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To Study the Prevalence of Different Forms of Thyroid Dysfunctions, Their Risk Factors and Clinical Implications in Cases of Type 2 Diabetes Mellitus, Presenting at Tertiary Care Hospital of Kumaon Region of Uttarakhand.

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ABSTRACT

Background: Diabetes mellitus and thyroid disorders are the most common endocrine disorders worldwide. Various studies have found that diabetes and thyroid disorders mutually influence each other and both disorders tend to coexist. Objective: To study the prevalence of different forms of thyroid dysfunctions, their risk factors and clinical implications in cases of type 2 diabetes mellitus. **Methods:** The study was conducted on 300 patients of Type 2 diabetes mellitus. All the patients were evaluated for thyroid dysfunction by testing thyroid profile (T3, T4 and TSH). The correlation of prevalence of thyroid disorder with gender distribution, age distribution, HbA1C, duration of diabetes, hypertension, BMI, microvascular complication and dyslipidaemia was done. The observations and interpretations were recorded and results obtained were statistically analysed. **Results:** There was a high prevalence (20%) of thyroid disorders in patients of type 2 diabetes mellitus. Most common was subclinical hypothyroidism (11.66%) which was further found to be more in females, in middle to elderly patients, less than 5 years duration and patients with normal BMI. **Conclusion:** Screening for thyroid disorders should be done in all diabetic patients. Treatment of thyroid disorder in diabetics may be beneficial for their glycemic control and prevention of progression of microvascular complication.

Keywords: Type 2 diabetes mellitus, Thyroid disorders, Hpothyroidism.

INTRODUCTION

Thyroid disorders and Diabetes Mellitus are two most common endocrinological disorders encountered in clinical practice. Diabetes and thyroid disorders have been found to mutually influence each other and association between both these conditions has long been reported. First report was published in 1979 about association between DM and TD and since then many researchers have worked over it.[1,2]

The prevalence of thyroid diseases in diabetes is significantly higher than in the general population. Thyroid disorders are more common in patients with type 1 DM due to common autoimmune origin but now there have been studies showing increased prevalence of thyroid disorders in type 2 DM as well.[3] The prevalence of thyroid disorders in patients with diabetes has been reported as 13.4%, with highest in patients with type 1 diabetes (31.4%) and lowest in patients with type 2 DM (6.8%). In addition to autoimmune link between type 1 DM and thyroid disorders, both diabetes and thyroid disease are commonly found in elderly, further contributing to the higher association.[4] The most common thyroid dysfunction in diabetics reported in most of the studies is Subclinical Hypothyroidism (4.8%).[5]

The present study was carried out to find out the prevalence of different forms of thyroid dysfunctions, their risk factors and clinical implications in cases of type2 diabetes mellitus, Presenting at tertiary care hospital of Kumaon Region of Uttarakhand.

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MATERIALS AND METHODS

The present study was carried out in the Department of General Medicine, Government Medical College

and associated Dr. Susheela Tiwari Hospital, Haldwani, Distt. Nainital, Uttarakhand. This was a cross sectional observational hospital based study in which patients were enrolled from October 2016 to September 2018. All patients fulfilling the inclusion criteria were taken from General Medicine Out Patient Department as well as In Patient Department. Type of study: Cross sectional study.DURATION OF STUDY: The study was carried out from October 2016 to September 2018. (Duration 2Years). A total 300 patients were included in this study, who were fulfilling the inclusion criteria

Inclusion criteria

1. Already diagnosed cases of type 2 DM who were under treatment (complicated/uncomplicated)
2. Newly diagnosed cases of type 2 DM

Exclusion criteria

3. Pregnancy
4. Patients taking drugs affecting thyroid function
5. Type 1 DM
6. Critically ill patients

Case definition of known diabetic

1. Patient having records fulfilling criteria for diagnosis of type 2 diabetes mellitus.
2. Patient having clinical evidence of chronic microvascular complications
3. Patient already on OHA/insulin

These patients were then evaluated for thyroid disorders.

Diagnosis of thyroid dysfunction was made according to the American Thyroid Association/American Association of Clinical Endocrinologist Guidelines:

- Subclinical hypothyroidism: a serum TSH of more than 4.5mIU/ml, in combination with a normal free T4.[12]
- Overt hypothyroidism: An elevated TSH, usually above 10 mIU/L, in combination with a subnormal free T4.[12]
- Overt Hyperthyroidism: A TSH of less than 0.01mIU/L with raised free T4.[13]
- Subclinical hyperthyroidism: A TSH of less than 0.01mIU/L with normal free T4.[13]

RESULTS

Thyroid disorders were found in 20% (60/300) of the diabetic patients (Fig. 1). Most common thyroid disorder found was subclinical hypothyroidism (11.66%) followed by hypothyroidism (7.33%) which was followed by hyperthyroidism (1%) [Table 1]. Prevalence of thyroid disorders was found to be more in females as compared to males. This difference was statistically significant. (P<0.012, S) [Table 2].

Maximum number of thyroid disorder were in age group of 41-50 yrs. This was followed by age group 51-60. Minimum number only (n=2) of patients with thyroid disorder were seen above 70 yrs of age. This was found to be statistically insignificant [Table 3]. Maximum number (n=33) of both clinical as well as subclinical hypothyroidism had less than 5 years of duration, This was followed by 5-10, 10-15 years respectively. Only n=2 patients were having duration of diabtes more than15 years. On statistical analysis this difference was found to be statistically insignificant (P>0.561, NS)

Maximum number of patients having HbA1c in between 7.1-8. Apperently it is a inverse relation between HbA1c value and number of patients of thyroid disorder was observed (figure 2).This relation was found to be statistically signifinat. Maximum number n= 23 patients (38.33%) with thyroid dysfunction in the study group had normal BMI.Twenty n=20 patients (33.33%) were overweight, n=12 patients (20%) were obese. while only 5 patients (8.33%) were underweight. This was not found to be Statistically Significant.e (P>0.621, NS)

Dyslipidemia was present in (43.33%) of patients with thyroid dysfunction while (26.26%) of euthyroid patients had abnormal lipid profile.This difference between the presence of dyslipidemia in the euthyroid and thyroid dysfunction group was found to be statistically significant. (P<0.001, S)Hypertension was seen in (37.91%) of euthyroid patients while (35%) of those with thyroid dysfunction were hypertensive. This was not significant statistically. (P>0.601 NS).

All microvascular complication nephropathy, retinopathy and neuropathy was seen in greater percentage of patients with thyroid dysfunction as compared to euthyroid patients. All these microvascular complication on statistical analysis was found to be significant.

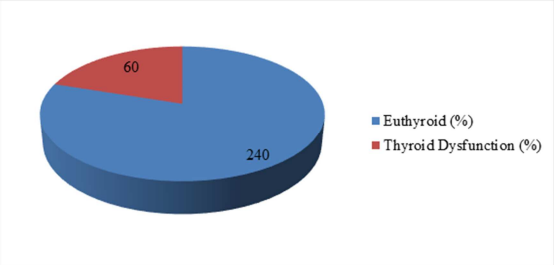

Figure 1: Showing prevalence of thyroid dysfunction in the study group

Table 1: Prevalence of various thyroid dysfunction in the study group.

Thyroid status	Number	Percentage
Euthyroid	240	80%
SCH	35	11.66%
Overt hypothyroid	22	7.33%
Hyperthyroid	3	1%

Table 2: Distribution of thyroid dysfunction according to gender.

Thyroid dysfunction	Male	Female
Present	23	37
Absent	115	125
Total	138	162

Chi-squire = 1.77, d.f. 1, p < 0.012

Table 3: Showing agewise distribution of patients having thyroid dysfunction.

Age (Yrs)	Thyroid Dysfunction (N=60)	Percentage
30-40	12	20
41-50	23	38.33
51-60	16	26.66
61-70	7	11.66
>70	2	3.33
Total	60	100

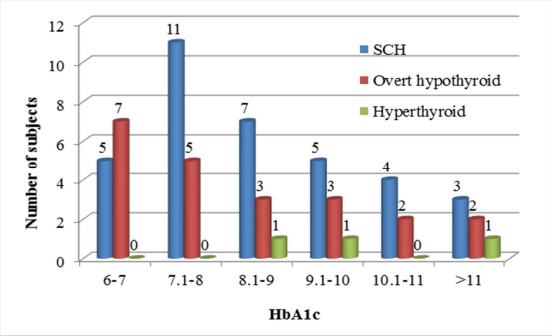

Figure 2: Showing correlation between HbA1c and thyroid disorder.

DISCUSSION

Prevalence of thyroid dysfunction

In the present study conducted on 300 Type 2 DM patients the prevalence of thyroid dysfunction was found to be 20% (n=60).Maximum load 57(19%) was contributed by SCH 35(11.66%) and Overt hypothyroid 22(7.33%).Only 1% patients (n=3) had hyperthyroidism.

Our results were comparable to the prevalence reported by Anil et al (2017), Khan Nz et al(2017), Khurana A et al (2016),Palma et al (2013),Jain et al(2016). In their study the prevalence of thyroid dysfunction was 24%, 23%, 16%, 14.7% and 13.7% respectively.[18,21,23-25]

In cases of thyroid dysfunctions maximum prevalence was found to be of subclinical hypothyroidism i.e 35 (11.66%) patients. Our results are in concordance with the results of Perros et al, Celani et al, Nobre et al, Babu et al and Radaiedeh et al.[5,8,11,17,20] Similarly Radaideh et al and Celani et al in their respective studies found subclinical hypothyroidism as the most common form of individual thyroid disorder.[8,11]

In the present study, overt hypothyroidism was found to be the second most common form of thyroid dysfunction in type 2 diabetes mellitus patients. Similar results were reported by Singh et al, Akbar et al who in their respective studies on type 2 diabetics also found overt hypothyroidism as the second most common form of thyroid disorder.[7,10]

The author suggest that the high prevalence of subclinical hypothyroidism was probably due to public awareness and easy availability of thyroid function test at door level.Whatever the difference may be in various studies, one fact was common in all that there is tendency of hypothyroid (overt and subclinical) in diabetic patients.

In the present study thyroid dysfunction was found to be more common in females 37 (22.84%) as compared to males 23 (16.66%). This difference in prevalence with respect to gender, on statistical analysis, was found to be significant (p<0.012,S). Khurana et al found the prevalence of thyroid disorders more in females as compared to males (71.87% vs 28.12%). This was statistically significant (p < 0.05). [18]Our results were also similar with studies of Vondra et al, Babu et al, Anil et al.[19-21]

Age & thyroid dysfunction

In our study the maximum number of hypothyroidism (SCH and Overt hypothyroid) were in the age group of 40-60 yrs n=37 (61.66%). Anil kumar et al had maximum number of hypothyroidism (13.1%) in the age group 46-54 years. They reported less affected (7.5%) thyroid disorder in younger age 18-35years.[21,22] Similarly, in our study we also had only 12 (20%) cases in age group of 30-40 years. In advanced age at more than 70 years only 1 case of both SCH and Overt hypothyroid was seen.

The results of our study are not in correlation with the previous studies of Khurana A. et al, Feely et al, Vondra et al. They found high prevalence of thyroid disorders in diabetic patients with advancing age.[1,18,19]

Duration of diabetes & thyroid dysfunction

In the present study,out of 60 diabetic patients who had thyroid disorders, the maximum number of patients 33 (55%) had duration of diabetes 1 - 5 years. Fifteen (25%) had duration of diabetes 5.1 - 10 years and 7(11.66%) had duration of diabetes more than 10 years. Only 3(5%) patients of thyroid dysfunction were seen in recently diagnosed type 2 diabetes mellitus. Only 2(3.33) case of thyroid dysfunction had duration of diabetes more than 15 years.This difference was not statistically significant (p > 0.561,NS). Although apparently it looked that very small and long duration of diabetes has low affinity with thyroid disorder but this was not statistically established.Our results are in concordance with Khurana A. et al. They had (46.87%) patients of thyroid disorder in 5 years of duration of diabetes.[18]

Thyroid disorder and glycosylated hemoglobin (hba1c)

The maximum number 28 (46.66%) of thyroid disorder had HbA1c from 6-8%. All these patients were having hypothyroid (overt or subclinical). We

found that increase of HbA1c,reduces number of cases of hypothyroid. Ardekani et al (2009) reported a higher mean HbA1c in diabetics with thyroid disease (8.90±1.99%) as compared to euthyroid diabetics (7.11 ± 1.99%).[16] Diez et al(2010) also found a higher mean HbA1c of patients having thyroid dysfunction as compared to the euthyroid group.[14] Both these studies had no statistically significance. Our study revealed an inverse correlation between HbA1c level and thyroid dysfunction. This was opposite in contrast to other studies.

Body mass index

Despite the popular belief that hypothyroid causes obesity only modest increase in weight is seen with hypothyroid.Similarly in our study the maximum diabetic patients had normal BMI.In the present study the mean BMI in the thyroid dysfunction subgroup came out to be 28.29±8.17kg/m2, which was higher than the mean BMI of the euthyroid subgroup (25.80±5.89kg/m2). This was not statistically significant (p>0.618, NS).

Yang et al reported BMI of 24.8±3.6kg/m2 in subclinical hypothyroid group and 24.6 ± 3.4 kg/m2 in euthyroid group. Kim et al also reported a higher BMI in the subclinical hypothyroid group (24.1 ± 3.2 kg/m2) as compared to the euthyroid group (24.8 ± 3.9 kg/m2) . Both of these studies did not shown any statistical significant correlation.[6,15]

Dyslipidemia and thyroid dysfunction

In the present study dyslipidemia was found in higher percentage of diabetics with thyroid dysfunction i.e. 43.33% (n=26) than diabetics without thyroid dysfunction, i.e. 26.67%(n=64). This higher prevalence of dyslipidemia in diabetics with thyroid dysfunction as compared to euthyroid diabetics was found to be statistically significant (p<0.001, S).

Our results were similar to those reported by Papazafiropoulou et al (2010) who also found dyslipidemia more commonly present in diabetics with thyroid dysfunction (52.2%) as compared to diabetics with normal thyroid function (45.8%).This was statistically significant.[9]

Nobre et al and Khurana as et al found no significant difference between lipid profile of euthyroid patients and patients having thyroid disorders in type 2 diabetes mellitus.[17,18]

Hypertension & thyroid dysfunction

Out of 60 patients who had thyroid disorders, 21 (35%) had hypertension and 39 (65%) were normotensive. It was also seen that 91 (37.91%) euthyroid diabetics had hypertension. So apparently it seemed that hypertension was more common in euthyroid diabetics as compared to diabetics with some form of thyroid dysfunction. This was not found to be statistical significant. Our results were in corcordance with Khurana A et al who also found that there was no significant association of hypertension and presence of thyroid dysfunction in diabetic patients.[18]

Microvascular complications & thyroid dysfunction

In the present study, 44 (73.33%) patients of type 2 diabetes mellitus with thyroid dysfunctions were found with microvascular complication i.e.nephropathy 13 (21.66%), retinopathy 14 (23.33%), neuropathy 17 (28.33%). Greater prevalence of nephropathy in diabetics with thyroid dysfunction was seen as compared to euthyroid diabetics. This was found to be statistically significant (p=0.003). Kim et al (2011) did not find any statistically significant difference in presence of diabetic nephropathy in euthyroid and sub clinical hypothyroid diabetics (p= 0.0281).[15]

Greater prevalence of retinopathy in diabetics with thyroid dysfunction was seen as compared to euthyroid diabetics. This was found to be statistically significant (p=0.014, S). Our results were similar to those of Yang et al (2010) and Kim et al(2011), both of whom found statistically significant higher prevalence of diabetic retinopathy in subclinical hypothyroid diabetics as compared to euthyroid diabetics (p=0.011 and p=0.036 respectively).[6,15]

All microvascular complications were significantly higher in diabetics with thyroid dysfunction in our study.

CONCLUSION

Our study showed a high prevalence of thyroid dysfunction in patients with type 2 diabetes mellitus. A large variation in prevalence of thyroid dysfunction from (10.8% - 46.5%) in various studies was seen. Screening for thyroid disorders should be done in all diabetic patients. Treatment of thyroid disorder in diabetics may be beneficial for their glycemic control and prevention of progression of microvascular complication.

The limitation of our study was that, the present study was a cross sectional study .A case control study would be a better method to find relation between diabetes mellitus and thyroid disorder. The aetiology of thyroid disorder was not fully evaluated. Correlation between various thyroid disorders and diabetes may suggest some common pathogenesis of both diabetes and thyroid disorder.

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