetes mellitus.

METHODS

A cross sectional observational study was conducted among 230 subjects attending our tertiary care centre, meeting case definition of type 2 diabetes mellitus, over a period of 18 months. A detailed history was taken, and examination was done, followed by baseline investigations, blood sugar and thyroid function tests. Data was collected in proforma, entered in Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS).

RESULTS

In the present study, 18.3 % (42) patients with type 2 diabetes mellitus had abnormal thyroid profile. The most common abnormality was subclinical hypothyroidism (66 %). 57.2 % were females and 42.8 %, males. Majority belonged to 41 - 60 yrs. age group (56.5 %). 57 % patients had family history of diabetes mellitus. 75 % were overweight and obese. The prevalence of hypertension (50.9 %) and hypercholesterolemia (31.8 %) was high.

CONCLUSIONS

Prevalence of thyroid dysfunction was found to be more among type 2 diabetics than in general population, and that too, in females. There was no significant correlation between age, type of treatment, family history, hypertension and hypercholesterolemia.

KEYWORDS

DM, Thyroid Gland Disorder

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BACKGROUND

Diabetes mellitus is the most common endocrine metabolic disease.[1] The impact of this disease on the quality of life and on morbidity and mortality is a well-known fact. Reduced secretion of insulin, impaired action of insulin or both of these are responsible for hyperglycaemia. Thyroid disorders are the second most common diseases affecting the endocrine system. A combination of diabetes and thyroid disorders is hence a common occurrence.[2] Thyroid hormones, being insulin antagonists, can directly affect the insulin secretion. Diabetes also influences thyroid function at the level of hypothalamic thyroid stimulating hormone (TSH) release and at the level of thyroid gland for conversion of T4 to T3. Regardless of glycaemic control, nocturnal TSH peak is absent in diabetes. Thyroid dysfunction impedes the glycaemic control, and must be recognised and treated at the earliest.[3]

There are 2 types of diabetes: types 1 and 2. Type 1 is primarily due to destruction of pancreatic β-cells. It is characterised by the presence of anti-GAD, anti-islet cell or anti-insulin antibodies, implying that there are autoimmune processes that have led to β-cell destruction.[4,5] Type 2 is the common form, characterised by insulin resistance and abnormal insulin secretion. They have relative insulin deficiency associated with progressive β-cell failure. The risk of developing type 2 diabetes increases with risk factors like obesity, age, physical inactivity and family history.[6] The most important risk factors for diabetes have been described as unfavourable lifestyle and diet.

Hypothyroidism is associated with reduced gluconeogenesis, slow degradation of insulin and increased sensitivity to exogenous insulin. In hyperthyroidism, pre-existing diabetes mellitus may be aggravated. Also, thyrotoxicosis itself is diabetogenic. Frank diabetes is seen in 2 - 3 %, when hyperthyroidism develops in normal individuals.

Vondra et al. in their study found that prevalence of thyroid disease in diabetic patients is 2 - 3 times higher than in non-diabetic subjects and recommended thyroid disease screening and diagnosis in patients with diabetes mellitus.[6] Chubb et al. concluded that subclinical hypothyroidism is a common but incidental finding and routine screening of thyroid function in type 2 diabetes is questionable.[7] Holl R.W. et al. in their study found that 113 patients had concurrent clinical thyroid dysfunction among a diabetic clinic population of 5,000.

There was a rapid increase in the prevalence of thyroid antibodies with advancing age, rising from 3.5 percent in patients less than 5 years up to 25.3 percent in those between 15 and 20 years.[8] Jain G et al. in their study on the evaluation for thyroid dysfunction in 200 patients of type 2 diabetes mellitus aged between 40 - 70 years, found that there was a high prevalence (16 %) of thyroid disorders in patients of type 2 diabetes mellitus, most common was subclinical hypothyroidism (7.5 %) which was further found to be more in females, elderly patients, patients with uncontrolled diabetes and patients with body mass index (BMI) > 30 and suggested that screening of thyroid dysfunction should be done in all diabetic patients especially in patients with poor diabetic control.[9]

India has the highest number of diabetics in the world and Kerala is known as the diabetic capital of India. Even though Kerala is a state with high literacy, this is not reflected in the prevalence of diabetes, which is as high as 20 %, with prediabetes at 11 %. Heart disease and thyroid disease are more prevalent among diabetics than the general population, which makes the study relevant in our population.[10,11] November 14th has been observed as the world diabetes day (WDD).[2] The objective of the study was to know the profile of thyroid dysfunction in patients with diabetes mellitus type 2.

METHODS

A hospital based cross sectional observational study was conducted from January 2018 to June 2019 (18 months) after getting ethical clearance. Patients who were attending outpatient department (OPD) and getting admitted in the wards of the Department of General Medicine, TDMC Alappuzha, with diagnosis of type II diabetes mellitus, were the study subjects. Consecutive sampling was done, including all patients with type 2 diabetes aged more than 18 years and newly detected patients attending Medicine OPD or admitted in wards irrespective of glucose control and treatment by oral hypoglycaemic agents (OHA) / insulin. Patients with type 1 DM, known thyroid disease, chronic renal failure and diabetic nephropathy, acute illness (sepsis, acute myocardial infarction, severe heart failure, recent admission in intensive care unit), hepatic dysfunction, psychiatric illness, pregnancy, patients on treatment with drugs interfering with thyroid function were excluded from the study.

Sample size

$n = 4pq/d2 = 230$

- P = 29
- Q = 71
- d can be taken as 20 % p = 6
- n = 4 x 29 x 71 / 6 x 6 = 228

Reference Study

Prevalence of thyroid disorder was 29 % in type 2 diabetes mellitus in the study by Ravishankar et al.[11]

Informed and written consent was obtained from the patients and proforma with detailed history and examination was collected. Basic laboratory investigation reports were entered in the proforma. Thyroid function tests and serum cholesterol were evaluated. Patients were diagnosed based on the American Diabetes Association (ADA) criteria for diabetes.[12] BMI was calculated based on World Health Organisation (WHO) criteria for Asian population. Thyroid hormone values were used to categorise the subjects. The data was entered into Microsoft Excel spreadsheet and

analysed using Statistical Package for the Social Sciences (SPSS) Software. The correlation of prevalence of thyroid disorder with gender distribution, age distribution, hypercholesterolemia, hypertension, family history of diabetes, body mass index were analysed using percentages and proportions. Chi-square test was used to find statistical significance (P value at < 0.05).

RESULTS

A total of 230 patients were enrolled in the study. 56.5 % were between age groups 41 - 60 years, 22.2 % of patients were under 40 years and 21.3 % were above 61 years (Figure 1). 119 (51.7 %) were males & 111 (48.3 %) were females. 131 (57 %) had history of diabetes mellitus and 99 (43 %) did not have history of diabetes mellitus. Among the cases, 169 were on OHA, 82 on insulin and 36 on both. 76 % (175) were overweight and obese whereas 23.5 % (54) had normal BMI. 113 (49.1 %) had hypertension and 73 (31.8 %) had hypercholesterolemia.

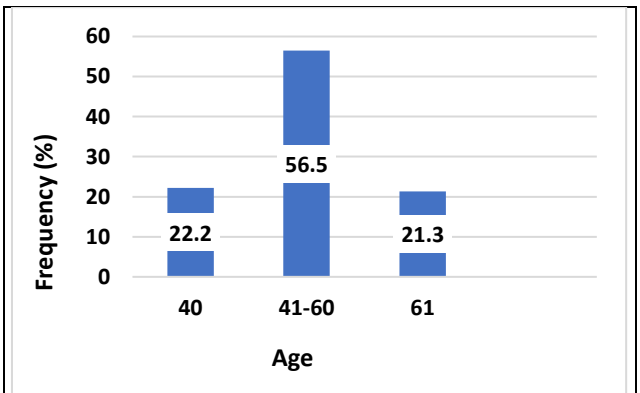

Figure 1. Age Distribution in the Study Population

Age	Thyroid Abnormality	Abnormal	Normal
≤ 40	7	44	51
41 - 60	25	105	130
> 60	10	39	49
Total	**42**	**188**	**230**

Table 1. Abnormal Thyroid Profile vs. Age Group

Chi-Square p value = 0.626

Sex	Thyroid Abnormality	Abnormal	Normal
Female	24	87	111
Male	18	101	119
Total	**42**	**188**	**230**

Table 2. Abnormal Thyroid Profile vs. Sex

Chi-Square p value = 0.043

The present study showed 12.2 % (28) with sub clinical hypothyroidism, 1.3 % (3) with sub clinical hyperthyroidism, 0.4 % (1) with overt hyperthyroidism and overt hypothyroidism in 4.3 % (10) (Figure 2). The majority (81 %; 188) had normal thyroid values (Figure 3). Among the cases, 14 (6.1 %) had low free triiodothyronine (FT3) levels, 212 (92.2 %) were normal and 4 (1.7 %) had high FT3. 9 (3.9 %) had low free thyroxine (FT4) levels and 16 (7 %) had high FT4 levels. The majority were (205; 89.1 %) normal. 4 (1.7 %) of the cases had low TSH levels, 187 (81.3 %) were normal and 39 (17 %) had high TSH levels.

Out of the 42 with abnormal thyroid profile, 10 (23.8 %) were found to be of age 61 years and above, 25 (59.5 %) were between 41 - 60 years and 7 (16.7 %) were 40 years or less (Table 1). 42.8 % (18) were males and 57.2 % (24) were females, which was statistically significant (Table 2). 54.7 % (23) were overweight and obese. Of 42 with abnormal thyroid profile, 54.7 % (23) had family history of diabetes mellitus, 54.7 % (23) had hypercholesterolemia and 57.1 % (24) had hypertension.

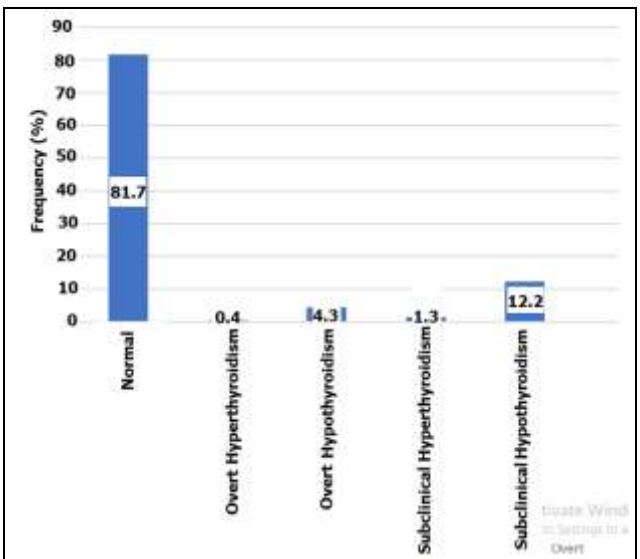

Figure 2. Thyroid Profile among Cases

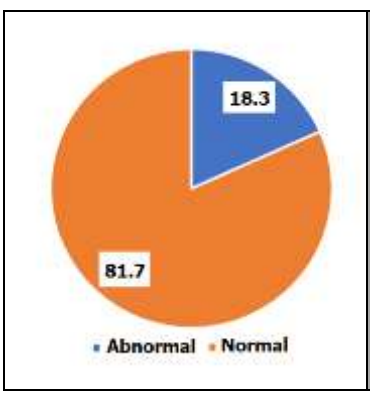

Figure 3. Thyroid Abnormality among Cases

DISCUSSION

Of the 230 cases of type 2 diabetic patients studied, 51 (22.2 %) were up to 40 years, 130 (56.5 %) were between 41 - 60 years and 49 (21.3 %) were 61 years or more. This observation is also similar to the WHO report and Kapur et al. who diagnosed maximum number of cases in the age group 40 to 59 years, with no significant difference based on gender.[13]

Of the total study subjects, 51.7 % (119) were males and 48.3 % (111) were females, sex ratio was 1.07:1. Contrary to this, Michalek et al. who reported that prevalence of diabetes was higher among women.[14] 57 % (131) of patients had family history of diabetes whereas 43 % (99) had no family history, similar to the studies by Tattersal, Fojans. Among the study population, 76 % (175 / 230) were overweight and obese; 23.5 % (54 / 230) were

normal. Mc Larty et al. and YonGik et al. reported that prevalence of impaired glucose tolerance (IGT) in subjects of all age group increased with rising BMI.[15,16]

In the present study, 169 were on OHA (73 %), 82 were on insulin and 36 were on both. 18.3 % (42) had abnormalities in thyroid profile. The present study is similar to Abdel-Rahman et al., in which 908 type 2 diabetic patients showed a prevalence of 12.5 % thyroid dysfunction out of which, 6.6 % were newly diagnosed and 5.9 % had prior knowledge of the disease; 10.3 % of patients had hypothyroidism (overt and sub clinical) and 1.7 % of patients had hyperthyroidism (overt and sub clinical).[17] Zdrojewicz et al. contradicts the findings of the present study, as they found no differences in thyroid gland function between patients with type 2 diabetes mellitus and non-diabetics. In the present study, 12.2 % (28) of the patients had sub clinical hypothyroidism and 1.3 % (3) had sub clinical hyperthyroidism.[18] Poorly controlled diabetes can lead to fluctuations in TSH and thyrotropin-releasing hormone (TRH), causing this scenario.

In the present study, 49.1 % (113 / 230) had hypertension. Tanow observed that 78 % of insulin dependent diabetes mellitus (IDDM) patients and 50 % of non-insulin-dependent diabetes (NIDDM) had hypertension. Fuller et al. observed that hypertension was highest in NIDDM patients older than 53 years.[19] Both these studies showed findings similar to the present study.

31.8 % (73 / 230) had raised total cholesterol level, showing a high incidence of dyslipidaemia in diabetics. Southwell et al. in their study found that 40 % of the diabetics had hypercholesterolaemia, supporting this finding.[20]

Among the patients with abnormal thyroid profile, 40.5 % (17 / 42) of patients were found to be of age 61 or more and 40 or less. 59.5 % (25 / 42) were of age between 41 - 60 years, but it has no significance (P = 0.626). Vondra et al. in his study found that thyroid diseases in diabetic patients is 2 - 3 times higher than in nondiabetic subjects; it raises with age and is strongly influenced by female gender and autoimmune diabetes. This contradicts with our findings.[6]

In the present study, 57.2 % (24 / 42) patients were found to be females compared to 42.8 % (18 / 42) males in the group with abnormal thyroid profile. This was statistically significant (P = 0.043). Celani et al., Abdel-Rahman et al. and Michalek et al. in their study found that the prevalence of thyroid dysfunction was significantly higher in the female than in the male diabetic patients, supporting our findings.

In the present study, 54.7 % (23 / 42) patients with abnormal thyroid profile were found to have family history of diabetes mellitus compared to 45.3 % (19 / 42) which did not. This was not statistically significant (P = 0.751). Out of 42 patients with abnormal thyroid profile, 54.7 % (23 / 42) were either overweight or obese. There was no significant correlation between BMI and abnormalities in thyroid profile (P > 0.05).

In the present study, 57.1 % (24 / 42) of patients had hypertension with abnormal thyroid profile whereas 42.9 % (18 / 42) of patients had no hypertension. This had no statistical significance (P = 0.171). The findings of our study are similar with Chubb et al. Out of 42 patients with abnormal thyroid profile, 54.7 % (23) have hypercholesterolemia, which was not statistically significant (P = 0.171) compared with normal thyroid profile group.

CONCLUSIONS

Prevalence of thyroid dysfunction was found to be more among type 2 diabetics than in general population, and that too, in females. There was no significant correlation between age, type of treatment, family history, hypertension and hypercholesterolemia. Routine screening for thyroid dysfunction among type 2 diabetics is justified.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.
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