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Thyroid Dysfunction in Newly Diagnosed Type 1 Diabetic Children

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Abstract: Thyroid disease may affect diabetes management. The aim of this study, was to investigate the prevalence of thyroid dysfunction among children and adolescents with newly diagnosed type I diabetes in Iran. A case-control study was done between March 2005 to August 2008 in the pediatric ward of a tertiary Hospital, Ahwaz, Iran. In words 75 consecutive newly diagnosed type 1 subjects were selected and were compared with 105 healthy control children. Physical examination for signs of thyroid dysfunction and estimation of thyroid size by using palpation were performed and TSH and T3 and T4 were measured to evaluate prevalence of thyroid dysfunction. Prevalence of thyroid dysfunction in diabetics was 14.6%; of them 9.3% were subclinical hypothyroidism, 4% hypothyroidism and 1.3% subclinical hyperthyroidism, which were higher than normal controls. Goiter prevalence by palpation was the same in both groups. Because of higher prevalence of thyroid dysfunction in newly diagnosed type 1 diabetes than in controls, we confirm the recommendation that thyroid testing be done at diagnosis and routinely in children and adolescents with type I diabetes.

Key words: Diabetes type 1, thyroid dysfunction, subclinical hypothyroidism, subclinical hyperthyroidism

INTRODUCTION

Insulin Dependent Diabetes Mellitus (IDDM) is associated with other autoimmune diseases, especially thyroid disorders (Riley, 1981).

Prevalence of thyroid autoimmunity in children and adolescents with type I diabetes has been reported between 3.9 and 50% in various studies (Burek, 1990; Lorini, 1996; Lindberg, 1997) and they include Hashimoto thyroiditis and Graves disease (Lorini, 1996; Roldan, 1999; Pearce, 2003).

Early detection of thyroid autoimmunity or disease in children is important, because of its progression to subclinical hypothyroidism in 11% and overt hypothyroidism in 3% of them (Pearce, 2003).

To decrease unfavorable outcomes in children with diabetes, subclinical hypothyroidism should be diagnosed early and treatment started promptly. Moreover, early treatment in these patients reduces the risk of hyperlipidemia and atherosclerotic heart disease in future (Mohn, 2002; Taddei, 2003; Gonzalez, 2007).

Because of differences in ethnic groups, geographic location and iodine intake are various parameters that affect thyroid function and because most of previous studies focused on well established and chronic disease we decided to investigate the prevalence of thyroid dysfunction especially subclinical hypothyroidism among newly diagnosed children and adolescents with type I diabetes in Ahwaz city, Iran.

MATERIALS AND METHODS

In a case-control study during March 2005 to August 2008, 75 consecutive newly diagnosed children and adolescents with type I diabetes (cases) were selected from pediatric ward of a tertiary Hospital, Ahwaz, Iran and were matched for age and sex with 105 healthy children and adolescents with the same sociodemographic features as control group.

None of subjects with diabetes were in ketoacidosis and they were tested for thyroid dysfunction immediately after glycemic control following diagnosis. Controls were subjects who were presented for routine check-up and after explanation about purpose of research Informed consents were obtained from the parents of all children and adolescents before entry to the study.

None of the cases or controls was receiving any drug affecting thyroid function and children with history of autoimmune thyroid diseases in family or history of previous thyroid disorders were excluded. Blood glucose of diabetes subjects was controlled at the time of blood sampling according to the level of HBA1c. A

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questionnaire related to demographic information was completed for each participant. All patients and controls underwent a physical examination for signs of thyroid dysfunction and estimation of thyroid size by palpation. Thyroid size was classified according to the WHO into grade 0, not palpable; 1, palpable but not visible and 2, visible goiter. Clinical examinations were performed by the same investigator. All parents were asked about iodinated salt consumption. In order to assess thyroid dysfunction, venous blood sampling was performed to determine levels of TSH and thyroid hormones.

All measurements were done in a single laboratory with the same method. Normal range values were: 70-204 ng dL^{-1} for T3, 4.7-12.4 μg dL^{-1} for T4 and 0.3-4 IU mL^{-1} for TSH.

T3 and T4 levels were measured by Radioimmunoassay (RIA) method using Kavoshyar kit, Iran and TSH by RIA method using Pars azmoon kit, Iran.

Subclinical hypothyroidism was defined as an elevated TSH level (4.0 IU mL^{-1}) together with normal serum thyroid hormone levels. Hypothyroidism was defined as an elevated TSH together with a decreased serum thyroid hormone level.

Subclinical hyperthyroidism was defined as a decreased TSH (0.3 IU mL^{-1}) together with normal thyroid hormone levels and hyperthyroidism was defined as a decreased TSH together with elevated thyroid hormone levels. The study protocol was approved by the research ethics committee of Jondishapour University of Medical Sciences. The study was in accordance with the Helsinki Declaration.

Data analysis was performed using SPSS software version 10 (Chicago, IL, USA). The results were presented as mean±SD and comparisons of groups were done by Mann-Whitney's unpaired rank sum test. Comparisons of frequencies were performed by chi-squared (χ^2) test, $p<0.05$ was considered statistically significant.

RESULTS

The 75 newly diagnosed children and adolescents included 38 females and 37 males and the 105 controls were 60 females and 45 males. Mean age of cases and controls was 9.51±3.09 and 10.34±1.71 years, respectively which was not different between groups (p: 0.13, 95% CI:-1.93-0.27). The results of thyroid function tests are presented in Table 1.

There was a significant difference between the 2 groups in T3, T4 and TSH levels. Table 2 shows prevalence of thyroid dysfunction in cases and controls. Both subclinical hypothyroidism and overt hypothyroidism were more frequent among diabetic patients and the difference were statistically significant between 2 groups ($p<0.05$).

Table 1: Thyroid biochemical parameters in diabetics and controls

Biochemical parameters	Diabetics (n = 75)	Controls (n = 105)	Mann whitney p-value
T4 (μg dL^{-1})	4.02±1.460	7.54±1.810	0.0100
T3 (ng dL^{-1})	95.02±24.67	136.49±50.41	0.0002
TSH (IU mL^{-1})	5.97±15.04	1.75±2.190	0.0300

*$p<0.05$ significant

Table 2: Prevalence of thyroid dysfunction in diabetics and controls

Thyroid dysfunction	Diabetics (n = 75)	Controls (n = 105)	p-value
Subclinical hypothyroidism	9.3 (7)	2 (2)	0.02
Hypothyroidism	4.0 (5)	1 (1)	0.03
Subclinical hyperthyroidism	1.3 (1)	1 (1)	ns
Hyperthyroidism	None	None	ns
Total dysfunction	14.6 (13)	4 (5)	0.009

$p<0.05$ significant; ns: non significant

Thyroid enlargement estimated by palpation was detected in 8% (6 children) with diabetes and in 7% (8 children) of the control group ($p>0.05$) and none of the children with thyroid enlargement had thyroid dysfunction. No significant sex differences were found ($p>0.05$). All parents said that they use only iodinated salt.

DISCUSSION

Thyroid disease may affect diabetes management. A hyperthyroid state may increase insulin requirements (due to rapid drug metabolism and clearance from the body), while a hypothyroid state can decrease insulin requirements (Gonzalez, 2007).

Thyroid disease frequency increases with age and hypothyroidism is the most common thyroid disorder in the normal and diabetic populations.

Prevalence of thyroid disorders is higher in diabetes patients compared with the normal population, because patients with one autoimmune disease are at risk of developing other autoimmune disorders (Gonzalez, 2007).

Overall prevalence of thyroid dysfunction in diabetics and general population is 10.8 and 6.6%, respectively and is more frequent among women, affecting up to 30% of females with type 1 diabetes (McKenna, 1990; Dareneliler, 1994; Prina, 1994).

In a previous study in Iran, prevalence of thyroid dysfunction was 5.37%, of them subclinical and overt hypothyroidism was reported in 1.34% of cases, which is less than our study although, the sample size is larger (200 diabetics and 200 controls) than ours. In our study, T4 and TSH levels were significantly higher in controls and it was the same as (Larijani, 2003).

In our study, prevalence of thyroid dysfunction in diabetics was 14.6%, of them 9.3% was subclinical hypothyroidism, 4% hypothyroidism and 1.3% subclinical hyperthyroidism, which are higher than normal control as previous studies (Larijani, 2003; Radaideh, 2003; Hansen, 1999, 2003; Perros, 1995).

Our study power was that these findings were at the beginning of diabetes and with time they may be more prominent and it necessitates further care and attention to this problem.

In another study of Iranian patients by Moayeri (2004) antibodies against thyroid peroxidase were significantly more frequent in children with diabetes. We did not evaluate thyroid antibodies including anti thyroglubolin antibody and anti thyroid peroxidase which is not our purpose of study, however it is one study limitation.

Goiter was found in 8% of children which is lower than in the Moayeri study in both patient and control groups and may be due to iodinated salt use and also, fish consumption as one of the main foods in this area (Moayeri, 2004).

Also, thyroid autoimmunity as an indicator of the need to determine gastric parietal cell and adrenal autoimmunity.

CONCLUSION

Due to its importance in glycemic control and its effect on development and metabolism, annual thyroid function screening and examination of thyroid antibodies in diabetic children for early detection and treatment of asymptomatic thyroid dysfunction in order to achieve better diabetes control and prevention of hypothyroidism is mandatory.

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