

Thyroid Disease in Diabetes Mellitus

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A variety of thyroid abnormalities may co-exist and interact with diabetes mellitus. In this study, we aimed to examine the frequency of thyroid disease in patients with diabetes mellitus and the relation between goiter and antidiabetic treatment.

820 patients with diabetes mellitus (507 females and 313 males, age $54,3 \pm 0,4$ years) were evaluated retrospectively. Age, sex, duration of diabetes mellitus, type of treatment, duration of treatment with oral antidiabetic drugs, thyroid morphology, thyroid function, duration of thyroid disease and their relations were examined.

Thyroid dysfunction was found in 20 patients of whom 11 were hyperthyroid (1,3 %) and 9 hypothyroid (1,1 %). Also, thyroid morphology was found abnormal in 120 patients of whom 37 had diffuse goiter (4,5 %), 24 solitary nodule (2,9 %), 47 multinodular goiter (5,7 %) and 12 patients had thyroidectomy (1,4 %). There was no difference in thyroid function and morphology between groups that were treated with diet only, oral antidiabetic drugs and insulin.

When compared with epidemiological studies, the results were similar. So, it was thought that there is no increase in goiter prevalence in diabetes mellitus.

KEY WORDS Diabetes mellitus, Thyroid

Introduction

A variety of thyroid abnormalities may co-exist and interact with diabetes mellitus. The reported frequency of hyperthyroidism and hypothyroidism in patients with diabetes has varied from 3,2 % to 4,6 % and 0,7 % to 4,0 % respectively (1). Diabetes mellitus 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 (T_4) to 3,5,3'-triiodothyronine (T_3) in the peripheral tissue (2,3). Alterations in thyroid hormones indicates the characteristics of "low T_3 " syndrome. Marked hyperglycemia decreases the activity and concentration of hepatic T_4 -5' deiodinase. The characteristic findings include low serum concentrations of T_3 , elevated levels of reverse T_3 (rT_3) and low, normal, or high levels of T_4 . The values return to normal after correction of hyperglycemia (3,4).

When hyperthyroidism is also present in a patient with poorly controlled diabetes, the total and even free T_4 and T_3 concentrations may be inappropriately normal, in which case the diagnosis would be difficult. A suppressed serum basal TSH or an absolutely flat response to TRH would support the diagnosis. In the cases of this type that have been described, serum thyroid hormones rose to hyperthyroid levels with treatment of the diabetes, and the diagnosis became clear (5). So, the presence of hyperthyroidism should be suspected in diabetic patients with or without thyroid enlargement in the presence of unexplained weight loss, supraventricular tachycardia, increased body warmth, heat intolerance, tremor, unexplained increase in insulin requirement, ketoacidosis, instability of the diabetes or prior symptoms of hyperthyroidism (6).

Although it is difficult to evaluate the prevalence of goiter in diabetics, studies have shown results from 3,4 % to 17 % (6). Also, the effect of treatment, particularly goitrogenic effect of sulfonylureas may be important when evaluating the frequency of goiter in diabetes mellitus (1,7).

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In this study we aimed to examine the frequency of thyroid disease in patients with diabetes mellitus and the relation between goiter and antidiabetic treatment. And also we aimed to ascertain whether patients with diabetes mellitus should be screened routinely for evidence of thyroid dysfunction and goiter or not.

Materials and Methods

820 patients with diabetes mellitus (507 females and 313 males, age 54.3 ± 0.4 years) that have been followed in the Department of Endocrinology and Metabolism of the Osmangazi University Medical Faculty were evaluated with respect to thyroid disease.

Age, sex, duration of diabetes mellitus, type of treatment, duration of treatment with oral antidiabetic drugs, thyroid morphology, thyroid function, duration of thyroid disease and their relations were examined. Thyroid morphology was examined with palpation in all patients and with ultrasonography if there was goiter or any doubt. Particularly, TSH levels were taken into consideration to evaluate thyroid function and if there was any suspicion, TRH test was performed.

Statistical analyses were performed using the t test, paired t test, χ^2 test and Pearson product correlation. All laboratory data are expressed as mean \pm SEM.

Results

820 diabetic patients were examined and the association of diabetes mellitus and thyroid dysfunction

was found in 20 patients (19 females, 1 male) of whom 11 were hyperthyroid (1,3 %) and 9 hypothyroid (1,1 %). Also, thyroid morphology was found abnormal in 120 patients (99 females 21 males) of whom 37 had diffuse goiter (4,5 %), 24 solitary nodule (2,9 %), 47 multinodular goiter (5,7 %) and 12 patients had thyroidectomy (1,4 %). Thyroid dysfunction ($p < 0.01$) and thyroid morphology abnormality ($p < 0.001$) was found to be more frequent in women (Table 1).

There was no difference in thyroid function and morphology between groups that were treated with diet only, oral antidiabetic drugs or insulin (Table 2).

In 75 patients (62,5 %) diabetes appeared before the thyroid disease, in 21 patients (17,5 %) after thyroid disease and in 24 patients (20,0 %) the onset was simultaneous (Table 3).

Discussion

There is little reliable information on the prevalence of hyperthyroidism and hypothyroidism in the community. The incidence of hypothyroidism in different communities has varied from 0,6 % to 1,5 % (1). As discussed above, frequency of hypothyroidism in patients with diabetes mellitus has been reported as 0,7 % to 4 %, hyperthyroidism has varied from 3,2 % to 4,6 % and dysfunction of the hypothalamo -hypophysial- thyroid axis is considered to be involved in abnormal thyroid function in diabetic patients. In our study, hyperthyroidism was found to be 1,5 % and hypothyroidism 1,1 %.

To evaluate the prevalence of goiter in diabetics is difficult, because, the region from which the

Table 1. Distribution of thyroid morphology and functions in diabetic patients.

	All patients	Female (61.83)	Male (38.17)	p
Age (year)	54.3 \pm 0.4	53.6 \pm 0.6	55.5 \pm 0.7	> 0.05
Duration of diabetes mellitus (year)	8.9 \pm 0.2	8.7 \pm 0.3	9.2 \pm 0.4	> 0.05
Duration of thyroid disease (year)	4.4 \pm 0.7	5.1 \pm 0.8	1.3 \pm 0.5	< 0.05*
Morphology	Normal	700 (85.37 %)	408	292
	Diffuse goiter	37 (4.51 %)	29	8
	Solitary nodule	24 (2.93 %)	20	4
	Multinodular goiter	47 (5.73 %)	41	6
	Thyroidectomy	12 (1.46 %)	9	3
Function	Euthyroid	800 (97.56 %)	488	312
	Hyperthyroid	11 (1.34 %)	11	0
	Hypothyroid	9 (1.10 %)	8	1

Table 2. Distribution of thyroid morphology and functions in diabetic patients according to treatment.

	1. Diet	2. OAD	3. Insulin	p
Age (year)	51.5±1.3	56.7±0.5	52.2±0.8	2-1,3 p< 0.001***
Duration of diabetes mellitus (year)	3.3±0.3	8.2±0.3	11.7±0.4	1-2-3 p< 0.001***
Duration of thyroid disease (year)	9.6±0.5	3.3±0.7	4.4±1.0	1-2,3 p< 0.01**
Morphology	Normal	85	328	p>0.05
	Diffuse goiter	6	19	
	Solitary nodule	3	12	
	Multinodular goiter	5	26	
	Thyroidectomy	1	7	
Function	Euthyroid	96	382	p>0.05
	Hyperthyroid	2	6	
	Hypothyroid	2	3	

Table 3. Time relations between diagnosis of DM and thyroid disease in diabetic patients with goiter.

	1. Thyroid disease before DM	2. Simultaneous	3. Thyroid disease after DM	p (1-3)
Female	19 (19.19 %)	16 (16.16 %)	64 (64.64 %)	< 0.001***
Male	2 (9.52 %)	8 (38.09 %)	11 (52.38 %)	< 0.01**
All patients	21 (17.50 %)	24 (20.00 %)	75 (62.50 %)	< 0.01**

patient came must be considered when evaluating the prevalence of goiter (6). The definition of iodine-deficient goiter endemia is based on the measurement of urinary iodine excretion and the prevalence of goiter in a population; the region is considered endemic when more than 10 % of the residing population has thyroid enlargement (8). Studies have shown that Eskişehir is one of the iodine - deficient goiter endemic areas. The iodine content of the drinking waters was found low (9,10). Also, the prevalence of goiter was found high to 34 % in epidemiological studies in our region (11,12). In the study that included 839 persons (575 females and 264 males) the prevalence of goiter was found to be 28 % in females, 9 % in males and 18,5 % in all patients (13).

The prevalence of goiter in diabetics seems high when our study is evaluated alone. But, when compared with epidemiological studies, the results appeared similar. So, it was thought that there is no increase in goiter prevalence in diabetes mellitus.

On the other hand, this opinion is not supported by the results which show that patients in whom diabetes appeared before the thyroid disease are more numerous than patients in whom diabetes appeared after thyroid disease.

Many investigators reported that treatment of diabetes with sulfonylureas led to an increased incidence of goiter and hypothyroidism (1,7). But, in this study, there was no difference in thyroid function and morphology between patients that underwent different treatment programs. However, the difficulties of retrospective study must be regarded when evaluating the discordant results.

Although the thyroid dysfunction and goiter incidence in diabetic and non-diabetic patients seems similar, we suggest that it may be useful to evaluate diabetic patients for thyroid enlargement and dysfunction (at least with palpation and TSH) because of the high ratios.

References

1. Sugrue DD, Mc Evoy M, Drury MI. Thyroid disease in diabetics. *Postgrad Med J* **58(865)**: 680-684, 1982.
2. Castells S. Thyroid function in juvenile diabetes. *Pediatr Clin North Am* **31(3)**: 623-634, 1984.
3. Shah SN. Thyroid disease in diabetes mellitus. *J Assoc Physicians India* **32(12)**: 1057-1059, 1984.
4. Gilani BB, Mac Gillivray MH, Voorhess ML, Mills BJ, Riley WJ, Mac Laren NK. Thyroid hormone abnormalities at diagnosis of insulin-dependent diabetes mellitus in children. *J Pediatr* **105(2)**: 218-222, 1984.
5. Cavalieri RR. The effects of nonthyroid disease and drugs on thyroid function tests. *Medical Clinics of North America* **75(1)**: 27-39, 1991.
6. Kozak GP, Coopan R. Diabetes and other endocrinologic disorders. Joslin's Diabetes Mellitus 12. edition (Ed: Marble A, Krall LP, Bradley RF, Christleb AR, Soeldner JS). Philadelphia, Lea & Febiger, 1985, 784-816.
7. Thyroid disease in young diabetics (editorial). *Lancet* **1 (8284)**:1285-1286, 1982.
8. Vitti P, Martino E, Aghini - Lombardi F, Rago T, Antonangeli L, Maccherini D, Nanni P, Laviselli A, Balestrieri A, Araneo G, Pinchera A. Thyroid volume measurement by ultrasound in children as a tool for the assessment of mild iodine deficiency. *J Clin Endocrinol Metab* **79**: 600-603, 1994.
9. Urgancıoğlu İ, Hatemi HH, Kökoğlu E, Güven Y, Sür N, Yılmaz O. Iodine determination in drinking water samples of Turkey: In relation to the endemic goiter problem. İstanbul, Nazım Terzioğlu Matematik Araştırma Merkezi Baskı Atölyesi, 1982, 1-16.
10. Hatemi HH, Urgancıoğlu İ. Türkiye'de endemik guatr ve iyod eksikliği. *Endokrinolojide Yönelişler*. 5: 19-21, 1992.
11. Yılmaz O, Uslu İ. Cerrahpaşa Tıp Fakültesi Endemik Guatr Taramaları (T.T.: 55-80). İstanbul 1986, 9-13.
12. Ersoy G, Uslu İ, Hatemi HH, Urgancıoğlu İ. Cerrahpaşa Tıp Fakültesi Endemik Guatr Taramaları (T.T.: 33-54). İstanbul, 1985,10.
13. Akıncı TD, Hatemi HH, Berkarda B. Cerrahpaşa Tıp Fakültesi Toplum Hekimliği Merkezi Toplum Sağlığı Taramaları. İstanbul, 1984, 30-31.