Original Article

Antithyroid antibody (TPO-Ab) Status in Type 2 Diabetic Patients

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Abstract

Background: *The presence of thyroid peroxidase antibody (TPO-Ab) in type 2 diabetic patients is a risk factor for the future development of thyroid dysfunction.*

Objective: *To observe thyroid antibody status in type 2 diabetic patients.*

Materials and Methods: *This cross-sectional study was carried out in the Department of Physiology, Sir Salimullah Medical College, Dhaka from July 2016 to June 2017. Total 60 subjects including male and females, age ranged from 40 to 60 years were included in this study, among them 30 were non-diabetic subjects and 30 were type 2 diabetic patients.*

Results: *In this study, the mean serum TPO-Ab level was significantly (<0.01) higher in diabetic subjects in comparison to that of apparently healthy non-diabetic subjects and mean serum TPO-Ab level was higher in uncontrolled diabetic subjects in comparison to that of controlled diabetic subjects but the difference is not statistically significant. However, On the other hand, among the diabetic patients, 6.67% had positive TPO-Ab whereas, among the uncontrolled diabetic patients 11.76% had positive TPO-Ab. There was no correlation between TPO-Ab and HbA1c.*

Conclusion: *The present study reveals that TPO-Ab may present in type 2 diabetic patients.*

Key words: *TPO-Ab, Type 2 diabetes mellitus.*

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Introduction

Diabetes is a chronic, metabolic disease characterized by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys and nerves. The most common is type 2 diabetes, usually in adults, which occurs when the body becomes resistant to insulin or doesn't make enough insulin.[1] In the past few decades the prevalence of type 2 diabetes has risen dramatically in countries of all income levels due to population growth, aging, urbanization, increase prevalence of obesity and physical inactivity.[2] Type 1 diabetes, once known as juvenile diabetes or insulin-dependent diabetes, is a chronic condition in which the pancreas produces little or no insulin by itself. Long term diabetes mellitus is associated with vascular complications like retinopathy, nephropathy, peripheral and autonomic neuropathy, cardiovascular and cerebrovascular diseases.[3] In addition, thyroid dysfunction is another common endocrine disorder that is also increasing day by day[4,5] and may occur in diabetic patients[6,7] especially those with autoimmune thyroid disorder.[8] Thyroid peroxidase (TPO) is an important enzyme that helps in synthesis of thyroid hormones catalyzing the oxidation of iodide on tyrosine residues in thyroglobulin.[9] TPO is a membrane-associated hemo-glycoprotein expressed only in thyrocytes and is one of the most important thyroid gland antigens. Presence of antibody against this antigen is known as TPO antibody.[10] Genetic and environmental factors are involved in the pathogenesis of autoimmune thyroid disease (AITD).[11] However, the prevalence of TPO antibody in general population is 21.85%[5] whereas in type 2 diabetic patients it is about 36.7%.[12] Kahaly found that, in areas of the world where iodine intake is sufficient, autoimmune disorders represent the commonest cause of thyroid dysfunction.[13] Sahu et al. (2015) found 28.33% thyroid dysfunction in type 2 diabetic patients. TPO antibody was positive in 62.07% cases of hypothyroidism and 40% cases of hyperthyroidism. They also observed that TSH showed significant positive correlation with TPO antibody. They had significant negative correlation between TSH and fasting serum insulin, HOMA-IR, HOMA-B.[8] Due to the increased prevalence of thyroid dysfunction in type 2 diabetes and antibody may be one of the factors,[14] this study was conducted to investigate thyroid autoimmunity in type 2 diabetes. Sarfo kanta states that, the presence of thyroid autoimmunity can increase risk of subclinical thyroid disease significantly and in their study they

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found higher frequency of thyroid autoimmunity in Ghanaian type 2 diabetic patients and significant association with thyroid dysfunction, female gender, hypercholesterolemia and hyperglycemia.[15]

Galag et al (2016) suggested that, all the subjects with type 2 diabetic patients particularly those with positive antibody should measure TSH level yearly to detect asymptomatic thyroid dysfunction.[16] As, it can aggravate classical risk factors such as dislipidaemia and lead to an increased risk of cardiovascular events, nephropathy and peripheral vascular disease in these patients.[17,18]

Materials and Methods

This cross sectional study was carried out in the Department of Physiology, Sir Salimullah Medical College (SSMC), Dhaka from July 2016 to June 2017. The study protocol was approved by Institutional Ethics Committee of SSMC. For this study, 30 diagnosed type 2 diabetic patients (Group-B) age ranged from 40 to 60 years were selected from the Out Patient Department (OPD) of Endocrinology, Sir Salimullah Medical College and Mitford Hospital, Dhaka. They were diagnosed previously according to American Diabetic Association (ADA) criteria. Thirty apparently healthy subjects with similar age, BMI and socioeconomic status were selected as comparison (Group A). Study group was again subdivided into two groups according to HbA1c level. Group B_1 included 17 uncontrolled diabetic patients and Group B_2 included 13 controlled diabetic patients. Diabetic patients with renal disease, known thyroid abnormalities, any other endocrine abnormalities and pregnancy were excluded from this study. All the subjects belonged to middle socio-economic status. After selection, the subjects were thoroughly informed about the aim, objectives and procedure of the study and were encouraged for voluntary participation. An informed written consent was taken from each subject. Detail personal, medical, family, socio-economic, occupational histories were taken and thorough physical examination was done and all informations were recorded in a standard pre-fixed questionnaire. With all aseptic precautions 7 ml of venous blood was drawn by sterile disposable syringe from ante-cubital vein. Then 2 ml of whole blood was transferred to an EDTA tube for determination of HbA1c level. The remaining blood was transferred to a clean and dry glass test tube and was kept in slanted position till formation of clot. After centrifugation, supernatant serum was collected in labeled eppendroff test-tube and was used for different biochemical tests. For assessment of antibody status, serum TPO antibody level was measured by chemiluminescent microparticle immunoassay method in the Department of Biochemistry, Bangabandhu Sheikh Mujib Medical University, Dhaka. However, fasting plasma glucose level was estimated by glucose oxidase method in the Department of Physiology, Sir Salimullah Medical College and HbA1c level was estimated by ion exchange high performance liquid chromatography method in the Department of Biochemistry, BSMMU to observe their glycemic status. Data was expressed as mean ± SD (Standard Deviation). The statistical analysis was done by Unpaired 't' test and Bonferroni test by using Statistical Package of Social Science (SPSS) windows version-22. p value ≤ 0.05 was considered as significant.

Results

In this study, the mean (±SD) fasting blood glucose and HbA1c levels were significantly ($p<0.001$) higher in group B in comparison to those of group A. Again, the mean (±SD) serum TPO-Ab level was significantly ($p<0.01$) higher in group B in comparison to that of group A. (Table-I)

On the other hand, The mean (±SD) fasting blood glucose and HbA1c levels were significantly higher in group B_1 ($p<0.001$) in comparison to that of group B_2. The mean (±SD) serum TPO-Ab levels was higher in group B1 in comparison to that of group B_2 but they are not statistically significant. (Table-II)

Table I: Fasting blood glucose, HbA1c and TPO-Ab levels in both groups (N=60)

Groups	n	Fasting blood glucose mmol/L	HbA1c %	TPO-Ab IU /ml
A	30	5.08 ± 0.64	5.04 ± 0.42	1.16 ± 0.70
B	30	7.28 ± 1.83	6.50 ± 0.96	2.85 ± 3.12

Statistical analysis

Groups	Fasting blood glucose (p value)	HbA1c (p value)	TPO-Ab (p value)
A vs B	<0.001 ***	<0.001 ***	<0.005 **

Data were expressed as mean ± SD. For statistical analysis, an Unpaired 't-test was performed to compare between the groups.
Group A: Comparison group (Healthy non-diabetic subjects)
Group B: Study group (Diabetic patients)
*** = Significant at $p<0.001$, ** = Significant at $p<0.01$
N= Total number of subjects

Table II: Fasting blood glucose, HbA1c levels and TPO-Ab levels in both groups (n=30)

Groups	n	Fasting blood glucose mmol/L	HbA1c %	TPO - Ab IU / ml
B_1	17	8.53± 1.16	7.17±0.63	3.44 ± 3.98
B_2	13	5.65 ± 1.08	5.62 ± 0.51	2.07 ± 1.01

Statistical analysis

Groups	Fasting blood glucose (p value)	HbA1c (p value)	TPO - Ab (p value)
B_1 vs B_2	<0.001 ***	<0.001 ***	0.2 96 ns

Data were expressed as mean ± SD. For statistical analysis, Bonferroni test was performed for comparison between two groups.
Group B_1: Uncontrolled diabetic patients
Group B_2: Controlled diabetic patients
*** = Significant at p<0.001, ns= not significant
n= Total number of diabetic subjects

In this study, among the diabetic patients, 6.67% had positive TPO-Ab and 93.33% had negative TPO-Ab. Again, among the uncontrolled diabetic patients, 11.76% had positive TPO-Ab and 88.24% had negative TPO-Ab. All the controlled diabetic patients had negative TPO-Ab.

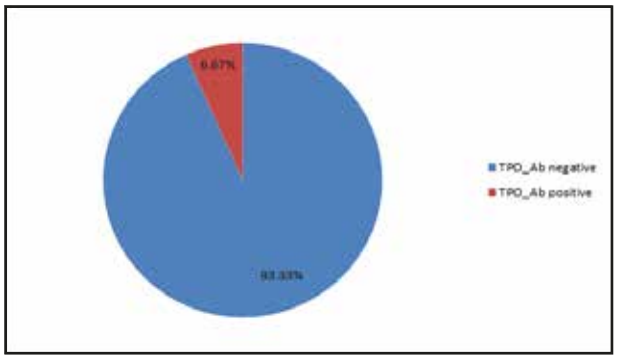

Figure 1: Distribution of TPO-Ab in diabetic subjects (n=30)

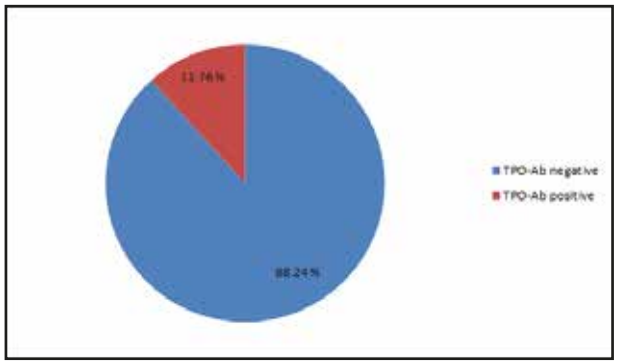

Figure 2: Distribution of TPO-Ab in uncontrolled diabetic subjects (n=17)

Discussion

This study observed thyroid autoimmunity in type 2 diabetic patients by measuring thyroid peroxidase antibody level. HbA1c level was also estimated to find out TPO-Ab level on uncontrolled and controlled diabetic patients.

In this study, the mean serum TPO-Ab level was significantly ($p<0.01$) higher in diabetic patients in comparison to that of non-diabetic subjects. But there was no significant difference on TPO-Ab level between uncontrolled and controlled diabetic patients. Almost similar findings were also reported by some other researchers of different countries.[19,20,21]

In this study, among the diabetic patients, 6.67% had positive TPO-Ab and 93.33% had negative TPO-Ab. Again, among the uncontrolled diabetic patients, 11.76% had positive TPO-Ab and 88.24% had negative TPO-Ab. Ardekani, Ardekani and Rashidi (2012) found 36.7% positive TPO-Ab among 2000 type 2 diabetic patients.[12] Radaideh et al. (2004) found 8.3% positive TPO-Ab among 600 diabetic patients.[19] Besides these, various researchers of different countries found different findings. [20,21,22]

Sahu et al. (2015) reported that thyroid peroxidase antibody is responsible for thyroid dysfunction in type 2 diabetic patients.8 Elebrashy et al. (2016) stated that the exact explanation for increased prevalence of autoimmune thyroid disease in type 2 diabetic patients is still not known. It may be due to genetic and environmental factors, infections and psychological stress.[23] Akbar, Ahmed and Mughales (2006) explained that presence of glutamic acid decarboxylase (GAD) antibody may be another cause of autoimmune thyroid disease in type 2 diabetic patients.[20]

Conclusion

From this study it can be concluded that, TPO-Ab level is increasing in type 2 diabetic patients and early detection may prevent future development of thyroid dysfunction in type 2 diabetic patients.

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